

# BLACK LOCH OF MYRTON

*The life and times of an Iron Age wetland  
settlement in southwest Scotland*



**ANNE CRONE & GRAEME CAVERS**



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HISTORIC  
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# Contributors

Enid Allison	Canterbury Archaeological Trust
John Barber	Independent
Phil Barratt	Archaeology, School of Humanities, University of Glasgow
Anthony Brown	School of Geography & Environmental Science, University of Southampton
Hamish Darrah	Dept Archaeology & Ancient History, University of Leicester
Kim Davies	Dept Geography, Bath Spa University
Calum Edward	Dept Earth Sciences, Uppsala University
Rob Engl	AOC Archaeology Group
Thierry Fonville	School of Geography & Environmental Science, University of Southampton ( <i>PhD &amp; post-doc</i> )
Derek Hamilton	SUERC, University of Glasgow
Maarten van Hardenbroek	Faculty of Science & Engineering, University of Groningen
Katie Head	School of Geography, Earth and Environmental Sciences, University of Plymouth
Andrew Henderson	School of Geography, Politics & Sociology, University of Newcastle
Pete Langdon	Dept Geography & Environmental Science, University of Southampton
Helen Mackay	Dept Geography, University of Durham
Dawn McLaren	AOC Archaeology Group
Natalie Mitchell	Powell-Cotton Museum, Birchington
Jackaline Robertson	AOC Archaeology Group
Lynne Roy	AOC Archaeology Group
Nicki Whitehouse	Archaeology, School of Humanities, University of Glasgow
Alex Wood	Independent



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Every season AOC staff were assisted by enthusiastic volunteers, both amateur and professional, many of whom returned season after season, some staying for the duration, others coming for a day or two. This volume would not have happened without them. Their names are listed below.

## 2013

**AOC team** Hana Kdolska, Jake Streatfeild-James.

**Volunteers** Helen and Mike Alexander, Peter Buxton, Margaret Cooper, David Devereux, Anne Dunford, Thierry Fonville, Piotr Jacobsson, John Pickin, Tessa Poller, Fran Sacree, Glenis and Ralph Vowles.

## 2015

**AOC team** Charlotte Douglas, Nick Johnstone, Hana Kdolska, Yvonne Robertson.

**Volunteers** Anne Brown, Peter Buxton, Alex Currie, Adrian Davies, David Devereux, Ros Francis, Ben Glanville, Danny Johnston, Tom McFarlane, John Pickin, Jamie-Ann Pirie, Tessa Poller, Isla Scott, Michael Stratigos.

## 2016

**AOC team** Lisa Bird, Alan Duffy, Nick Johnstone.

**Volunteers** Helen and Mike Alexander, John Barber, Lisa Brown, Peter Buxton, David Devereux, Ros Francis, Ben Glanville, Senga Hill, Danny Johnston, Rod McCullagh, Tom McFarlane, John Pickin, Jamie-Ann Pirie, Scott Walker, Julia Muir Watt, Isla Scott, Ruairaidh Soutar.

## 2017

**AOC team** Charlotte Douglas, Anne Marot, Steven Watt, Stuart Wilson, Alex Wood.

**Volunteers** Helen and Mike Alexander, John Barber, Heather and Mick Berrisford, David Devereux, Ben Glanville, Lyn Hampshire, Danielle Hannigan, John Harrison, Alan Hill, Maya Hoole, Rod McCullagh, Tom McFarlane, Ann and Fred Nelson, Jenny Roberts, Isla Scott, Ruairaidh Soutar, Amanda and Andie Wilson.

## 2018

**AOC team** Lisa Bird, Leanne Demay, Harry Francis, Rowan Gillis, Donna Hawthorne, Anne Marot, Andrew Morrison, Lindsey Stirling.

**Volunteers** Helen and Mike Alexander, John Barber, Heather and Mick Berrisford, Francis and John Brown, Ann Dunford, Vanessa Jackson, Danny Johnston, Rod McCullagh, Tom McFarlane, Ross Murray, Ann and Fred Nelson, John Pickin, Jamie-Ann Pirie, Jenny Roberts, Isla Scott, Ruairaidh Soutar, Tony Taylor, Katie Walker.

## 2019

**AOC team** Alex Wood, Harry Francis, Sam Kinirons, Anne Marot, Lindsey Stirling, Katie Walker.

**Volunteers** John Barber, Tom Gardiner, Frances Llanze, Carl Maxon, Rod McCullagh, Ann and Fred Nelson, John Pickin, Jenny Roberts, Michael Stratigos.

In these busy times it is very difficult to find a single person who is willing or able to review an entire publication of this size. Consequently, we approached peers who were willing to review the sections relevant to their area of expertise; these are listed below.

Chaps 2, 7 & 18.1	Martin Bridge (Oxford Dendrochronology Laboratory)
Chap 10	Lisa-Marie Shillito (University of Newcastle)
Chaps 11 & 12	Julie Bond (University of Bradford)
Chap 13	Harry Kenward (University of York)
Chaps 14 & 15.4	Mike Bamforth (University of York)
Chap 15	Fraser Hunter (National Museum of Scotland)
Chap 17	Viv Jones (University College London)
Chap 18	Strat Halliday

We are very grateful to these reviewers for their time and input; they have individually picked up factual errors, tightened up arguments and collectively made this a better volume. We only hope that those unreviewed sections written jointly by the authors will bear positive scrutiny.

Over the years many people have been involved in producing the graphics illustrating this volume. The artefacts have been illustrated by Alan Braby, Orlene Mcilpatrick and Sam O'Leary while Jamie Humble prepared many of the laser scans. The bulk of the graphics, the plans, sections, graphs etc have been prepared by Mark Hoyle, who has also produced the lively reconstructions of Iron Age Black Loch.

This volume was a large scrappy (digital) pile of text, tables and graphics which has been honed into shape by our copy-editor Alice Getley. Her methodical and rigorous eye has eradicated many errors and omissions and we thank her for all the work that she has put into shaping this volume.

---

# Introduction

## 1.1 The landscape setting; topography, hydrology and archaeology

### 1.1.1 Topographic context

Black Loch of Myrton (NX 3610 4283) is located on the Machars peninsula which, along with the Rhins of Galloway to the west (W), forms one of the major landscape units of Wigtownshire (Figure 1.1). The Machars takes its name from the Gaelic for ‘low lying land’, a suitable description for the undulating topography that stands in contrast to the western range of the southern uplands to the north (N) and the low hills and cliffs of the Rhins to the W. South of the modern A75 trunk road to Stranraer the area is typified by low rolling hills formed by glacial drumlins, save in the north-western region where the relatively high ground around Knock Fell, Mochrum Fell and Gargrie Moor provide ground that is less amenable to modern agriculture. Much of the W coast of the Machars comprises raised beach, with raised bars of marine gravels and sands facing Luce Bay. The parent geology of the area is almost exclusively Silurian shales and wackes, with the area around Monreith dominated by wackes of the Cairnharrow formation. These sedimentary rocks provide the parent material for extensive deposits of till and diamicton, with occasional pockets of fluvio-glacially deposited gravels and sands. In turn, these superficial deposits have provided the basis for the development of non-calcareous gleyed soils; these are typically acidic and, combined with the generally warm and wet Atlantic climate, better suited to pastoral dairy than arable agriculture.

### 1.1.2 Hydrological context

The south-westward movement of the ice sheet (Britice 2021) scored the landscape with glacial lineations that have formed natural divisions of topography which both modern roads and the main drainage paths follow, resulting in a SW–NE segmentation of the landscape of the western Machars. The Black Loch itself is one of a pair of shallow kettle-hole lochs (the other being White Loch of Myrton, 300 m to the north-west, NW) typical of Wigtownshire, being less than 10 m deep at most (Murray & Pullar 1910, Sheet XXXIX) and relatively small: the White Loch is currently around 20 Ha while the original extent of the Black Loch prior to drainage is unlikely to ever have exceeded 9 Ha and all historic maps depict it as less than 4 Ha (see Chapter 17.1). Together, the two lochs dominate the drainage catchment defined by the Killantrae Burn to the N and the Monreith Burn to the south (S). The latter was diverted as part of the major drainage operations that took place in the 19th century. Roy’s map of the 1750s depicts the Black Loch as a standing water body fed by the Monreith Burn which, in his depiction, in turn drains into the White Loch (labelled ‘Martin Loch’) and to the coast via the Barsalloch Burn, an unlikely arrangement that is probably a cartographic error (Figure 1.2).

The raised spur of land that divides the White and Black Lochs almost certainly always maintained the separation of those drainage channels, with the White Loch outlet being the Barsalloch Burn and the Black Loch drained by the Monreith Burn. By the



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Figure 1.1. Site location plan.



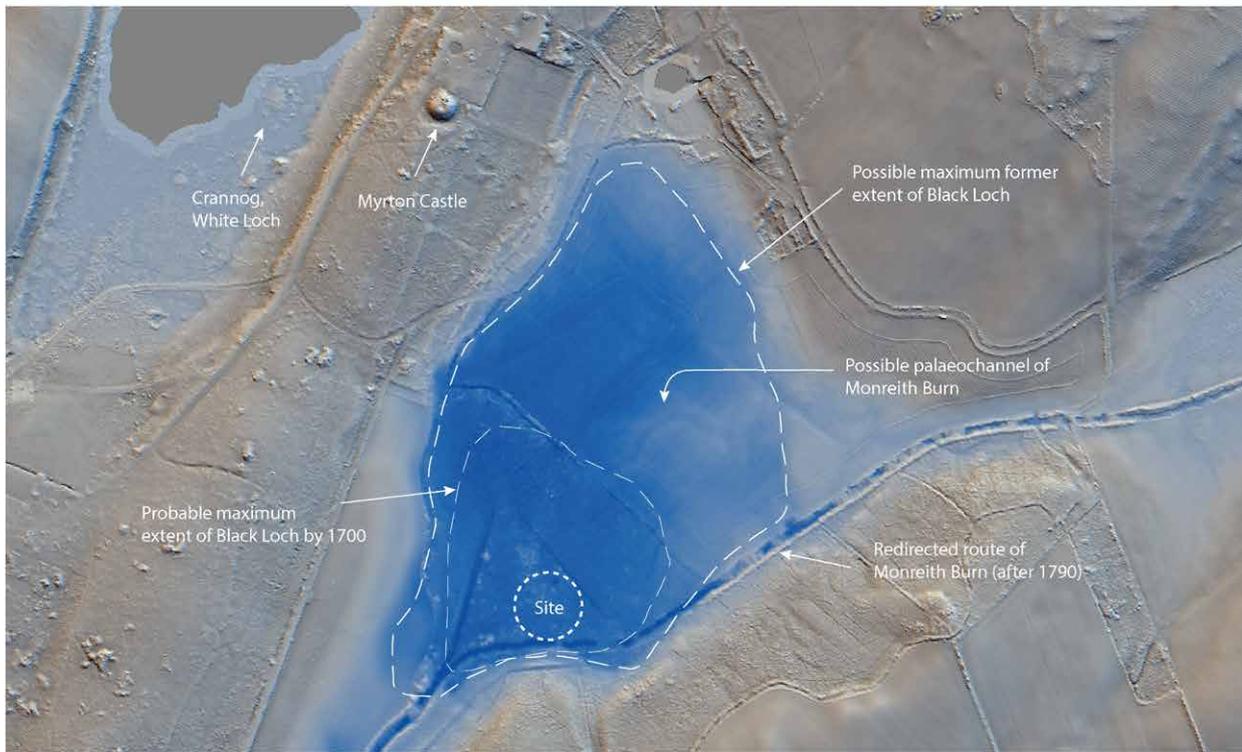
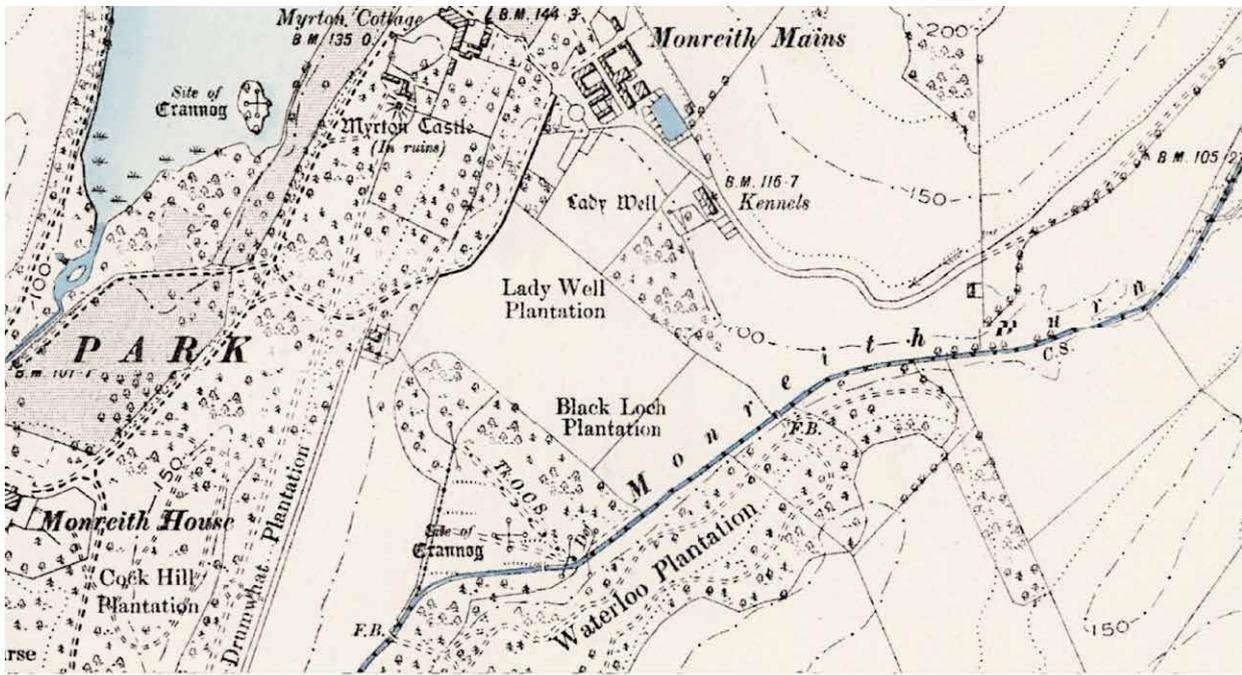


Figure 1.3. Ordnance Survey 6-inch map of 1888 (top) and topographic elevation model derived from Scottish Government Phase III LiDAR, which shows the position of the former route of Monreith Burn (as a palaeochannel feeding from the NE), and the maximum likely extent of the former loch and the probable extent of the loch by 1700.



Figure 1.4. Aerial image of the White Loch of Myrton showing the drained Black Loch in the top left (Image: © HES).

time of the first edition Ordnance Survey map (sheet 29, survey 1848, pub. 1850), the artificial drainage of the Black Loch was well established and the Monreith Burn had been diverted to the S, leaving the northern part of the Black Loch as wet, but viable agricultural land. The fields formed in this reclaimed area are fed by a natural spring, located to the N at ‘Lady Well’, and have apparently always been wet. Successive generations of farmers have attempted renewed efforts to drain them: it was the cutting of new drains and run-off ditches by the current farmer, Rory Christie, that brought about the rediscovery of the Black Loch settlement (see below).

The designed landscape of the Monreith Estate is centred around Monreith House, which was completed in the late 18th century. Receipts noted in the Scottish Record Office record payments made in the 1790s for substantial ground improvement works, and it may be that it was in this decade that the original drainage of the Black Loch was initiated. Gillone’s estate map of Merton policy, surveyed in 1777 (NLS Acc.13374), while insufficiently detailed to allow confidence in the drainage arrangements at the time, gives the Monreith Burn a sinuous path to the W of the loch, suggesting the redirection and drainage works

took place later in that century. Analysis of the Scottish Government’s Phase III LiDAR dataset shows possible palaeochannels of the Monreith Burn which originally fed the loch from the north-east (NE), while a flood model based on the elevation model indicates the maximum extent of the former loch (Figure 1.3). This is discussed in further detail in Chapter 17.1.

Today, the site is located in open woodland dominated by alder, hazel, willow and birch with occasional oaks and sycamores. The woodland, located at the southern end of the drained area is very wet ground and, prior to the drainage installed in 2009–10, would flood regularly in winter (Figure 1.4).

The vegetation is dominated by damp-loving species, including *phragmites* reeds and rushes (*Juncus sp*), yellow iris (*Iris pseudacorus*) and water dropwort/hemlock (*Oenanthe crocata*), though the drier, raised ground of the settlement itself is grassy with dense patches of nettles. According to the farmer, the woodland was cleared in the 1970s and the trees that have regenerated since are young and multi-stemmed, although some are substantial enough to have constrained the positioning of the trenches (see below).

### 1.1.3 Local archaeological context

The area surrounding the Myrton lochs has evidently been a focus of activity since the arrival of the earliest post-glacial settlers, with microliths attesting Mesolithic activity along the West Machars raised beaches (eg Cormack 1970). Neolithic and Bronze Age activity is represented by the Drumtroddan standing stones, located less than 1 km to the N of Black Loch. In 2012, three stone lined cists, one of which contained skeletal remains, were disturbed by ploughing in close proximity to the Wren's Egg, a large glacial erratic associated with standing stones at Blairbuy Farm, *circa* 800 m S of Black Loch (Bailie 2012). Prehistoric domestic buildings in the Machars are first detectable in the form of numerous hut circles, mostly distributed in upland areas around Knock Fell and Gargie Moor where they are associated with extensive relict field systems. However, new examples identified around the fringes of modern agriculture are regularly being added to the record through analysis of aerial LiDAR data (eg Cavers et al 2021), demonstrating that hut circle settlements are to be found in most areas of the Machars.

While the chronology of these hut circles and other unenclosed or palisaded settlements should be expected to extend into the Iron Age, by later prehistory the settlement record is almost exclusively visible in the form of the defended enclosures – forts, promontory forts and crannogs – that are found across Wigtownshire. In general, most forts are at the smaller end of the typical size range, with only a small number, such as Baldoon Hill and Knock Fell, approaching 1 Ha or above in area. Far more common are small defensive enclosures, less than 0.5 Ha in extent, with multivallate promontory forts (Toolis 2003) and stone-walled homesteads (Cavers & Geddes 2010) common around the coastal fringes. In most cases, there is little evidence for more than two or three buildings in use within these defences (Toolis 2007), but very little excavation has been carried out at any of these sites. In the locality of Black Loch, there are significant Iron Age enclosures at Fell of Barhullion and Barsalloch. At Barhullion, *circa* 1.2 km south-east (SE) of Black Loch, a stone fort with an unusual *chevaux-de-frise* occupies the most conspicuous area of high ground in the south-west (SW) Machars, with commanding views in all directions. The site seems certain to have been of some importance, but no excavation has been carried out and nothing is known of the date of occupation. Barsalloch is more typical of the earth and stone fortifications found along the S and W Machars coast; a substantial bank and ditch, over 3.5 m in depth, encloses an area large enough for perhaps only three roundhouses.

It seems that crannogs and related wetland settlements were a major component of the Iron Age settlement landscape in Wigtownshire and virtually every available body of water of any size was occupied by at least one site. The collection of sites found in Dowalton Loch when it was

drained in the 19th century, which demonstrably represent activity from the late Bronze Age to the early medieval period (Stuart 1868; Hunter 1994; Cavers 2010), suggests that it was common for the larger lochs to contain multiple settlements.

There is, as yet, no evidence that either White or Black Loch were occupied after the middle Iron Age, but the locality remained an important settlement into the early medieval period. The Monreith Cross, a remarkable 3 m high cross carved in 10th century Hiberno-Norse style from exotic stone – most likely from Argyll or the West Highlands – was located near Monreith House and surely indicates the presence of a significant ecclesiastical establishment at Myrton. The early history and original position of the cross are uncertain, but it seems to have been moved from Myrton Castle to Monreith House (Stuart 1867: 51), before being taken to Whithorn in the 1970s. Continuity of settlement into the medieval period is indicated by the presence of a possible homestead moat at Monreith Mains (Canmore ID 62769) which, if not in fact a prehistoric fortification similar to Rispaan Camp, might represent settlement in the 12th to 14th centuries. The standing remains of Myrton Castle are a 16th century keep with 17th century modifications, but it occupies the site of a motte similar to other examples found across Galloway and which are conventionally dated to the 11th/12th centuries.

*NOTE: for brevity, the names of Black Loch of Myrton and White Loch of Myrton are hereafter abbreviated to BLoM and WLoM.*

### 1.2 Previous archaeological investigations

The site of BLoM was 'discovered' in the late 19th century. Sir Herbert Maxwell, the landowner of the Monreith Estate at the time, was an enthusiastic antiquarian, described by Robert Munro as '*an experienced explorer of crannogs...*' (1885: 99) and together with Munro, he investigated numerous sites including the wetland settlements in Dowalton Loch (ibid). During a visit to Monreith, Maxwell took Munro to see '*...a supposed crannog in the dried bed of the Black Loch of Myrton...*' and he reported on the visit in a short footnote in his volume on the lake-dwellings of Wigtownshire (1885: 83). His description is worth quoting in full here:

'... in a short time we succeeded in detecting, through a dense thicket of bushes and nettles, the tops of a few black posts of oak which formed part of its surrounding stockade. Since then Sir Herbert made some tentative digging, of which he sends the following notes; "*The crannog which I showed you close to this house will I think repay further investigation. The loch has been drained for 80 years, and its bed repeatedly cropped and then planted. Trees now over 25 years*

*old. Surface of island extensive (140 feet diameter), and shows 8 or 9 mounds. Opened one; found pavement of flat stones laid in clay, about 9 feet in diameter and irregularly circular. Stones much fire-marked, with much ashes and cinders both above and below. Dug 4.5 feet deep, when water came in before reaching the old lake bottom. Found several excellent grinding-stones of white quartz and hard sandstone beach pebbles. Also many whitened beach pebbles, and some masses of corroded iron and vitreous slag. Worked only for four hours”.* (Munro 1885: 83).

This note was accompanied by illustrations showing two of the grinding stones which Maxwell subsequently also published separately (Maxwell 1889: 214–215). Maxwell’s description of the flat stones embedded in clay and ashes are now instantly recognizable as the large stone hearths which lie at the centre of each of the excavated roundhouses, while the mounds he described survive to this day and mark the location of the roundhouses described in this volume.

Maxwell also described his investigations at BLoM in his memoirs (Maxwell 1932) but this time with much greater levity:

*‘It came to pass that when we were exploring a crannog in the Black Loch of Myrton, close to Monreith, which had been drained in the 18th century, a party of young people came over from Barnbarroch to watch the excavation. Here again we were disappointed in the paucity of spoil, a few pounding stones, a flagged hearth and the usual midden of bones and hazel-nut shells was all that turned up. We adjourned with our visitors to luncheon at Monreith, returning with them to our toil immediately after. The workmen had not proceeded far when a large circlet of yellow metal was thrown out onto the peat. A gold armet! was my instant thought; and another was found close beside the first. These were carefully laid aside and the soil where they had lain scrupulously turned over and sifted before examining the precious armlets critically. When this was done, the murder was out. A wicked young woman, Miss Bessie Vans Agnew, had clandestinely and malice prepense, thrust a couple of brass curtain rings into the soft peat before the diggers!’* (Maxwell 1932)

In the midst of this light-hearted sketch he does describe another aspect of BLoM that became all too familiar as excavations proceeded, the very real absence of artefacts other than coarse stone tools (Chapter 15); his disappointment at the lack of ‘treasure’ at BLoM was felt by the excavation team at the end of many a season.

It was another century before Maxwell’s suggestion that BLoM might repay further investigation was acted on. On

the basis of his investigations BLoM was listed amongst the Group 1 ‘sites confidently identified as crannogs’ during the first phase of the SW Crannog Survey (Barber & Crone 1993: 525). The site was recorded as desiccated although coring produced some organic deposits (*ibid*: 526). Then, during drainage operations in 2010 to improve the pasture to the NE of the site the owner and farmer, Rory Christie, encountered two oak posts in the run-off channel. It was assumed that the posts formed part of the ‘stockade’ that Munro had observed and consequently a small assessment of the area around the findspot was carried out to determine the nature and condition of the site (Cavers 2010). Several mounds were visible close to the findspot and test-pits were dug in the vicinity of one of the mounds (Figure 1.5).

Horizontal timbers and an *in situ* stake were uncovered, all of which were subsequently identified as alder. The alder stake was radiocarbon-dated to 770–410 cal BCE (SUERC 32597) and one of the oak posts to 380–200 cal BCE (SUERC 32598) (Table 2.2), suggesting at least two phases of building activity on the site.

### 1.3 Research framework and methodology

The rediscovery of the site at BLoM was fortuitous in its timing, as the authors were at that point engaged in the Scottish Wetland Archaeology Programme’s (SWAP) excavations in Wigtownshire at Cults Loch and Whitefield Loch. The latter project (Cavers et al 2011) had produced the first ever prehistoric dendrochronological dates from Scotland, crucially establishing a link to the Carlisle and Irish tree-ring sequences and the prospect of further absolute dendro dating for Scottish crannogs. The possibilities for an investigation of Iron Age settlement dynamics armed with the high-resolution data provided by accurate dating and well-preserved occupation deposits were the stimulus for the Cults Landscape Project. This coupled the excavation of a crannog settlement with exploration of nearby fortified enclosures with the aim of understanding changes in function through the latter half of the 1st millennium BCE. This approach was successful in integrating the wetland settlement record with the neighbouring ‘dryland’ sites, to some extent addressing the cursory consideration given to crannogs in investigations of Iron Age settlement and exploiting the remarkable levels of preservation found on them and which are usually missing from terrestrial settlements (Cavers & Crone 2018). However, while the Cults Loch 3 promontory settlement provided large quantities of information on the chronology of the site’s use and the economy of its occupants, complex taphonomic processes had resulted in very partial survival of structural remains and, as a result, the interpretation of the buildings on the site was not straightforward. It was clear, nonetheless, that the chronological resolution afforded by the crannogs of SW Scotland, combined with their excellent levels of



Figure 1.5. Test-pitting along the line of the newly installed drainage in 2010 located timbers belonging to ST1.

preservation, presented the potential for spectacular results from future excavations.

The identification of organic structural remains associated with the probable hearths of buildings at Black Loch was, then, of clear and direct relevance to the SWAP research programme, given the advances made by the Whitefield and Cults Loch projects. The radiocarbon dates obtained from the first timber samples collected from the site were virtually identical to those obtained from Cults Loch 3, opening up the possibility that timbers from the site could be matched to the new dendro sequence established by the earlier projects. Two factors weighed strongly in favour of a new excavation programme at Black Loch. Firstly, the preservation environment of the site, in peaty bog rather than open water, offered the realistic prospect of being able to excavate across the site, including around its margins in areas that would be flooded or submerged at other sites. Secondly, the establishment of effective drainage through the wet woodland meant that there was a strong likelihood that the surviving structures and associated deposits would suffer from desiccation or from the introduction of more aerobic conditions, with the consequent loss of important archaeological deposits. Consequently, funding for an initial season of excavation was sought from Historic Environment Scotland. During

this first season in 2013 it became apparent that the historic changes to the hydrology around the site described above had already wrought significant damage to archaeological deposits on the site (see below) and subsequently funding was extended to a further five seasons of fieldwork.

Investigation of the site proceeded in stages. Following the identification of structural timbers in 2010, a single evaluation trench was excavated over one of the hearth mounds in 2013 and, having established the presence of the suspected building remains, a detailed topographic survey was carried out in order to map the stone hearth mounds and attempt to define the extents of the settlement. This was later augmented with geophysical survey carried out using resistivity and gradiometry which assisted in the identification of stone spreads and hearth mounds across the site. From these early investigations it was apparent that the activity area was likely confined to the area of slightly raised ground in the SE corner of the woodland, an area that seemed to accord with Maxwell's descriptions.

Subsequent seasons of excavation sought to clarify specific research questions, which evolved as the project proceeded. Practicalities also played a part in shaping the excavation strategy: several large trees grow over the site and these constrained the positioning and layout of trenches (Figures 1.6 & 1.7).

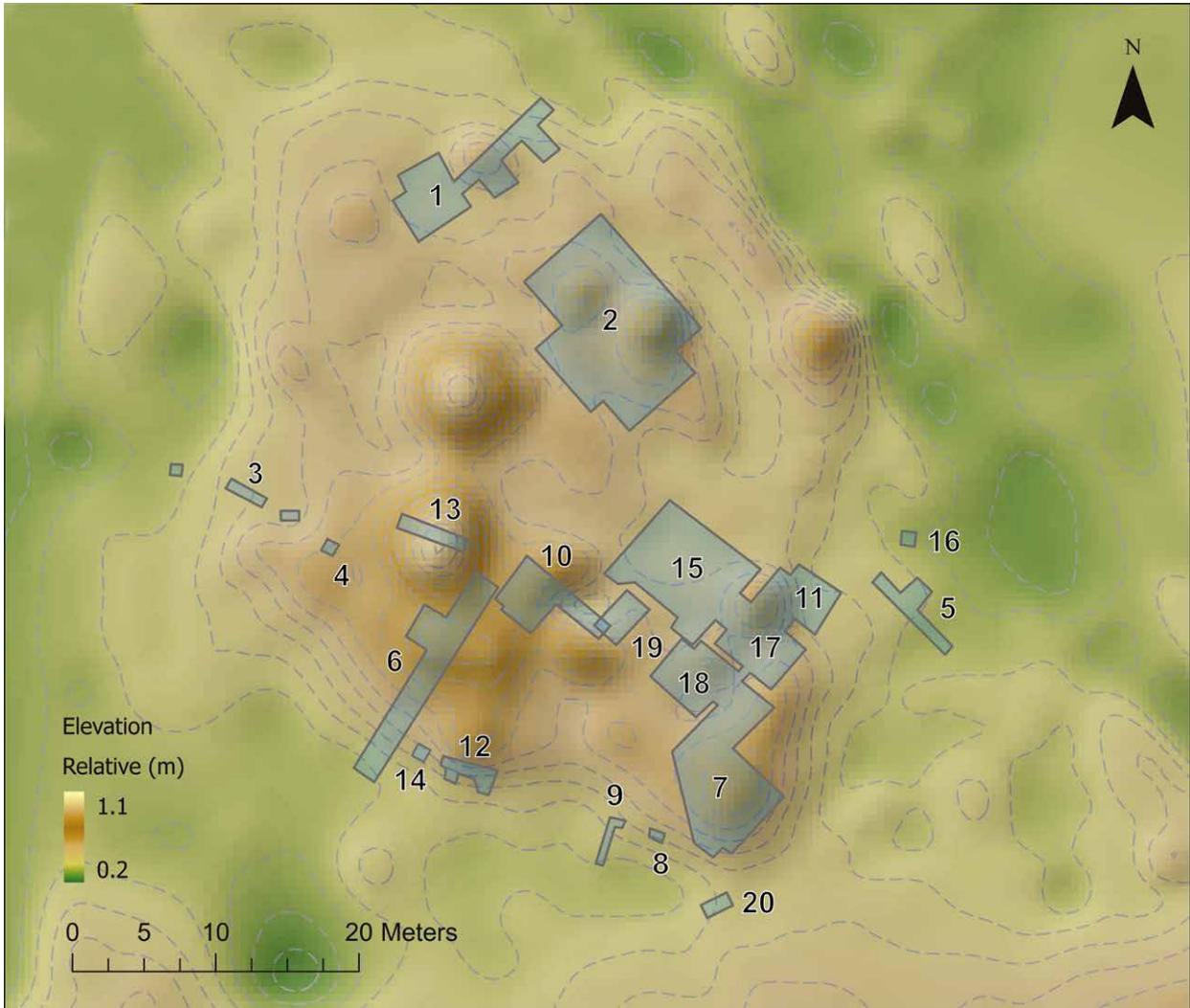


Figure 1.6. The layout of the trenches over the duration of the project. In several places, large trees had to be worked around.

In 2015, a single large trench (Trench 2) aimed to characterise a second hearth mound and the structure that contained it. In 2016, two trenches were excavated. The first was an extension to Trench 2 which aimed to expose the entrance of ST2, as well as the outer wall and surrounding log pavement to the S of the building. The second, Trench 6 was placed over an area of raised, stony ground identified by the topographic and resistance surveys and extended to the SW in an attempt to identify the southern perimeter of the settlement. In 2017 Trench 7 aimed to identify the entrance onto the settlement by targeting the closest point to the dry land located to the S, while Trench 10 targeted a further stony feature in the interior, thought to be possible structural remains. Trenches 8, 9 and 12 pursued the defensive perimeter around the southern edge of the island. In 2018 work focused on extending the entrance investigations (Trench 7X), while Trenches 15 and 11 aimed to investigate ST3, another building featuring a hearth stack

sequence and located between the entrance and ST2. In the course of these excavations, the corduroy trackway through the spine of the settlement was identified, along with evidence for early midden deposits that pre-dated an expansion of the settlement with the construction of ST3. In 2019 Trenches 17, 18 and 19 sought to establish the extent of this building and its relationship to the central trackway and the early midden deposits found beneath structural remains in Trench 7. The results are summarised in Section 1.4.

In parallel with the excavations at the site, the authors worked as part of the *Celtic Crannogs* project, a cross-institutional initiative led by Prof Tony Brown and colleagues at Southampton, Newcastle and Bournemouth Universities, and funded by the Arts and Humanities Research Council (AHRC). This project aimed to investigate the potential for the analysis of multiple strands of proxy evidence for activity on wetland settlements from off-site sediment cores, and involved the analysis of sedimentary



Figure 1.7. This photo, taken during vegetation clearance in advance of excavation of Trench 2 in 2015, illustrates the current character of the site, a wet carr woodland dominated by alder, hazel and sycamore. ST5 lies to the right surmounted by a number of large sycamore trees.

ancient DNA (sedaDNA), faecal sterols, geochemistry, insect remains, chironomids, pollen, diatoms and other botanical indicators for past environmental conditions and signals of human activity. The primary focus of the *Celtic Crannogs* project was in demonstrating the resolution of data that could be obtained from off-site analysis in the absence of excavation, working with samples obtained from lochs in Wigtownshire and Northern Ireland (Brown et al 2021: 2022). The analysis of deposits from BLoM offered not only the opportunity to expand on and enhance the data obtained from the on-site investigations, but also a means of ‘calibrating’ the effectiveness of these approaches through comparison with the excavation results. In practice, the two projects became closely interlinked as they progressed, with the results of each shaping the developing research strategy of the other. This multidisciplinary approach is now considered an essential prerequisite of wetland archaeological research, with the results of each analysis vital to the interpretation of the complex datasets obtained. The results of the off-site analyses are presented and discussed in Chapter 17.1.

#### 1.4 Pre-excavation surveys

Before excavations took place and in order to inform the placement of trenches, a series of pre-disturbance surveys were carried out, including a topographic survey, magnetic gradiometry and electrical resistivity. The topographic survey was carried out in January 2016, when seasonal vegetation cover was at its minimal extent. Terrain points were collected wherever gaps in tree cover and vegetation allowed, extending from the N bank of the Monreith Burn, S of the site, to the fence dividing the modern Black Loch bog from the farmed field to the N. The resulting terrain model demonstrated that the site comprised a series of small mounds, mostly *circa* 8 m in diameter, sited on a raised promontory *circa* 60 m by 48 m. Aerial LiDAR obtained from the Scottish Remote Sensing Portal (Phase III dataset) was assessed for the wooded area around the site when this became available after 2019, but there is no significant signature in terrain models produced from this dataset. In 2013 a reconnaissance coring survey was carried out across the site, aiming to establish the vertical and horizontal extents of the anthropogenic layers at the site;

this confirmed that the archaeological deposits, confined to the upper 1.5 m for the most part, overlay natural peats and not lake sediments; ie that the site was not a crannog in the conventional sense.

Following several seasons of excavation, limited geophysical survey was carried out on the site in 2017 in an attempt to refine our understanding of the buried deposits and structures and to inform the positioning of future trenches. Conditions on site were unsuitable for the collection of detailed geophysical data, with tree and vegetation cover preventing easy access. Nevertheless, the results of both electrical and magnetic surveys provided useful information and showed the extent of the stone spreads on the site and those with strong magnetic signals likely to be a consequence of their use as hearths. The stone mound labelled later as ST5 was particularly prominent in the survey results, with a highly magnetised, high-resistance central feature surrounded by a deep annular band of low resistance deposits.

## 1.5 Summary of the excavation results

The 19th century antiquarians referred to BLoM as a crannog because that was the prevailing terminology for island settlements found in lochs (Munro 1882), and the site continued to be described as such until the first season of excavation in 2013 (Crone & Cavers 2015). The investigations that year demonstrated that there were no artificial foundations under the structures and that the settlement had been built directly onto the peaty surface of a small natural island (Chapter 17.2). Thus, the site does not conform to the classic definition of a crannog (see Chapter 18 for further discussion) and is more correctly described as a settlement in a wetland setting.

Subsequently the topographic survey identified a roughly oval-shaped island, some 60 m NW/SE by 48.6 m NE/SW and 2,400 m<sup>2</sup> in area, attached to the shore by a natural causeway at its southern end. This area is defined by the 27 m OD contour, a somewhat arbitrary boundary which in places does not encompass trenches in which archaeological remains have been found, ie Trench 5 and the findspots of the Episode 3.2 palisade posts, T8 and T9. The eastern edge of the island has also been clipped by a 19th century drainage ditch. Within the boundaries of the 27 m contour the island now rises by only 0.14– 0.23 m above the surrounding surfaces, although it may have been a more pronounced mound during its occupation.

Excavation has demonstrated that many of the mounds observed by Maxwell (noted above) and defined by the topographic survey mark the location of roundhouse stances, the mounds having been created by the stack of stone-built hearths found at the centre of the roundhouses. In all, six roundhouses have been investigated, as well as the area around the entrance on to the island and the defensive perimeter flanking the entrance. House is a value-loaded

noun, implying as it does that it is the arena for purely domestic activities, such as sleeping, eating, food preparation etc (Harding 2009: 27–28) whereas structure is more all-encompassing of a range of activities. However, roundhouse will continue to be used throughout this volume, primarily because of its almost universal application in Iron Age studies, at the same time recognising that some of the structures under analysis may have served multiple functions.

Similarly, we refer to the enclosure works that surrounded the settlement as ‘defences’. In doing so, we recognise that we cannot demonstrate that such structures were designed with defence primarily in mind, but we do so for the sake of convenience and in alignment with terminology used in the discussion of other related Iron Age settlements. The term ‘rampart’ is also used, advisedly, for the relatively low and slim banks that surrounded the settlement in its latter stages. We return to the discussion of defensibility in the final chapters of this report.

Three major Episodes of activity have been identified on the settlement (Figure 1.8). Many of the houses have multiple hearths and each hearth and associated structures have been assigned a Phase number. The Phase numbers relate only to the house and are not demonstrably coeval across each Episode. The structural evidence for each Episode is briefly summarised here.

### 1.5.1 Episode 1

The primary settlement on the island consisted of at least three roundhouses, ST1, ST2 and ST5, clustered in the N half of the island around the end of the log trackway which formed the main access route into the settlement from the causeway (Figure 1.8).

The sides of the trackway were fence-lined and it was punctuated along its length by three oak threshold timbers, the outer set in the entranceway, the middle some 8 m into the interior and the inner some 6.4 m beyond that. The middle and outer thresholds were flanked by relatively lightweight wickerwork fences, but the inner threshold was flanked by a stout palisade of closely-set alder posts which curved N to encompass the roundhouses.

There were at least three Phases within ST1, each defined by a new hearth.

ST2, one of the more extensively excavated roundhouses, also had three Phases, in each of which the hearth, the floors and the entrance structure were replaced.

ST5 is one of the largest mounds on the island but it is topped by a large, well-established sycamore tree the roots of which are likely to have damaged the archaeological deposits and consequently it was never targeted for excavation. However, Trench 2 just clipped an arc of its perimeter and it was thus possible to establish that the mound was indeed a roundhouse, with walls constructed like its neighbours.



Figure 1.8.  
Reconstructions of  
what the settlement  
may have look like  
in Episodes 1 (top),  
2 (middle) and 3  
(bottom).

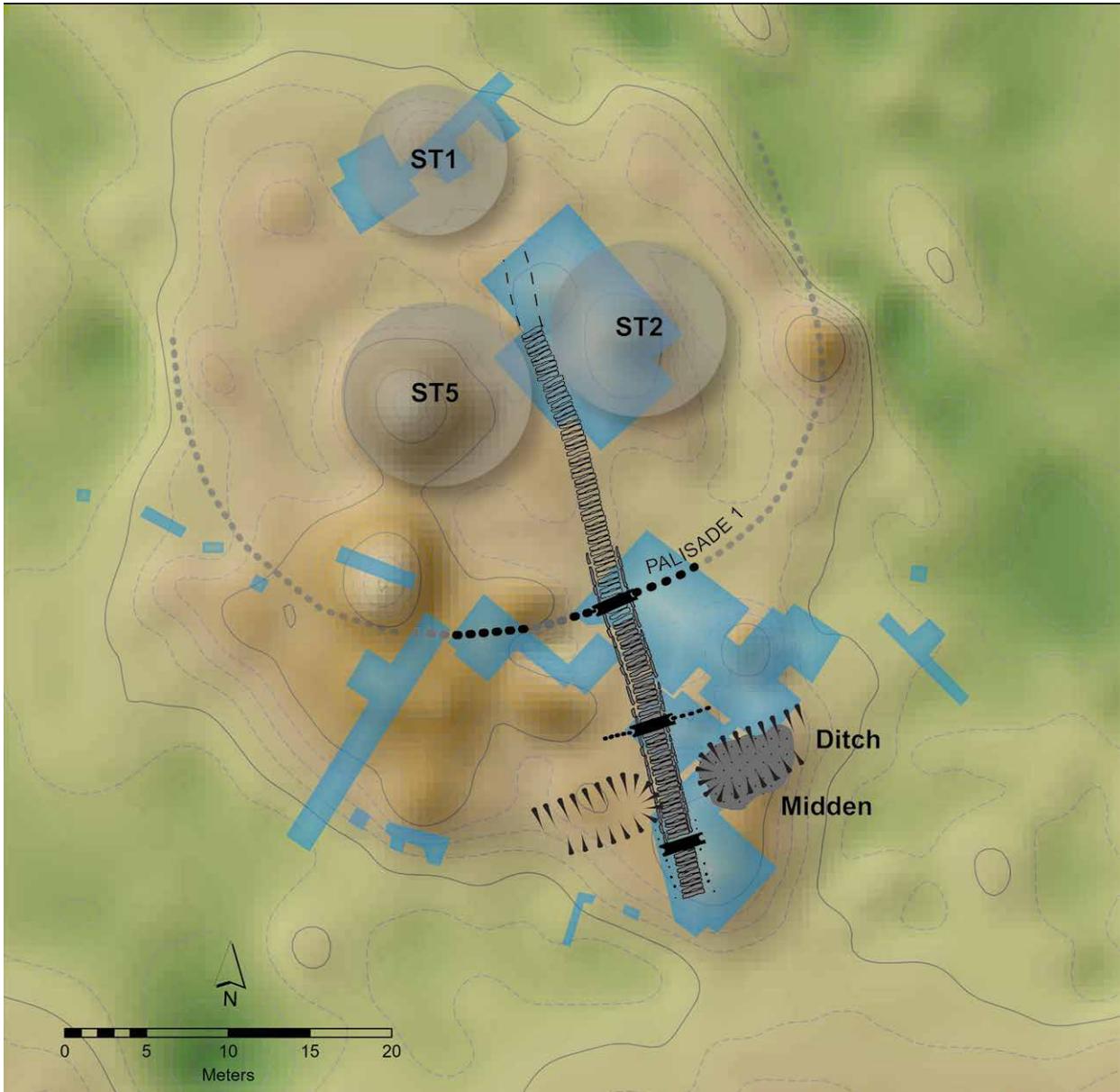


Figure 1.9. Episode 1 summary plan.

### 1.5.2 Episode 2

The second Episode of settlement also consisted of at least three roundhouses, ST3, ST4 and ST6, all built in the S half of the island (Figure 1.10). The trackway continued in use in this Episode but the Episode 1 palisade and fence-lines around the settlement were built over and the inner and middle threshold timbers became redundant. The defensive perimeter during this Episode consisted of an earthen bank revetted on its outer face by a wickerwork fence which flanked the outer threshold timber in the entranceway. The earthen bank turned right along the side of the trackway where its inner face was lined by closely-set posts, thus constraining traffic onto the island.

ST3 was one of the most extensively excavated roundhouses on the settlement. There were at least eight Phases of activity, each defined by a new hearth, refurbished floor surfaces and internal divisions.

Both ST4 and ST6 were found under features which were the primary targets of the excavation trenches (see Figure 1.10) and consequently only a limited area of each structure was investigated. Although the evidence for its superstructure was ambiguous, the hearth stack and floor surfaces establish that ST4 was a roundhouse. There were probably at least three Phases of activity, defined by refurbished surfaces and new hearths, of which two were exposed in the limited trench.

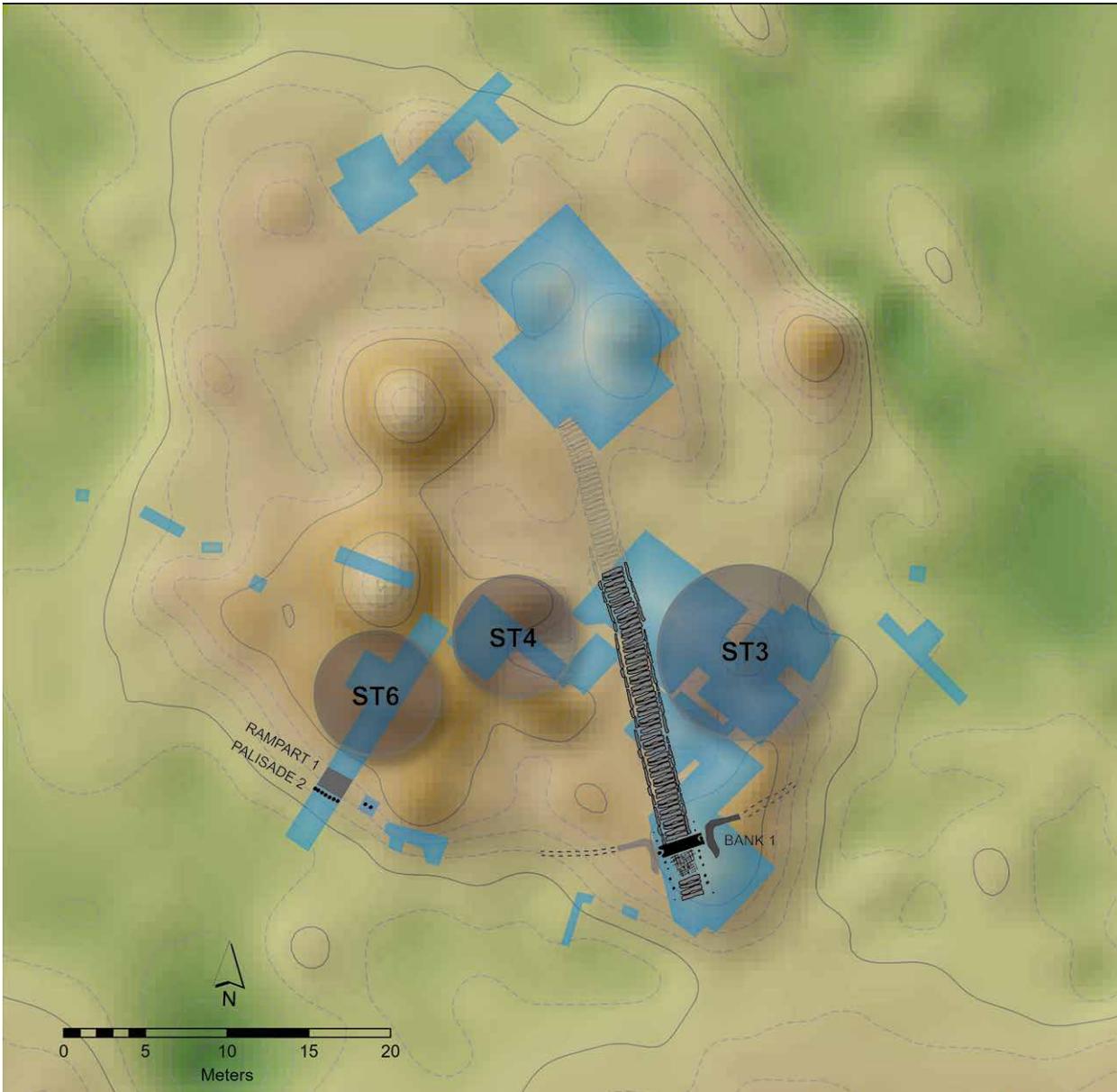


Figure 1.10. Episode 2 summary plan.

The evidence for the superstructure of ST6 is also limited but the floor surfaces and two superimposed ovens testify to the presence of a covered structure in which there were at least two Phases of activity.

During this Episode, ST2 goes out of use and a series of stone features were built over its footprint. These include several hearths, post-settings and stone clusters. The hearths were all domestic in scale and nature and could be all that remain of flimsily-built structures, the superstructures of which have decayed entirely away.

### 1.5.3 Episode 3

The evidence for this Episode comes primarily from the entrance area and the defensive perimeters around the settlement (Figure 1.11). Dendrochronology has identified three major pulses of building activity and, as these are settlement-wide, they are referred to as Episodes 3.1, 3.2 and 3.3.

In Episode 3.1 (278–276 BCE) the defensive perimeter consisted of an earthen bank, the exterior face of which was revetted by a palisade of closely-set posts. At the



Figure 1.11. Episode 3 summary plan.

entrance the bank terminated on either side of the trackway. The alignment of the old trackway was still used but it was resurfaced with oak planks. Oak posts lined both sides of the trackway as it approached the bank.

In Episode 3.2 (243 BCE) the defensive perimeter was significantly strengthened and the entranceway was re-aligned. An earthen rampart retained by an external palisade of oak posts was constructed which lay over the W edge of and cut through the earlier trackway. Further out into the littoral zone a palisade of massive oak planks was constructed.

The evidence for Episode 3.3 consists of a single oak post, dated to 223 BCE which lay on the edge of the Monreith Burn. Its function and relationship to the settlement is unknown but the post clearly signifies continuing activity around the island.

There was no unambiguous evidence for settlement associated with this Episode. Spreads of stones were found immediately under the turf in Trenches 6, 10 and 13 and, as they lie over both the earlier ST4 and ST6, they must be related to Episode 3 activity or later. They cluster on and around one of the higher mounds and consist of uneven surfaces of stone with stretches of low walling.



Figure 1.12. Volunteers and AOC archaeologists working on the excavation of Trenches 11 and 15 in 2018.

## 1.6 Organic survival and decay trajectories

The organic elements of the structures excavated at BLoM have survived because of their relatively rapid burial within a waterlogged anaerobic environment which subsequently suppressed their aerobic microbial decay. This occurred via two mechanisms, the weight of the structures and deposits causing them to sink into the peat, as well as flooding events when water levels in the loch rose over the island. However, across the island clear decay trajectories were observed, both vertical and horizontal, which indicate that conditions within the burial environment were not uniform across the island and have also fluctuated over time (see Chapter 1.1).

There was a pronounced decay trajectory from N to S on the island, perhaps seen most clearly along the trackway. At its northern end, where it was exposed between ST2 and ST5, the overall morphology of the wood was still visible, ie individual logs could be identified but they were decayed to the extent that their dimensions could not be precisely measured and they were spongy in texture (Grade 2 – poor; Van der Noort et al 1995 for scoring system). At its southern end, the logs were in optimum condition, structurally sound with well-preserved toolmarks and bark *in situ* (Grade 5 – excellent). A similar gradient was seen along a N–S axis in ST2; while three phases of flooring and sub-floor

wood structures had survived in the southern half of the house, only trace remains of the primary phase survived in the northern half. The walls of the house had survived to heights of 0.4 m above the original ground surface around the southern half, but only the tips of the stakes had survived intermittently around the northern half. This indicates that significant deposits have been lost over the northern half of the island, presumably because they either lay above the water table or lay within that zone where the water table fluctuated, the change from anaerobic to aerobic conditions stimulating biological activity and subsequent decay (High 2014: 52–57).

Vertically, the lowest structures and deposits were unsurprisingly the best-preserved, having remained permanently below the water table. Wood in these deposits could be characterised as Grade 5 while within the organic floors plant leaves were intact and easily identifiable by eye. In the uppermost deposits the process of mineralisation was well advanced with emerging Bh horizons covering ST1 and ST2 in which lens of well-decomposed organic matter represented all that remains of floor surfaces. These are the conflation horizons seen on other crannogs (eg Cavers & Crone 2018: 29–30). The diagenesis of the wood was most clearly displayed in the posts and stakes used throughout the settlement,



Figure 1.13. School pupils taking part in Dig TV, under the supervision of Urbancroft Films.

where the condition of the wood grades from Grade 5 at their bases and tips, where clear toolmark signatures could still be visible, to Grade 1 at the top, where the wood appeared to consist only of lignin, with complete loss of the cellulose. The species of wood is important in this context; the loss of mechanical strength is most clearly seen in the diffuse-porous species used on the settlement, ie alder, hazel, willow and birch, while oak, the heartwood in particular can remain mechanically strong for millennia, the tops of oak posts often surviving up into the A horizon.

One outcome of biological decay is the compaction and shrinkage of the organic matrix and it is this process which has left the stone and minerogenic-rich hearth stacks as prominent mounds across the island. As the organic deposits around inorganic features and oak timbers have shrunk and compacted, this has also led to deformities in sediment deposition and settlement, disconnecting hearths from their associated floor surfaces for example, and leaving patches of sediment in isolation. Thus, despite, or perhaps because of, the three-dimensional survival

which has made BLoM possibly the best-preserved Iron Age wetland settlement in the British Isles, the non-uniform shrinkage of the burial environment has still presented myriad problems of interpretation.

### 1.7 The community initiative

The SWAP research initiative in Wigtownshire has sought to involve the participation of members of the local community since its inception (eg Cavers & Crone 2018: 11), and over the course of the BLoM project close links were made with the Whithorn Trust and the many community volunteers associated with Whithorn (Figure 1.12). The excavations were assisted by volunteers every year (see Acknowledgements), numerous talks were delivered in Whithorn and Stranraer, while temporary exhibitions of the project results were delivered at *Whithorn Timescape*, the visitor centre run by the Whithorn Trust.

Several offshoot projects accompanied the excavations, designed to maximise public engagement with the archaeology, most notably the Dig TV initiative, led by Urbancroft films and which involved high school pupils

from across the local area filming and editing their own project documentaries (Figure 1.13).

The outreach project, ‘Whithorn: Hearth Home and Farm’, along with the Dig TV initiative was nominated for a British Archaeology award in the ‘Best Community Archaeology Engagement’ category in 2016.

Interest in the BLoM project and the prehistoric archaeology of the Machars more widely led to the proposal to reconstruct one of the BLoM buildings in Whithorn, a major undertaking managed and delivered by the Trust’s Julia Muir Watt. Based on ST2 from BLoM, the Whithorn roundhouse provides a vehicle for outreach and education for visitors to the *Whithorn Timescape*, augmenting and expanding on the story of the early Christian archaeology for which the town is famous. The reconstruction project was an impressive community effort, with volunteers working closely with local contractors and skilled craftspeople to reconstruct the building at full scale. The building project and the involvement of a cohort of local craftspeople was documented by Urbancroft and is still shown in the audio-visual area at *Whithorn Timescape*. In 2022, an MSc student, Hamish Darrah, recreated the oak planks that formed the façade of ST2 and Palisade 4, as part of an experimental archaeology project (Chapter 14.6), and the planks have now been erected in position near the entrance to the reconstructed roundhouse in Whithorn.

Throughout, the project sought to disseminate results to both professional and public audiences. Articles have appeared in *British Archaeology*, *Current Archaeology* and *Archaeology Scotland* as well as in several national newspapers and on BBC radio. In 2016 and 2018, the project featured on the BBC’s documentary series *Digging for Britain*.

Once again, the authors would like to acknowledge that these outreach projects could never have happened without the support of the Christie family, and in particular Rory Christie, who was always accommodating of the archaeology team’s requests and keen to support the associated community initiatives.

## 1.8 The structure of the monograph

The monograph is organised chronologically. In Chapter 2 the chronological framework for the site and the evidence underpinning it is presented and then, in Chapters 3, 4, 5 and 6 the structural evidence for Episodes 1, 2 and 3 is presented.

The ecofact assemblages, macroplants, bone, shell, insects, charcoal and wood have all been analysed, while soil micromorphology has been extensively employed to investigate the nature of the deposits, and lipid biomarker analysis has also been applied to detect the presence of faecal residues. The combined results of this analytical work have been vital in developing our taphonomic interpretations of the deposits and so we have decided against the more traditional approach

of presenting each strand of evidence separately in a specialist report. The wood and charcoal are reported on in Chapter 14 but with all the other analyses, we have taken the following approach:

The ecofactual evidence is referenced throughout Chapters 3–6 in the descriptions of the structural evidence, wherever it is considered relevant to the interpretation of the context. The following abbreviations have been used to indicate the source of the evidence being quoted:

- *Soil micromorphology* – *MM*
- *Macrofossils* – *MA*
- *Bone* – *BO*
- *Lipid biomarkers* – *LP*
- *Insects* – *IN*

The reader should consult Table 9.3 which categorises the broad range of deposit types that have been identified during micromorphological analysis; these categories are used throughout the text as a shorthand to describe particular deposits.

Ecofact summaries are presented at the end of Chapters 3–6, organised by context in numerical order. Only those contexts which contained significant or sizeable ecofact assemblages are listed here; those with only trace amounts of bone or macroplant, for instance, are recorded in the archive reports. For each context detailed descriptions of all the strands of ecofactual evidence available are presented in the following order:

- *Context* [001]
- *Micromorphology*
- *Lipid biomarkers*
- *Macroplant remains*
- *Bone & shellfish*
- *Insects*

To help the reader navigate this substantial body of evidence there are summary tables for each structure, indicating what materials have been analysed (Tables 3.1–3.4; Tables 4.1–4.4; Table 5.1 & Table 6.1).

Finally, each specialist provides an overview of their results in Chapters 7–14, presenting the methodologies employed, and contextualising and evaluating the significance of their results.

## 1.9 Context concordance

Many of the contexts and structures were excavated over multiple seasons and in different trenches; consequently, many have multiple context numbers. To simplify this for the reader the major structures have been renamed throughout the text and figures. However, the specialist reports still refer to the original context numbers and so a concordance is provided here in Table 1.1.

<b>New</b>	<b>Original</b>
Palisade 1	Palisade [1022]
Rampart 1	Rampart [621]
Bank 1	Bank [718/721]
Palisade 2	Palisade [609]
Rampart 2	Rampart [617]/[767]
Palisade 3	Palisade [618]/[712]
Palisade 4	Palisade [701]
Hearth 5	Hearth [207]
Hearth 6	Hearth [X279]

Table 1.1 Context concordance.



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# Chronology

## 2.1 Introduction

A tightly dated chronology for events on the settlement has been constructed using a combination of dendrochronology and radiocarbon dating. The latter has included both single sample dates and the wiggle-matching of multiple samples from measured ring sequences. This combined approach has resulted in a chronology for the excavated activity on the settlement which spans just over two centuries, beginning in the mid-5th century BCE and ending towards the late 3rd century BCE. Three major Episodes of activity have been identified and these provide the structure for the presentation of the excavated evidence in Chapters 3–6 of this monograph. Within each Episode there are Phases of building renovations which are specific to each structure. The chronological framework for the settlement is presented very briefly in this chapter; a more detailed presentation of the dendrochronological and radiocarbon-dating evidence can be found in Chapters 7 and 8, respectively.

## 2.2 Approaches

The use of so much oak timber in the construction of the settlement means that it has been possible to ascribe precise calendar dates for many of the building events. Thus, the oak dendrochronology has provided a calendrically dated framework within which the other chronological evidence can be fitted (Figure 2.1).

Several other wood species were also used extensively in the building of the settlement and tree-ring studies of the alder, ash and hazel have provided relative dating evidence, establishing chronological links between buildings and structures.

Dendrochronology provides precise spot dates but, unless there is a stratified sequence of dateable timbers, the question of duration of activity/ settlement is more difficult to address with dendrochronology alone. The well-stratified sequences within two of the structures have been intensively radiocarbon-dated and Bayesian modelling applied to determine the duration of their occupation (Figure 2.2 and Table 2.1).

Radiocarbon determinations were also obtained to provide marker dates throughout the project, to date features and contexts without dateable timbers, and exceptional wooden artefacts. In all a dataset of 75 single sample radiocarbon dates has been obtained (Table 2.2).

Episode 2 produced very few dateable oak timbers and so, to integrate it more fully into the site chronology, multiple radiocarbon dates from three of the measured tree-ring sequences were wiggle-match dated (hereafter referred to WMD dates), bringing the total number of radiocarbon dates to 84. The combined evidence from these varied approaches is presented in the table. All calibrated radiocarbon dates are quoted at 95% probability.

Episode

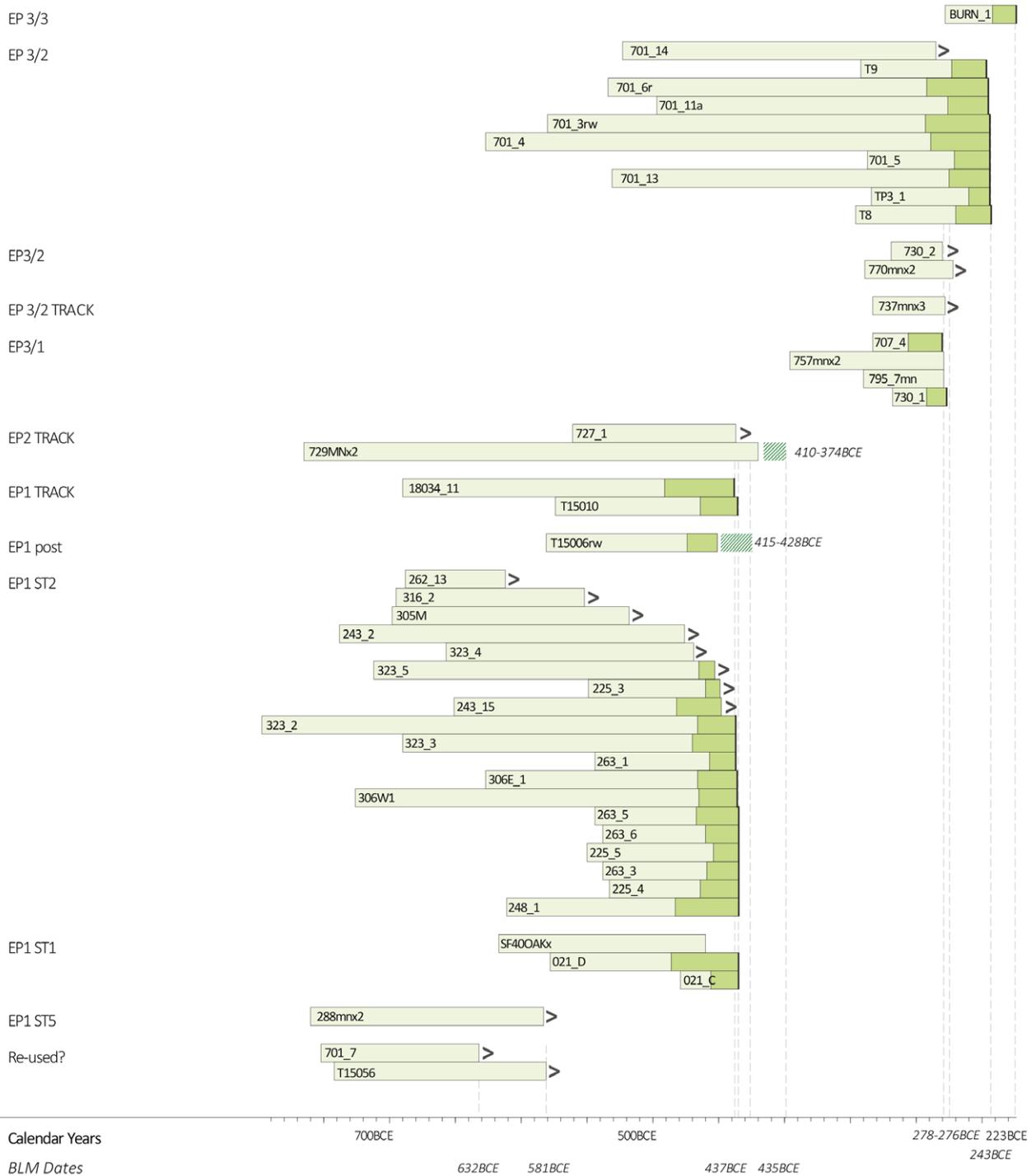


Figure 2.1. Summary bar diagram showing all dated oak timbers.

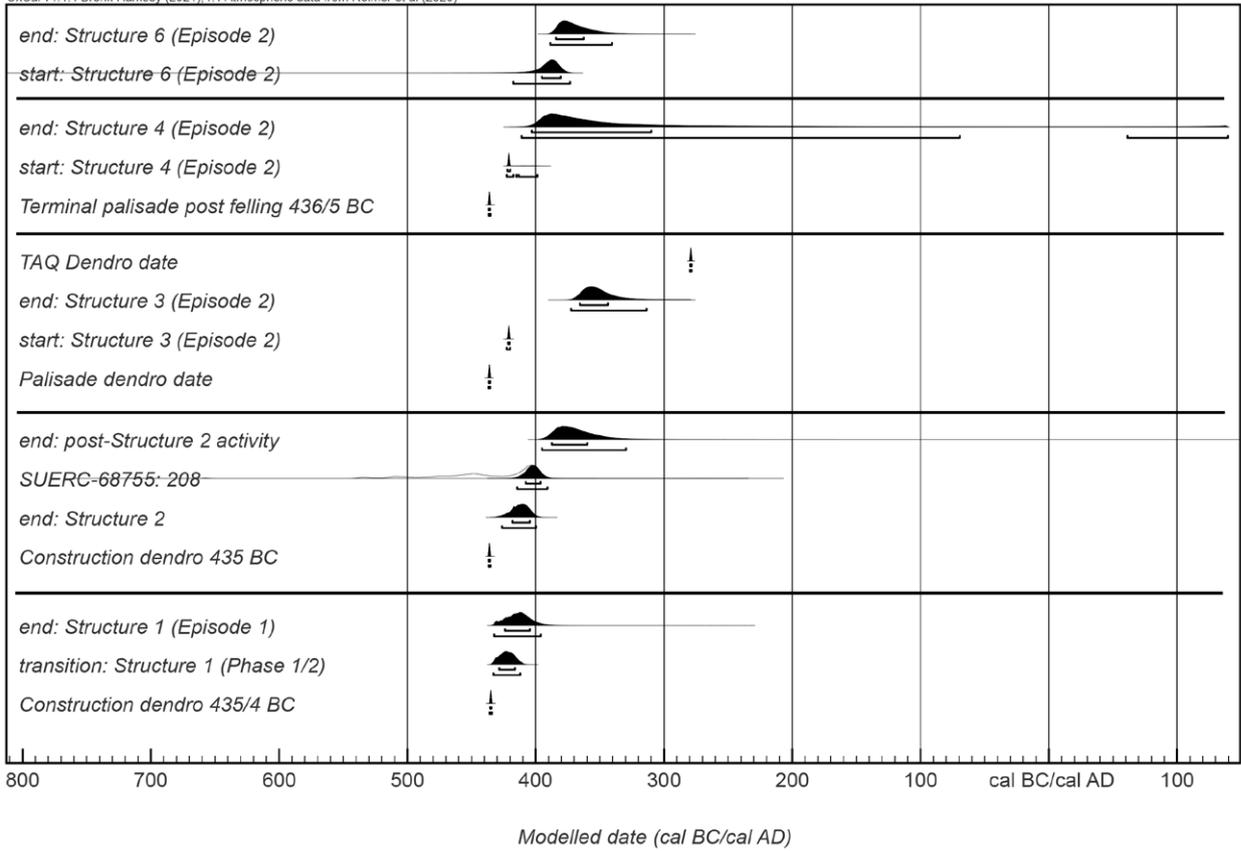


Figure 2.2. Summary figure of the start and end probabilities for the dated activity associated with the different structures at Black Loch of Myrton. The probabilities displayed are extracted from the full model in Figure 8.1, and which is described more fully in Chapter 8.

	<i>Start (95% probability)</i>	<i>Start (68% probability)</i>	<i>End (95% probability)</i>	<i>End (68% probability)</i>	<i>Span (95% probability)</i>	<i>Span (68% probability)</i>
<b>ST1</b>	435/4 BCE	435/4 BCE	435–395 cal BCE	425–405 cal BC	1–40 years	10–35 years
<b>ST2</b>	435 BCE	435 BCE	430–400 cal BCE	420–405 cal BC	10–40 years	15–35 years
<b>ST3</b>	425–420 cal BCE	425–420 cal BCE	375–310 cal BCE	370–340 cal BC	45–110 years	55–80 years
<b>ST4</b>	425–395 cal BCE	425–420 cal BCE	415–70 cal BC (91%) or cal CE 60–140 (4%)	405–310 cal BC	1–355 years (91%) or 485–560 years (4%)	1–110 years
<b>ST6</b>	420–370 cal BCE	400–380 cal BCE	390–340 cal BCE	385–360 cal BC	1–70 years	1–30 years

Table 2.1. Summary table of the start and end-dates with maximum span of dates for each structure (ST) at Black Loch of Myrton. Non-italicised dates are the earliest tree-ring date from a structure that has been assumed to be equivalent to the construction date.

Episode	Phase	Context	Sample ref	Description	Material	Species	SUERC NO.	UNCAL BCE	ERROR	CAL BCE
<b>1</b>	<b>ST1</b>									
	1	44		Hearth 1 debris	roundwood charcoal	<i>Alnus glutinosa</i>	57030	2376	29	702-391
					roundwood charcoal	<i>Corylus avellana</i>	57031	2481	29	774-486
					roundwood charcoal	<i>Corylus avellana</i>	57831	2457	29	756-415
	2	25		Hearth 2 debris	roundwood charcoal	<i>Corylus avellana</i>	57032	2355	29	516-380
					cereal grain	<i>Hordeum</i> sp.	57033	2447	26	751-411
					shell	<i>Corylus avellana</i>	58732	2398	29	729-399
					cereal grain	<i>Hordeum</i> sp.	58733	2440	29	751-408
	1	021B		Post in post-ring	wood	<i>Alnus glutinosa</i>	32597	2470	35	770-410
<b>1</b>	<b>ST2</b>									
	1	267		Primary foundation layer	bracken	<i>Pteridium aquilinum</i>	70172	2420	32	749-402
	1	261		Sub-floor structure - top	wood	<i>Corylus avellana</i>	70170	2441	32	752-408
				Bottom	wood	<i>Alnus glutinosa</i>	70171	2425	32	750-403
	1	251		Active floor - top	bracken	<i>Pteridium aquilinum</i>	70168	2427	32	750-403
				Bottom	bracken	<i>Pteridium aquilinum</i>	70176	2483	32	776-434
	1	274		Hearth 4 - debris <i>in situ</i>	roundwood charcoal	<i>Corylus avellana</i>	70181	2475	32	771-431
	2	253		sub-floor structure	wood	<i>Alnus glutinosa</i>	70169	2404	32	738-398
	2	250		Active floor - top	bracken	<i>Pteridium aquilinum</i>	70186	2387	32	728-396
				Bottom	bracken	<i>Pteridium aquilinum</i>	70417	2459	29	756-416
	2	249		Upper surface of [250]	charcoal	<i>Alnus glutinosa</i>	70179	2463	32	762-430
	2	256		Hearth 3 - sealing deposit	roundwood charcoal	<i>Alnus glutinosa</i>	70180	2438	32	753-407
	3	242		Hearth 2 - sealing deposit	charcoal	<i>Alnus glutinosa</i>	70178	2491	32	786-493

Episode	Phase	Context	Sample ref	Description	Material	Species	SUERC NO.	UNCAL BCE	ERROR	CAL BCE
	3	219		Floor deposits - top	humic fraction		68508	2367	27	533-390
				Floor deposits - middle	humic fraction		68509	2220	27	373-203
				Floor deposits - bottom	humic fraction		70182	2375	32	541-389
		241		Deposit under Hearth [207]= Ep 1 debris?	charcoal	<i>Alnus glutinosa</i>	68757	2364	29	536-386
		241		Deposit under Hearth [207] = Ep 1 debris?	charcoal	<i>Corylus avellana</i>	68761	2450	26	753-412
<b>1</b>	<b>Midden</b>									
		800		SF219 - bowl	wood	<i>Maloideae</i>	82683	2398	24	725-400
		800		Food debris	animal bone	<i>Bos</i>	82684	2401	28	729-400
<b>1</b>	<b>Palisade</b>									
		1		Palisade post	bark	<i>Alnus glutinosa</i>	76020	2417	35	750-401
<b>2</b>	<b>Post-ST2 features</b>									
		208		Hearth 5 hearth debris	charcoal	<i>Alnus glutinosa</i>	68755	2366	25	514-391
		208		Hearth 5 hearth debris	charcoal	<i>Corylus avellana</i>	68756	2359	26	512-387
		211		Hearth 1 - hearth debris	roundwood charcoal	<i>Corylus avellana</i>	70177	2242	32	391-206
		209		Carbonised hurdle screen	roundwood charcoal	<i>Corylus avellana</i>	70187	2307	32	411-231
		292		Charcoal deposit	charcoal	<i>Corylus avellana</i>	70482	2278	29	403-211
<b>2</b>	<b>Palisade</b>									
		2		Palisade	wood	<i>Alnus glutinosa</i>	70483	2235	29	387-204
<b>2</b>	<b>ST3</b>									
	1	15023	0 cm	Hearth 1 - hearth packing	charred plant		81388	2400	22	541-401
	2	1153	4	Active floor	charred plant		81382	2412	24	730-403
	2	1153	SF237	Lathe-turned baton	wood	<i>Taxus baccata</i>	82682	2427	24	743-406
	2	1755/1		Sub-floor structure	wood	<i>Alnus glutinosa</i>				

Episode	Phase	Context	Sample ref	Description	Material	Species	SUERC NO.	UNCAL BCE	ERROR	CAL BCE
			1-5				97185	2410	19	714-405
			6-10				100817	2436	24	749-408
			11-15				100818	2439	24	750-409
	2/3	15018	5 cm	Active floor	charred plant		81389	2399	22	702-401
	3	15018	10 cm	Active floor	wood		81390	2463	24	762-431
	3	15018	15 cm	Active floor	wet plant		81391	2422	22	732-407
	3	15018	20 cm	Active floor	wet plant		81392	2396	22	539-401
	3	15018	25 cm	Active floor	animal bone		81393	2521	27	794-543
	3	15018	30 cm	Active floor pre Hearth 3	wet plant		81397	2438	22	748-408
	4	1174	3	Hearth 3 - hearth debris	shell	<i>Corylus avellana</i>	81381	2462	22	760-431
	4	15018	35 cm	Active floor post Hearth 3	charcoal	<i>Corylus avellana</i>	81398	2405	24	728-402
	4	15018	40 cm	Active floor	shell	<i>Corylus avellana</i>	81399	2412	24	730-403
	4	15018	45 cm	Active floor	charred plant		81400	2398	24	725-400
	4	15018	50 cm	Active floor	charred plant		81401	2418	24	731-405
	4	15018	55 cm	Active floor pre Hearth 4	charcoal	<i>Betula sp.</i>	81402	2453	24	742-414
	5	1163	2	Hearth 4 - hearth debris	charcoal	<i>Alnus glutinosa</i>	81380	2417	24	731-405
	6	1150	5	Hearth 5 - hearth debris	shell	<i>Corylus avellana</i>	81383	2328	24	412-367
	6	1150	6	Hearth 5 - hearth debris	shell	<i>Corylus avellana</i>	81387	2232	22	382-206
	6	15015	60 cm	Active floor	charcoal	<i>Alnus glutinosa</i>	81403	2379	24	536-396
	6	15015	65 cm	Active floor	charcoal	<i>Betula sp.</i>	81407	2427	24	743-406
	6	15015	70 cm	Active floor	charcoal		81408	2434	22	747-407
	6	15016	75 cm	Dirty floor around Hearth 5	wood		81409	2319	24	409-365
	6	1711/13		Stake in outer wall line	wood	<i>Corylus avellana</i>				
			1-5				97183	2377	19	516-395
			6-10				100819	2320	20	410-367
			11-15				100820	2300	24	406-232
						<i>Corylus avellana</i>				
	8	15013	90 cm	Floor surface	charcoal	<i>Corylus avellana</i>	81410	2274	22	400-232
	8	15013	95 cm	Floor surface	charcoal	<i>Alnus glutinosa</i>	81411	2309	22	406-361
	8	15013	100 cm	Floor surface	shell	<i>Corylus avellana</i>	81412	2211	24	363-203
	8	15013	105 cm	Floor surface	charcoal	<i>Corylus avellana</i>	81413	2256	24	395-209
	8	15013	110 cm	Floor surface	charcoal	<i>Alnus glutinosa</i>	81417	2490	22	770-540

Episode	Phase	Context	Sample ref	Description	Material	Species	SUERC NO.	UNCAL BCE	ERROR	CAL BCE
	8	15013	115 cm	Pre-Hearth 7	charcoal	<i>Betula</i> sp.	81418	2196	24	361–196
	?	743		Hazelnut deposit	nutshell	<i>Corylus avellana</i>	76021	2242	35	393–204
<b>2</b>	<b>ST4</b>									
	/	1016/1		Floor surface	roundwood wood	<i>Alnus glutinosa</i>	76018	2335	35	534–258
	/	1016/2		Floor surface	roundwood wood	<i>Alnus glutinosa</i>	76019	2317	35	481–232
<b>2</b>	<b>ST6</b>									
	1?	612		Building debris	charcoal	<i>Corylus avellana</i>	70484	2254	29	395–208
	1	658		Deposit Oven 1	wood	<i>Corylus avellana</i>	70492	2263	29	398–209
	1	656		Wicker structure Oven 1	wood	<i>Fraxinus excelsior</i>	70488	2280	29	404–211
	1	651_4NW		Post under Oven 1	wood	<i>Quercus</i> sp.				
			1-10				97184	2435	19	744–410
			11-15				100824	2446	24	751–412
			16-20				100825	2440	21	749–410
	2	639		Cooking deposit in Oven 2	charcoal	<i>Corylus avellana</i>	70487	2268	29	400–210
	2	634		Hurdle matting over Oven 1	wood	<i>Alnus glutinosa</i>	70486	2276	29	401–211
<b>3</b>	<b>Ramparts &amp; palisades</b>									
	3.2	Rampart 2		Turf bank	charcoal	<i>Alnus glutinosa</i>	70485	2275	29	401–210
	3.2	Palisade 4	12	Plank palisade	wood	<i>Quercus</i> sp.	76023	2196	35	368–175
	3.2	Palisade 4	9	Plank palisade	wood	<i>Quercus</i> sp.	76022	2225	35	382–203
	3.2	Palisade 4	T9	Post in palisade	wood	<i>Quercus</i> sp.	32598	2215	30	380–200
	?	503	Tr5	Clay spread	charcoal	<i>Betula</i> sp.	68762	2132	29	350–54

Table 2.2. All radiocarbon dates from BLoM, listed by Episode and structure. Pink highlight denotes exclusion from age-depth model (see Chapter 8 for explanation).

## 2.3 Episode 1

Oak dendrochronology has demonstrated that the primary settlement was developed over a period of 2–3 years. Felling of timber began in 437 BCE. The trackway into the settlement began to be laid in that year, work progressing into the interior with the construction of Palisade [1022] in 436/435 BCE. Structure 2 (ST2) was constructed in the spring/summer of 435 BCE, the trackway was then extended along the side of and beyond the house, and ST1 was subsequently built in the winter/spring of 435/434 BCE. As analysis of the ash from both structures suggests they were built in the same year, ST1 was probably also built in 435 BCE. A precise felling date could not be obtained for ST5, although the felling range spanned the 435 BCE felling date for the other Episode 1 structures. However, analysis of the hazel also suggests that ST2 and ST5 were built in the same year.

Analysis of the alder timbers used in ST1, ST2, Palisade [1022] and the trackway has established strong chronological relationships between these structures, placing their construction within the same felling band (Chapter 7.3). The alder analysis has demonstrated that the Episode 1 trackway extended from the interior of the settlement out to the entranceway onto the site. There is no evidence of later refurbishment of the trackway using logs.

The alder and hazel analyses have also provided some insights into the duration of the structures. There is no physical evidence for timber refurbishment except for the replacement of posts in the post-ring of ST1 and the dendrochronological evidence suggests that this must have happened within the span of the felling band, ie a decade (Chapter 7.3.2.3). Other than this instance there is no dendrochronological evidence in ST1 and ST2 for anything more than a single phase of construction of the superstructure.

Some 28 radiocarbon dates were obtained for this Episode (Table 2.2). Their modelling suggests that ST1 could have lasted for up to 40 years and was out of use by 395 cal BCE at the latest, while ST2 could have been in use for between 10 and 40 years and was out of use by 400 cal BCE at the latest.

## 2.4 Episode 2

The rarity of oak use in the structures of this Episode means that it cannot be precisely dated using dendrochronology alone. Nonetheless, the dendro date of 436/435 BCE for the Episode 1 palisade provides a clear *terminus post quem* (*tpq*) for some of the Episode 2 houses which were built over the palisade. A small number of decayed oak planks on the trackway suggests building activity on the trackway sometime after 410 BCE and probably in the first quarter of the 4th century BCE. The correlation between a replacement post of ash in ST3 and an ash post alongside the Episode 1 trackway in the entrance suggests that a refurbishment phase in ST3 took place some 66 years after the trackway construction. As oak timbers used in the trackway were felled between 437 BCE and 435 BCE this

would place the refurbishment phase between 371 BCE and 369 BCE.

The only Episode 2 structure that produced dendrochronological results is ST3. Analysis of the alder has correlated the Phase 2 floor supports with the primary post-ring, while analysis of the hazel stakes suggests that between the construction of the outer wall line in Phase 2 and its refurbishment in Phase 7 there may have been as little as 12 years.

Some 51 radiocarbon dates were obtained for this Episode (Table 2.2), of which nine were wiggle-match dates on three timbers. Their modelling suggests that the post-ST2 hearth-building activity took place very soon after the demise of ST2, beginning between 415–390 cal BCE and finishing by 400–330 cal BCE. ST3 was built between 425–420 cal BCE and fell out of use between 375–310 cal BCE. This provides supporting evidence for the refurbishment phase indicated by the ash chronology as happening between 371 BCE and 369 BCE. The modelling provides an estimated maximum span of activity of 45–110 years in ST3. However, the hazel tree-ring chronology suggests that there was as little as 12 years between the primary and penultimate construction phases. Some allowance must be made for occupation after the final construction phase, dates for which are contained within the radiocarbon chronology, but nonetheless there is still a sizeable discrepancy between the two lines of evidence. One approach to resolving this discrepancy is to accept that, while actual duration cannot be resolved, it is likely to lie at the shorter end of the estimated span. In technical terms, whereas the hazel dendrochronology can point to an absolute duration of use, modelled C14 can only reliably indicate the likely maximum duration and cannot easily resolve a minimum duration as a result of the inherent error involved in the C14 method. As such the two determinations need not conflict but should be considered together.

ST4 was probably constructed 425–395 cal BCE but its duration cannot be closely refined because only two radiocarbon dates were obtained from the structure. ST6 was probably constructed 420–375 cal BCE and lasted for 1–70 years, probably ending 390–340 cal BCE.

## 2.5 Episode 3

There are five radiocarbon dates for this Episode, obtained primarily as rangefinder dates (Table 2.2).

Dendrochronological analysis of the oak timbers used to build the perimeter defences shows frequent rebuilding of the settlement perimeter over 55 years, from 278–276 BCE to 223 BCE. At least three distinct building events have been identified:

### 2.5.1 Episode 3.1

In 278–276 BCE a barrier of posts is constructed on either side of the trackway in the entrance area.

### 2.5.2 Episode 3.2

Palisade [701] is constructed in 243 BCE. A palisade of oak posts continues the circuit of this enclosure work around the W edge of the island. *Tpq* dates of 270 BCE, 268 BCE, 265 BCE and 262 BCE for Palisade [618]/[712], the terminus of rampart [617]/[767] and the trackway surface could feasibly represent the same building event but equally may represent numerous other earlier events subsumed within this Episode.

### 2.5.3 Episode 3.3

There was further building work on the perimeter of the settlement in 223 BCE, represented by the single post near the southern shore. The nature of this structure is unknown. If we assume that occupation continued after this building event, and allow a generation at least for that occupation, then the settlement was probably finally abandoned in the early 2nd century BCE.



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# Episode 1

The primary settlement consisted of at least three roundhouses, ST1, ST2 and ST5, which were clustered in the northern half of the island around the end of the trackway, the main access route into the settlement from the causeway (Figure 3.1). The defensive perimeter of the settlement consisted of a robust inner palisade of closely-set alder posts which curved across the middle of the island. Further out towards the causeway two more slightly-built fencelines, aligned on oak threshold timbers which punctuated the trackway at intervals, may have formed additional boundaries to access onto the island. These fences lay on either side of a ditch, only the E terminal of which was uncovered.

## 3.1 The trackway, entrance and defensive structures

### 3.1.1 Chronological evidence

Both [18034/11], the middle threshold beam, and [18033], the oak post pinning its E end, were felled in 437 BCE, whilst [15010], the oak post which pinned the W end of the inner threshold [15002/0] and marked the terminal of the Episode 1 palisade, was felled in the winter/spring of 436/5 BCE. These dates can be interpreted in two ways. Either preparations for the settlement began in 437 BCE and timber stockpiled until construction of the settlement in 435 BCE, or the trackway began to be laid in 437 BCE and construction progressed into the interior with completion of the settlement in 435 BCE.

The alder logs used throughout the trackway, [807/1] from the entrance way, transverse logs [15002] and [18034], and longitudinal logs [15004] and [18025], were all felled within a band of nine years. As with the oak, at least three of these years could be accounted for either by stockpiling or by yearly felling as construction progressed. The key relationship is that of log [807/1] with some of the inner trackway logs and logs from the external surface around ST2 (Table 7.9) which demonstrates that the Episode 1 trackway extended out to the entranceway onto the island.

In addition to the calendar date of 436/5 BCE for the oak terminal post, four of the alder posts from the palisade could be grouped together and displayed good correlation with the alder logs felled for the construction of ST1 and ST2, linking the palisade construction to the Episode 1 buildings. They displayed end-dates spread over two years.

The oak post [15056] in the post-pad on the E side of the Episode 1 threshold produced a dendro date in the 6th century BCE (Chapter 7.2.2.4). This is anomalous in its Episode 1 context and probably indicates the re-use of old wood in certain parts of the primary gate construction.

### 3.1.2 The trackway and access on to the island

The island appears to be attached to the old loch shore to the S via a narrow neck of raised ground defined by the 27 m OD contour. The rise in raised ground is so slight at this point that this natural causeway is likely to have been permanently boggy and frequently flooded so the possibility of an artificial causeway was explored. A small trench, 2 m x 1 m, was cut across the neck (Trench 20, Figure 1.6) but only natural



Figure 3.1. Reconstruction of what the settlement may have looked like in Episode 1.

peat deposits were encountered. Nonetheless, it still seems probable that the log trackway that formed the primary access into the settlement had extended across this neck to dry land but has either decayed or been removed.

The log trackway was traced from the edge of the island to at least as far as the junction between ST2 and ST5, and probably to the threshold of ST1. In total, the track was traced for a length of 43 m from the access onto the site in the S, to the point where it ceased to be preserved. The track was constructed almost entirely of alder logs, except for the threshold beams (see later) and two longitudinals, which were oak.

The track was most completely exposed in Trenches 15 and 18, where it was 3.2 m wide (Figures 3.2 & 3.3).

In both trenches, the track comprised closely set tangential logs, [18034] and [15002], between 0.19 m and 0.32 m in diameter, all with the bark still intact. These logs were unworked aside from their generally flattened ends, though several had evidence for the typical hour-glass-shaped tow-hole in the ends. A compact deposit of woodchips [15041] found between logs [15002] may represent construction debris. Elsewhere bracken [18029] had been packed between the logs; the insect fauna suggests that this deposit also included discarded floor litter from within a house (IN).

In both trenches, the track was lined by longitudinal logs of similar dimensions [18025] and [15004], again all with the bark intact (Figure 3.4).

The purpose of these longitudinal logs seems to have been primarily as levelling and retention for the track logs,

and they were held in place by a stout wicker fence [18023]/ [15042] formed by posts of ash, alder, willow and hazel averaging 0.071 m in diameter spaced *circa* 0.4 m to 0.5 m apart (Figure 3.5).

The willow withies of the lining fence were similarly robust, much more so than the wicker walling observed in any of the buildings on the settlement, comprising rods surviving up to 1 m in length and typically around 0.04 m in diameter. Up to four levels of withies survived on this fence, probably explained by the fact that the structure was set into a steep-sided slot cut in the natural peat [18020], *circa* 0.3 m deep and filled with cobble-sized packing stones [18021] and [18028], a mixture of twiggy debris, woodchips and flooring materials (MA:IN). In Trench 18, without exception, the upper surface of the [18023] posts were charred, suggesting that the fence was destroyed by fire, at least in this area.

The trackway was also uncovered in Trench 2 for a length of 6.2 m but it was in a much more decayed condition here (Figure 3.6).

In keeping with the N/S decay trajectory observed across the site the trackway petered out to the N, but its condition improved to the S. The track spanned the 3 m gap between the walls of ST2 and ST5 and its construction in this area was different to that observed along its length further to the S. Here, it had been laid down over a layer of brash [326] some 0.13 m thick which had been laid down directly over the peat, but this layer was not observed in other areas of the track, when the tangential logs were lifted. At the narrowest point between the two structures the trackway consisted of

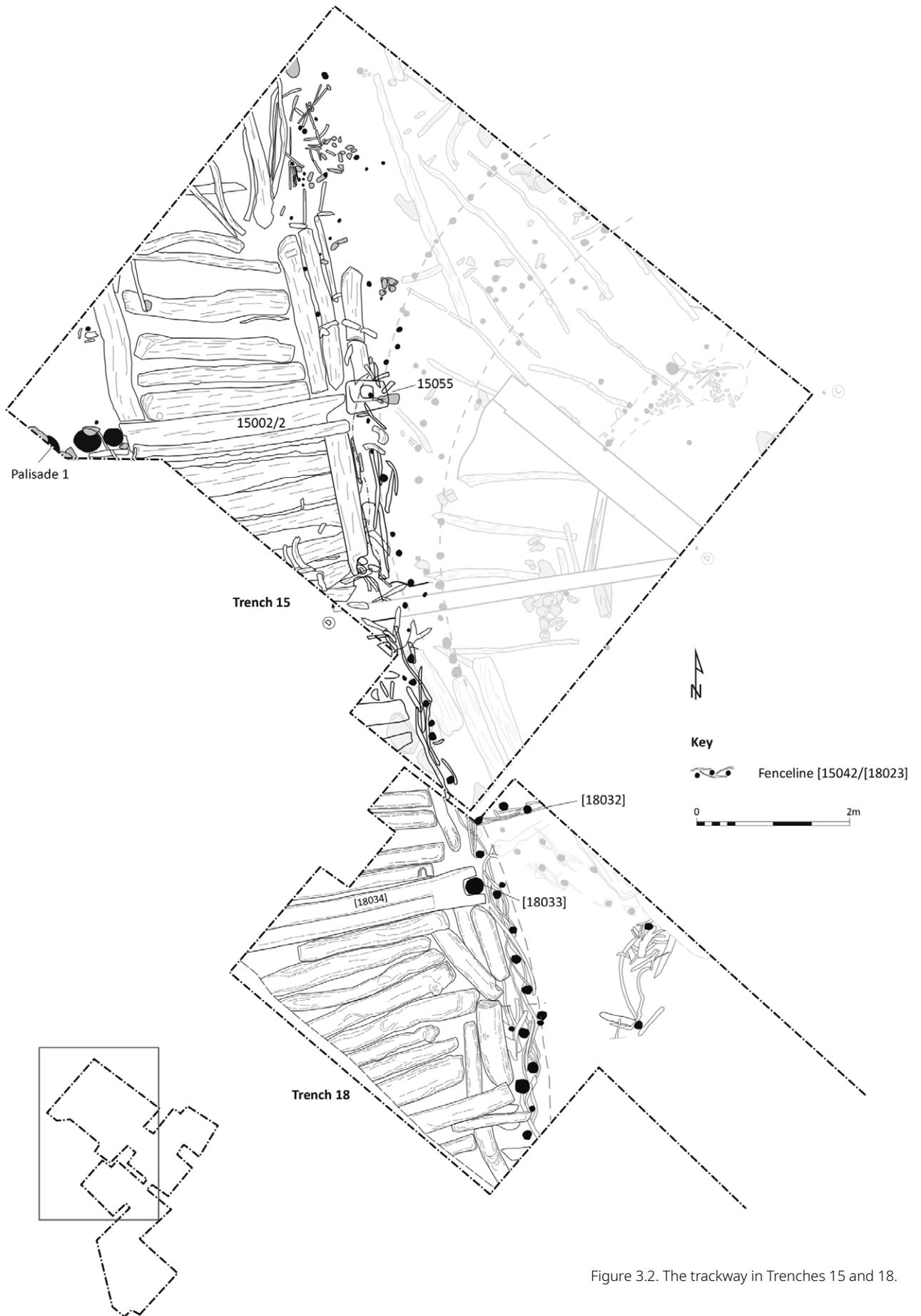


Figure 3.2. The trackway in Trenches 15 and 18.



Figure 3.3. The trackway logs in Trench 15 after the removal of all the surface deposits, looking S. The threshold is the flattened beam [15002/0], the open mortise visible on the left side.



Figure 3.4. The trackway in Trench 18 after the removal of all surface deposits, looking W. The threshold beam [18034/11] lies just behind the large post [18033] which pins the beam in position; the stepped chamfer is visible, facing inwards to the settlement. The longitudinal logs along the edge of the track are held in place by a stout wicker fence [18032].

tangential logs packed tightly together, over which were the remains of smaller longitudinal logs. As the space between the houses opened up, the construction changed to one of more widely spaced and larger tangential logs, set roughly 2 m apart, between which smaller longitudinals were laid.

This change in construction style may have been dictated by the difficulties of dealing with the narrow passage between the two houses. The houses must have been built before the trackway was laid down; this is clearly demonstrated in the area between the trackway and the entrance into ST2. In this area tangential alder logs [321] and [333] had been packed tightly against the outer wallface and over these large alder logs [309]

had been laid radiating out from the walls of the house (Figure 3.7).

Dendrochronological analysis has demonstrated that one of the [321] logs correlated very well with a trackway longitudinal [807] in the entrance area, indicating that all the timber had been felled as part of a coherent construction plan. At the junction between the track and this surface the longitudinals of the trackway spread out over the [309] logs to meet the wall of the house. The [309] logs had been covered by a thick deposit of brash [308] which was pinned in place by small stakes [311] (Figure 3.7). Such a surface had not survived over the trackway in this area, but it seems probable that it was originally similarly covered in brash to create a flat and walkable surface.



Figure 3.5. The wicker fence [15042] lining the trackway in Trench 15.



Figure 3.6. The trackway in Trench 2, looking S. The stakes of the outer wall of ST2 are marked by garden tags on the left and the outer wall of ST5 lies under the ranging rod on the right.

### 3.1.2.1 The threshold timbers

The trackway was punctuated by three large oak threshold beams: [15002/0] which lies between the Episode 1 palisade and defines the inner entrance into the Episode 1 settlement (Figure 3.3); [775] which defines the entrance onto the island; and [18034/11] which lies roughly midway between them (Figure 3.8). The spacing between the thresholds was not equal, [15002/0] being located 6.4 m from [18034/11], and [775] 8 m to the S of that. All three threshold timbers were very similar in design, with open mortises at each end designed to accommodate vertical posts, as well as a stepped chamfer running along their axes, presumably

intended to accommodate gates or doors (Figure 3.4). Some of the posts associated with the thresholds were still *in situ*, all of them oak; post [15010] in the W mortise of [15002/0], post [18033] in the E mortise of [18034] (Figure 3.8), and [793/1] in the E mortise of [775].

Although [775] was found as part of the Episode 2 renovation of the entrance way (Chapter 4.1) it is argued below that it was originally laid down during the primary construction of the trackway and was re-used in Episode 2. Unfortunately, it could not be dendro-dated so this hypothesis cannot be tested. Each of the threshold beams was associated with a palisade or fenceline; these are described below.



Figure 3.7. The [309] logs around the exterior of ST2. The stakes [311] that pinned down the brash surface [308] are visible in between the logs, marked by white garden tags, including one that had been jammed into the top of one of the logs.



Figure 3.8. Threshold beam [18034/11] showing the mortised end with post [18033] *in situ*.

### 3.1.2.2 Surfacing and resurfacing

Although the chamfers in the upper surfaces of the threshold oaks would seem likely to be designed to accommodate a gate or door, this interpretation conflicts somewhat with the fact that the track was overlain by both organic and inorganic surfaces (see below). These include roundwood matting [18019] and other organic debris [18003] as well as cobble-sized stones [18002], so it seems probable that the logs themselves were never intended to be the walking surface. This interpretation is supported by the survival of the bark on all of the trackway logs and, although it was difficult to demonstrate this (rather than subsidence into

the peat), it is possible that the entire log trackway was set into a steep-sided trench cut into the peat [18020], so that the logs may have acted as a below-ground foundation for the walking surface, providing stability as well as drainage for the main route into the settlement. This may also explain the apparent longevity of the track as an access route through the site: if the logs functioned as a foundation, the walking surface could have been repeatedly replaced or renewed without disturbing the timbers beneath.

In Trench 15, the surfacing of the trackway comprised bundles of roundwood rods laid at 90° to one another [15003], interspersed with cobble-sized stones (Figure 3.9).

Figure 3.9. Matting [15003] over the trackway in Trench 15. The stepped chamfer in the threshold beam is visible facing inward to the settlement, the matting lapping over the inner edge. The remains of a cobble surface are visible along the right-hand edge of the track.



Figure 3.10. Cobble surface [18002] overlying the trackway in Trench 18, looking S.



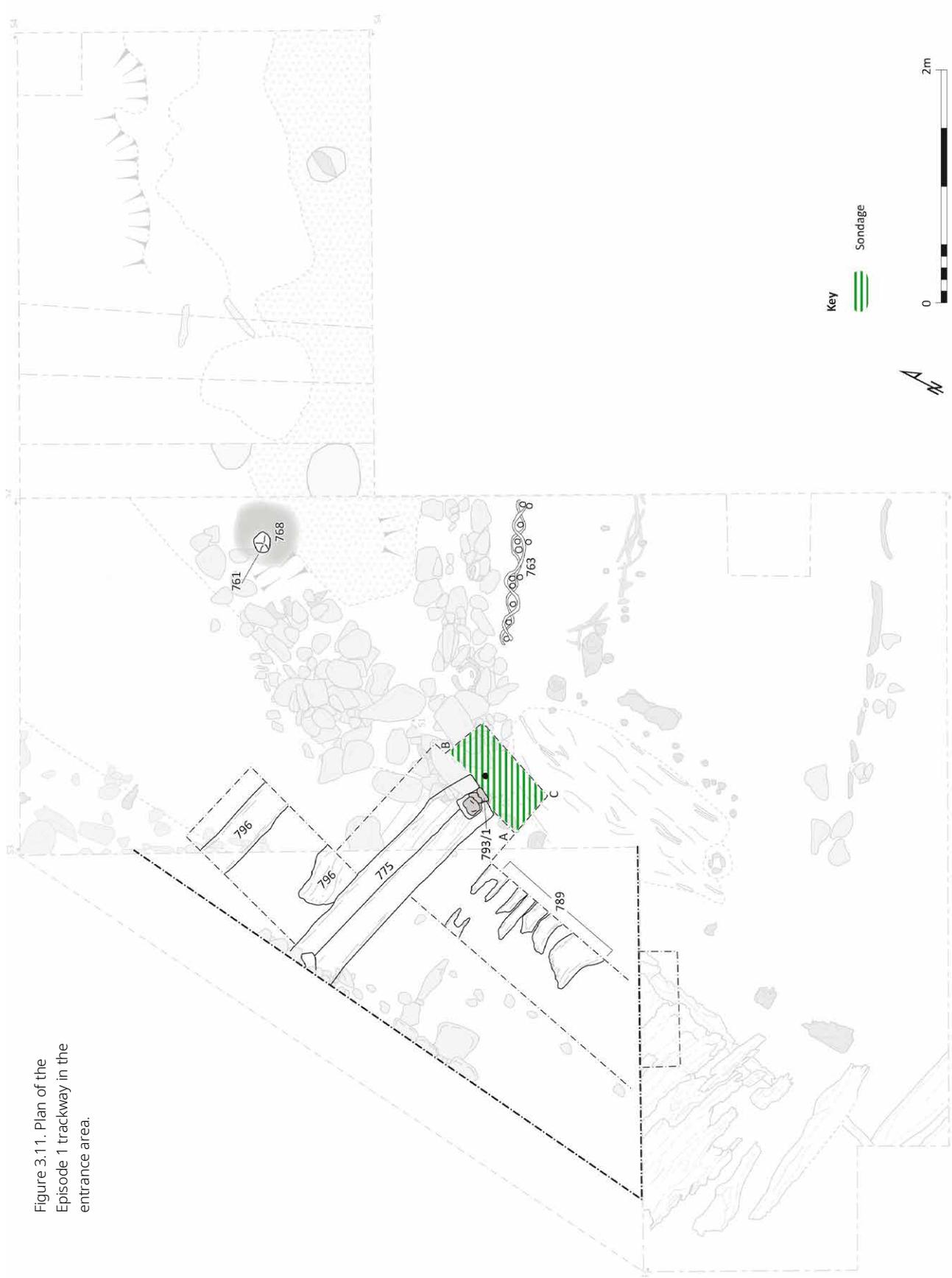


Figure 3.11. Plan of the Episode 1 trackway in the entrance area.

This arrangement was very similar to the surfacing in the outer sections of the trackway at the points where the threshold timbers were placed, eg the latest Episode 2 track surface in Trench 7 [738] (equivalent to [18019] described above), and was clearly the method used for metalling the high-traffic points on the trackway. It is notable that a similar approach was taken to surfacing the entrance to ST2, where roundwoods and cobbles were evidently used to maintain a dry walking surface above the principal structural timbers in the doorframe of the roundhouse. In all instances, the roundwood/ cobble surfacing was interspersed with a matrix of compressed and comminuted plant debris (eg [18033]), suggesting leaf matter and small twigs were also used in this surfacing material.

In later episodes, the trackway was overlain by cobbles and larger slabby stones, suggesting a more substantial approach may have been taken to the metalling in later stages of the site's use. In Trench 18, a spread of large cobbles and larger stones was found beneath the topsoil horizon in a matrix of grey/ orange silt (Figure 3.10). Like other stone spreads in the upper strata of the site, it was

not entirely clear what the purpose of these stones was, but it is probable that they were designed to consolidate the walking surface in later phases.

### 3.1.3 The trackway in the entrance area (Figure 3.11)

Although there appears to have been a natural causeway onto the island it was nonetheless very boggy in the entrance area and must have been frequently submerged as water levels in the loch rose and fell. This area would also have suffered the heaviest traffic and consequently, the trackway into the settlement had to be frequently refurbished. Making sense of the structural sequence in this area was further complicated by varying degrees of compression.

For the same reasons, high water levels in this area made excavation challenging and the very earliest elements of the trackway were only glimpsed in a small 0.8 m x 0.5 m sondage (Figure 3.12).

These consisted of a large longitudinal alder log [807] which had either sunk into the natural peat or lay within a cut slot (which could not be detected within the small

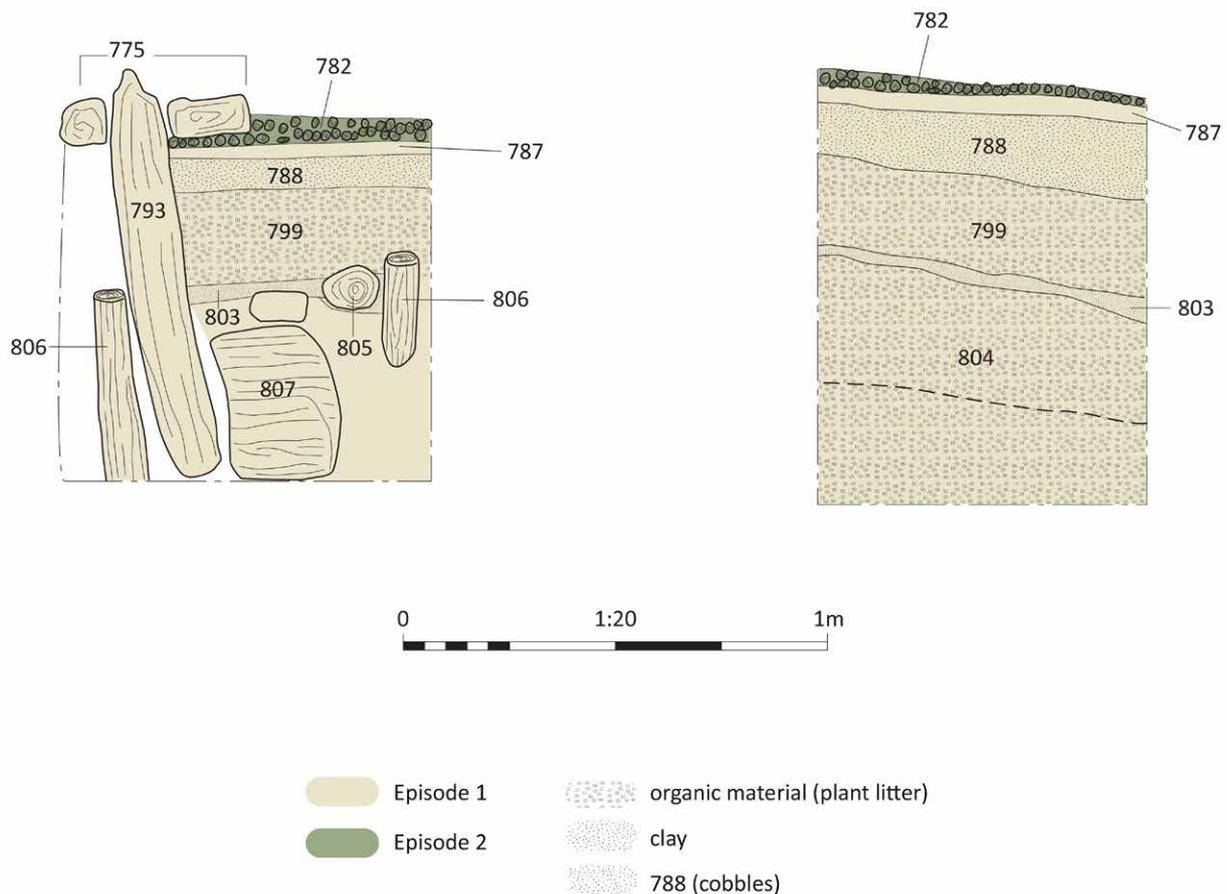


Figure 3.12. The Episode 1 trackway seen in section in the sondage in the entrance area.

sondage) and had been pinned in place with smaller posts [806] on either side of it. Overlying [807] were smaller tangential oak logs [805] and large alder logs [796] which would have created a surface *circa* 0.45 m lower than the log surface seen in the interior.

Without the dendrochronological evidence this lower structure might have been interpreted as a much earlier phase than the trackway that presents itself on the surface of the natural peat further into the settlement. However, the statistical relationships between log [807] and some of the tangential and longitudinal alder logs in Trench 18 is incontrovertible (Table 7.9) and demonstrates that they were all felled at the same time; in particular, the correlation between [807] and [18025/2] is so strong as to suggest that they are logs cut from the same tree. This lower structure is therefore considered to be part of the primary trackway, [807] representing a longitudinal log along the E edge of the track. There is a build-up of some 0.3 m of deposits over this lower structure before threshold beam [775] was laid down in Episode 2 (Chapter 4.1). However, it is argued here that [775] probably formed part of the Episode 1 trackway and was simply lifted and re-used in the same position in Episode 2.

The primary trackway was sealed by [803], a thin layer of pale grey clay which probably represents a flooding event. A surface of tangential planks [789] was laid down over this; their severely decayed condition suggests that this surface was exposed for some time (Figure 3.11). A thick deposit of wood-rich peat [799] was laid over this, possibly as levelling for a cobbled surface, [788], and this in turn was covered by a layer of sand-rich peat [787]. Both [787] and the matrix of [788] contained quantities of woody debris and bracken with some sedge and rush, as well as food and fuel debris (MA), suggesting that this was a laid surface into which domestic debris had been spilled and trampled. This is probably the same as [760], a mineral-rich organic deposit which lay to the N of the sondage and displayed evidence of trampling, including domestic debris (MM). The charred top of an oak post [761] lay level with this surface and is therefore part of the primary trackway structure. On the surface of [760] and around the post was a spread of charcoal and grey clayey ash [768] which was probably associated with the burning of the post (Figure 3.11). The top of some of the stakes in fenceline [763] had also been charred and were associated with a similar charcoal-rich spread [768] (Figure 6.4). These may all be part of the same conflagration event which signalled the end of Episode 1 in the entrance area.

### 3.1.4 Palisades and fencelines

#### 3.1.4.1 Palisade 1

Palisade 1 formed the defensive perimeter associated with threshold beam [15002/0]. It survived only on the W side

of the trackway where it lay under the later Episode 2 ST4 (Figure 3.13 & see Figure 4.41).

It consisted of closely set posts, all of which were alder except for the terminal post [15010] which was oak. The posts varied considerably in diameter, from 0.2 m to 0.4 m, but were quite similar in age, with the most complete sequences varying from 91 to 114 years. Very little had been done to modify the posts; their bark was still intact and they all had flattish bases, usually shaped to a very blunt chisel edge by axe-dressing from two sides. On the largest of the posts, [1022/5], the facet on one side was over 0.55 m long and bore over 70 toolmarks made by an axe with a blade approximately 0.04 m wide. All of the posts were pierced just above the base by tow-holes.

The posts were set within a narrow slot [1025] cut into the natural peat. The cut [1029] was very difficult to identify and was distinguishable only through the character of the backfilled peat [1026], which contained lumps of inorganic orange clay as well as worked offcuts of ash and alder. Several of these splinters were quite large, with three or four *circa* 0.5 m in length and packed horizontally beside the posts in the palisade slot. There were no packing stones around the palisade posts, and the slot was near vertical on the outer (S) side, whilst the inner side sloped more gently, although still in the region of 80°. Although stones were not used to pack the palisade posts, several large roundwood logs, alder and one willow had been lain behind the posts, within the slot fill [1026], acting as packing behind them (Figure 4.43). In front of the posts, several large strips of timber, probably offcuts from dressing the posts, were also packed into the backfill. A peaty layer containing many woodchips and charcoal [1028] was encountered overlying the natural peat to the N of the palisade. The presence of a chopped tree stump beneath this layer supports its interpretation as a construction level associated with the erection of the palisade, whilst the insect assemblage reflects both natural and anthropic input, including house fauna.

Like the alder posts, the terminal oak post [15010] was shaped to a blunt tip and had a tow-hole. It sat within the open-ended mortise at the W end of threshold beam [15002/0], and some 0.27 m above its junction with the beam the post was pierced by a large roughly oval hole 0.075 m x 0.050 m and 0.081 m deep in which the remains of a much-decayed oak peg had survived (Figure 3.14).

There was no reciprocal post in the mortise at the E end of the threshold beam. Instead, there was a large ash block [15055], around 0.75 m by 0.5 m and *circa* 0.4 m thick, into which a large mortise hole had been cut vertically through the centre but which did not penetrate through to its base (Figure 3.15).

A second slot ran from the end of the block to join the mortise hole and was probably designed to secure the vertical oak post [15056] which remained within the mortise.



Figure 3.13. Palisade 1. The stones in the baulk are the remains of Hearth 4/2 in the later Episode 2 ST4.



Figure 3.14. The terminal oak post [15010] in Palisade 1. The hole is visible just above the surviving sapwood.

This post was *circa* 0.25 m in diameter, with a blunt tip. Given the position of the block and post at the end of the threshold beam in the trackway, it is probable that these items represent the remains of a gate post and post-shoe for the entrance gate into the Episode 1 enclosure. The fact that the post was placed in the post-shoe rather than driven into the peat might suggest that it was part of the moving section of the gate, although there was no evidence of the wear on the mortise that might be expected if the post itself rotated within the block. It is therefore more likely that the gate hung from this post and swung on its own hinges. The constant use of the gate might mean that this structure was

prone to wearing out and required regular replacement, hence the use of a free-standing block rather than the earth-fast post employed on the corresponding side of the threshold. The weight of the gate possibly meant that the gatepost was also prone to sinking, hence the need for the supporting block.

Except for the gate post and post-shoe, the primary palisade to the E of the trackway had been dismantled to make way for the construction of ST3. The palisade posts had been removed wholesale and the palisade trench backfilled. The palisade trench cut [15047] was just visible in the natural peat beneath the floor of the building



Figure 3.15. Post-shoe [15055] with post [15056] *in situ*, at the E end of the threshold timber [15002/0].

(Figure 4.12); although very difficult to see against the natural peat deposits, its presence was distinguished by the more twiggy peat fill [15048], which was similar in character to the fill of the palisade slot to the W of the track. Natural tree roots [15053] were observed in the base of the palisade cut, and a single slender stake was found within the fill, possibly the remains of packing or pinning relating to the removed palisade posts.

#### 3.1.4.2 Fencelines [18032] and [763]

Short stretches of two fencelines which lay perpendicular to the axis of the trackway and aligned with the threshold timbers [18034/11] and [775] were uncovered, both to the E of the trackway. Fenceline [18032] was uncovered just to the N of threshold [18034/11], mostly buried below ST3 (Figure 3.2). It was almost certainly an extension of fenceline [18023] which ran along the E edge of the trackway; it was similarly stoutly built with willow stakes and its withies were interwoven with those of [18023]. The tops of its posts were also charred like those in [18023]. Fenceline [763] was aligned on the E end of threshold [775]. It consisted of a line of mostly ash stakes, some of which were clustered in twos and threes, around which stout ash withies had been woven. The tops of some of the stakes in [763] were also burnt.

Whilst the fences lining the trackway ([15042] and [18023] – see above – would have acted as a retention structure designed to keep the logs in position, they may also have created a boundary demarcating the trackway from the rest of the settlement. The MM of [759], one of the deposits used to refurbish the trackway in the entrance area during Episode 2 (Chapter 4.1) indicates the presence of herbivore dung, suggesting the movement of livestock in and out of

the site, traffic which would have been impossible on the natural peat bog surface. It is possible therefore, that the fences and lining structures associated with the trackway are related to the corralling of animals, with fences and gates designed to allow their movement in and out of the settlement in stages. The perpendicular fencelines and associated thresholds lie outside Palisade 1; it is possible that these formed gates dividing the track into segments, with the lining fence containing livestock as it was moved in and out of the enclosure. The perpendicular fencelines also lay on either side of the posited ditch terminal so their function may also have been to act as a safety barrier, preventing animals and humans falling into the ditch.

#### 3.1.5 The ditch terminal and midden

Excavation carried out to the E of the trackway in Trenches 7, 11 and 18 uncovered evidence for the dumping of refuse material, probably into a ditch located outside the Episode 1 enclosure (Figure 1.9). This area provides the only evidence for midden material deriving from the settlement, and contrasts sharply with the character of the deposits from within the structures, which were evidently kept clean.

The midden deposits lay within a wide pit or, perhaps more likely, a ditch cut [18031], defined by a sloping edge face in the natural peat [802]. This cut was steep sided, breaking to a shallow U-shaped base *circa* 1 m below the natural peat surface to the W. The SE counter-scarp of the ditch was not located within the trench, but a series of bucket auger transects taken on alignments radiating from the trench was able to locate the extent of the midden deposits to the E, these becoming progressively shallower 3 m from the base of the cut in Trench 18 (Figure 3.16). This suggests that the cut of the ditch was around 5.5 m in width, and *circa* 1 m

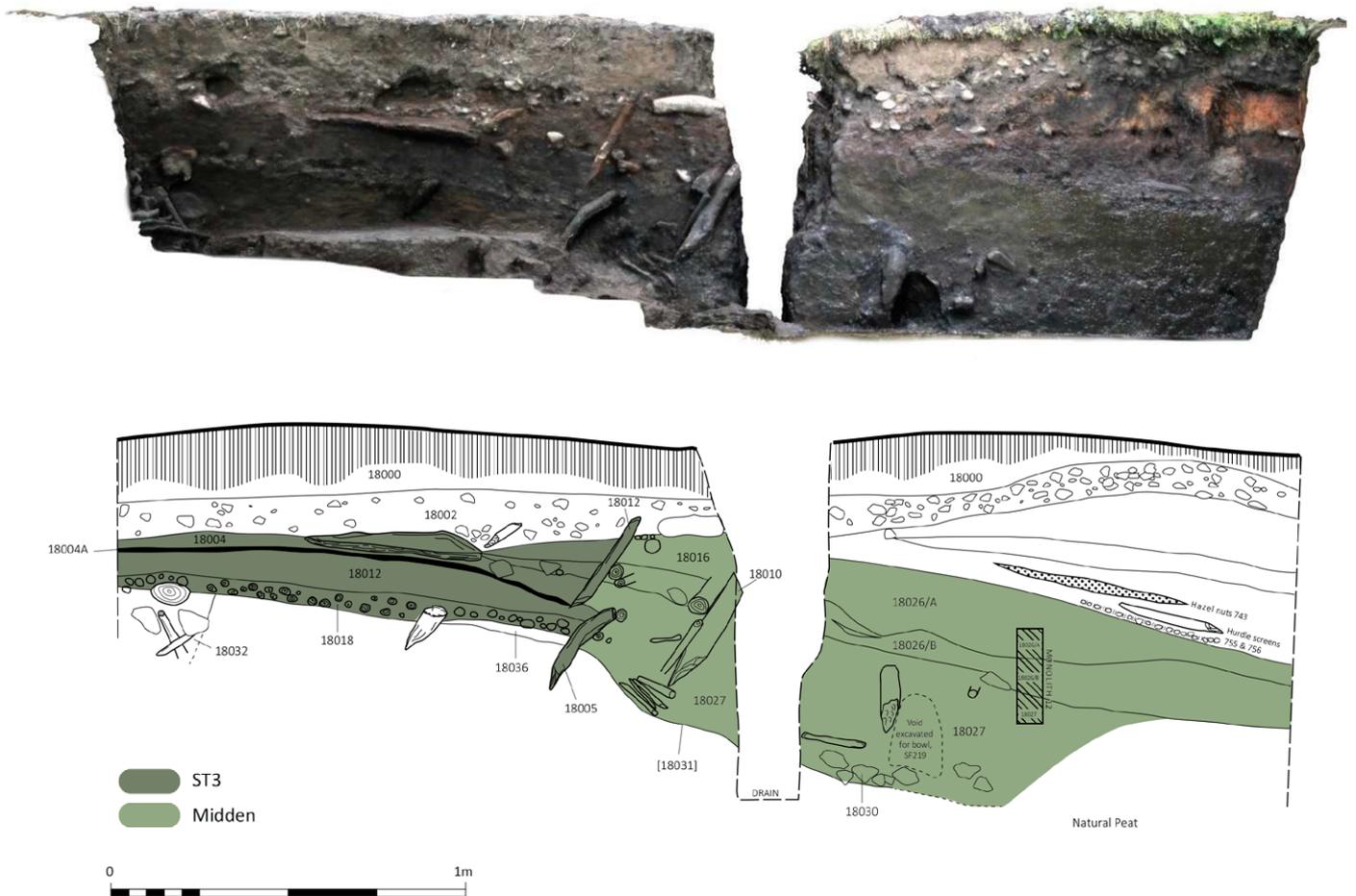


Figure 3.16. Section through the ditch terminal.

in depth. Further transects extending from Trenches 18, 11 and 17 had variable success in locating the extent of the midden deposits, but it is likely that the cut [18031] continues to the N, beneath ST3. If so, it may have formed a curvilinear cut into the natural peat, delimiting the settlement.

The lowest fill of the ditch was a spread of cobble-like stones [18030], above which was a very mixed deposit [18027/800] of dark brown peat containing twiggy debris, woodchips and small stones, as well as occasional discrete lumps of compressed flooring material of bracken and reeds, as though this was discarded waste flooring from a period of refurbishment. A thin layer of roundwoods [754] observed in the base of the 2017 sump is probably part of the same deposit (Figure 6.10). MM confirms that [18027] displays the characteristics of discarded organic flooring, as does the presence of a house fauna amongst the insect remains (IN). MA confirms that it was composed of bracken, woody debris and sedge, with traces of food debris. Faecal waste was not detected in [18027]. In [18027/800] a crucible fragment (SF220) and woodworking debris (SF218) were detected, as well as a flattened but almost complete turned

wooden vessel (SF219) and a complete saddle quern (SF234). The deposit also contained several cow skulls (SF209/ 217) and quantities of unburnt animal bone, some of which displayed butchery marks (BO), as well as limpet shells and several puffballs (SF224).

Above [18027] was a very smooth, brown-orange peat [18026] containing discrete layers of bracken, as though this deposit represented the dumping of stabling or other flooring deposits. Deposit [748] observed in the 2017 sump is probably the same as [18026] (Figure 6.10). The upper levels of [18026] were smoother and less fibrous than the lower, although this was clearly a single deposit of similar material; these layers were labelled [18026/A] (upper) and [18026/B] (lower). MM shows that there were more than seven episodes of dumping of discarded organic flooring, some of which also had characteristics of stabling waste. The faecal signal of cattle and/ or sheep was detected in both [18026/A] and [18026/B] (LB). MA has identified the components of the flooring as primarily bracken with sedge, rush, heather and turves. There was no food or fuel debris incorporated in these discarded floors, and the insect fauna was relatively

small. One possible explanation for this is that the floor layers were being removed too rapidly for an insect fauna to colonise them (IN). The presence of turves and absence of food debris and insects, as well as the presence of faecal waste distinguishes it from [18027] the discarded flooring below it, suggesting that this was an accumulation of refuse from either different buildings or different areas.

### 3.1.5.1 Fence [18010]

Along the NW edge of the ditch, a short length of fence [18010] was uncovered, comprising a series of heavy stakes averaging *circa* 0.08–0.1 m in diameter with coarse withies mainly *circa* 0.02–0.04 m in diameter. This fenceline seems to have lined the edge of the ditch but may have been built after the ditch had begun filling up because the stakes were embedded in dumps of the midden material and did not penetrate the surface of the natural peat (Figure 3.16).

## 3.1.6 Ecofact summaries for the Episode 1 trackway, entrance and defensive structures

Table 3.1 summarises the type of ecofact analysis undertaken for each of the contexts described below.

### 3.1.6.1 [760]

#### Micromorphology

The largest observed organic component of [760] were wood and plant tissue fragments which had a weak horizontal orientation. Approximately 10% of the unit comprises roundwood and wood and possible bark fragments. Occasional straight edges to the wood fragments were observed, the incorporation of worked wood into the track. Small quantities of hazelnut and burnt cereal grains represent food refuse but are indicative of general activity in the area rather than a specific food preparation area. Similarly, charcoal is indicative of a nearby hearth or fire event. However, the quantity of charcoal suggests mixed fuel debris rather than representing the *in situ* burning of a

post or stake. The surrounding sediment matrix is not burnt, and high quantities of uncharred plant and wood remains are also present. Indicators of anthropogenic activity include charcoal fragments, charred seeds and anorthic sediment fragments with sharp boundaries with the surrounding groundmass which may have been trampled into the deposit. Thus [760] appears to represent the remains of a trampled surface augmented/ influenced by waste materials which may have been deliberately added and trampled into the surface as part of the trackway construction, but may also have been accidentally incorporated as food and waste were carried between the structures and the wider settlement.

### 3.1.6.2 [787]

#### Macroplant

The flooring material present was a mix of waterlogged roundwood, wood fragments, hazel buds, bracken and sedge, some of which were identified as white sedge, hairy sedge and rush. These plants were likely deliberately laid in this area to create a waterproof surface. The presence of bog bean amongst the weed species indicates that this part of the site was probably boggy and required additional resurfacing of floor layers to create drier surfaces. The context was described as trampled, but its contents suggest it may have been a deliberately laid surface.

There were 42 carbonised cereal caryopses and chaff fragments. The species were emmer (52%), barley (17%), wheat (7%), bread/ club wheat (5%) and cereal (19%). There was also a large quantity of burnt peat and some waterlogged hazelnut shells. These all represent food and fuel debris spilled and trampled onto this surface.

### 3.1.6.3 [800]

#### Macroplant

A single puffball was collected by hand from the midden deposit. It was mature and is unlikely to have been gathered for food. Instead, it was probably intended to be used as part of a first aid kit to help stop bleeding or as a fire starter. Whatever the reason for it being collected, it appears not to have been used and was instead disposed of within the midden.

*SF219 [800] Bowl deposit:* the wooden bowl found in the midden was filled with leaves. Preservation of the leaves was excellent and these were gently removed by teasing apart the layers. All the leaves were willow and appeared to form distinct layers suggesting that the bowl had been deliberately lined with them. However, willow leaves were also found in the sediment around the bowl which perhaps suggests that the bowl was discarded along with the willow leaves, some of which then accidentally became trapped within its interior.

Willow was not used extensively during the occupation of the settlement. Willow did grow locally but not in great

CONTEXT	MM	LB	MA	BO	INS
[760]	*				
[787]			*		
[800]			*	*	
[1028]					*
[15041]			*		
[18026A & B]	*	*	*		*
[18027]	*	*	*	*	*
[18029]			*		

Table 3.1. Summary of ecofact analyses for contexts from the Episode 1 trackway, entrance and defensive structures.

quantities (Chapter 17.1.5) and this is reflected in its minor presence on the settlement (Chapter 17.2.3.4). It is therefore possible that the large quantity of willow leaves recovered from in and around the bowl was deliberately collected. Willow leaves and bark have long been used as a medicine from prehistory onwards and it is possible that they were gathered at BLoM for a specific purpose.

Other finds recovered from the sediment sampled within the bowl included small fragments of sedge, bracken and wood which may have been the remnants of a decomposed floor. There were some blackberries that could be evidence for the disposal of food or faecal matter within the midden. Weed species and moss were noted but these were likely plants that grew alongside the midden. The most abundant weed was common nettle which tends to favour disturbed acidic soils, making the environment surrounding this feature an excellent habitat for this species. It is unlikely these plants were deliberately deposited within the bowl prior to its disposal and instead were re-deposited as inclusions within the sediment in the midden.

### Bone

The bone assemblage consisted of 60 fragments (1,590.4 g) with preservation ranging from poor to excellent but most were described as good. These fragments were preserved entirely through waterlogging and no burnt bone was recovered. The species present are cattle (12), pig (2), large mammal (L/M) (42) and medium mammal (M/M) (2).

The cattle elements were skull fragments, a mandible, a tooth, scapula, tibia and metacarpal, some of which was collected as small find SF217. Analysis of the skull fragments revealed the presence of two individuals. Examination of tooth eruption and wear indicates that these two animals were slaughtered between the ages of 24 and 30 months. The teeth of one individual displayed evidence of possible malnutrition. Both the tibia and metacarpal were fused and these both belonged to an animal older than 24 months.

The two pig bones were identified as a humerus and ulna. The humerus was unfused and this belonged to an animal younger than 12 months. No fusion data was available for the ulna.

The L/M and M/M skeletal elements consisted of skull fragments, mandibles, vertebrae, scapula and ribs. An L/M lumbar vertebra had been chopped or sawn in two and a thoracic vertebra had evidence of a cut mark along a spine. An L/M long bone was marrow cracked. One of the L/M ribs bore evidence that it had been worked.

### 3.1.6.4 [1028]

#### Insects

A substantial, highly diverse assemblage of 241 beetles and bugs of 139 taxa from a 3 l sample indicated a combination

of natural and man-made deposition (concentration 80 l<sup>-1</sup>;  $\alpha = 137$ , SE = 16). Aquatics (11% of the assemblage) included *Coelostoma orbiculare* which is usually associated with mosses, typically in floating rafts of vegetation or at the edges of water bodies. Taxa from outdoor habitats were common (40% of the fauna). Some of these may have come from the peat and would therefore be indicative of the local environment at the time the peat formed. Others may relate to conditions adjacent and contemporaneous with the settlement. A number of insects indicated wooded wetland and perhaps somewhat swampy conditions. Plant-feeding beetles included *Donacia obscura*, usually found on sedges (Cyperaceae), and *Notaris acridulus* which is associated primarily with reed sweet-grass (*Glyceria maxima*) and perhaps with other semi-aquatic grasses. Several ground beetles were indicative of damp shade and woody vegetation: *Elaphrus cupreus* (a ground beetle) occurs in sparsely vegetated shady waterside habitats, *Agonum thoreyi* in damp litter or under bark by water, and *Platynus assimilis* under logs and loose bark. A salpingid beetle (*Vincencellus* or *Rhinosisimus*) is also found under bark. Other insects were indicative of nettles (*Trioza urticae* nymphs, *Brachypterus*) and docks (*Gastrophysa viridula*, *Perapion curtirostre*), whilst *Meligethes* is primarily associated with various wild and cultivated Brassicaceae, and *Phyllopertha horticola* and *Dascillus cervinus* with grassland.

Decomposers made up 35% of the assemblage, around half of them having synanthropic associations, and their diversity was relatively high ( $\alpha_{RT} = 23$ , SE = 4). A house fauna indicated that mouldering litter from within a building had been incorporated into the deposit (*Latridius minutus* group, *Atomaria*, *Cryptophagus* spp.; 6%). Scarabaeoid dung beetles (*Geotrupes* s.l., Aphodiinae) accounted for 3% of the fauna.

(Terms:  $\alpha$  – index of diversity (alpha) for the whole assemblage; RT – total decomposers;  $\alpha_{RT}$  – diversity (alpha) of the decomposer component; and SE – standard error of alpha. See Chapter 13 for a detailed description.)

### 3.1.6.5 [15041]

#### Macroplant

This deposit was described as construction debris. The ecofact assemblage is consistent with this interpretation as it appears that waste fragments of waterlogged wood, bracken, leaves and buds were dumped in this area. The only evidence for any possible domestic debris is in the form of the hazelnut shells but these could be accidental inclusions within the wood waste. The weed species and moss were probably growing in this area and were covered over by the discarded construction debris.

### 3.1.6.6 [18026B/18026A]

#### Micromorphology

Contexts [18026B] and [18026A] were hypothesised as a dump of old flooring or stabling waste deposits and was sampled in order to determine if separate flooring episodes or evidence of stabling waste could be identified. It was found that [18026B] was present across samples ST3/M12/K1, ST3/M12/K2 and ST3/M12/K3 within which it was found to comprise five sedimentary units. For [18026A] this is present at the top of sample ST3/M12/K3 and comprises two further sedimentary units.

Each unit is separated by a clear, sharp discontinuity boundary signifying at least seven distinct episodes of deposition/ dumping. Microlaminations within some units as well as juxtaposition of materials indicate it is likely that more than seven episodes of dumping are represented but that some limited post-depositional mixing has blurred boundaries and do not allow these to be separated out further. The seven identified units also display differences in microstructures, particularly in terms of compaction, indicating that they originate from different parts of the site and that some have been more heavily trampled and compressed than others. Variations in coarse organic matter also indicate use of different proportions of organic material used within the floors. This is consistent with the pattern observed within the Type B floors within ST2 where changes in the proportion of bracken and roundwood have been observed at the microscale. Proportions of anthropogenic residues also vary and may indicate deposition of waste materials from different parts of the structure – floors derived from areas closest to the hearth for example are likely to contain higher proportions of fuel and food waste. Differences in the proportions of anthropogenic residues likely also reflect where in the stratigraphic sequence the floor was removed from. These dumped deposits could have been brought from any of the structures occupied during Episode 1.

The possibility that layers of stabling waste have also been dumped in the midden has been investigated using micromorphology and faecal steroid analysis. Possible herbivore dung fragments characterised by concentrations of 'chopped' elongate organic matter and accumulations of 'wavy' organic matter embedded in yellow phosphatic groundmass were identified within Unit 1 and Unit 2 of ST3/M12/K2 [18026B] and Unit 1 of ST3/M12/K3 [18026A] and are consistent with Type H stabling deposits. The faecal steroid analysis (internal ref) identified enhanced levels of faecal matter from a sample taken level within Unit 1 of ST3/M12/K3 which is consistent with micromorphological evidence for dung in this unit. An enhanced faecal steroid signal was also identified from a sample of [18026A] but no micromorphological evidence for dung or stabling waste was identified in the two units representing this context. This

suggests that a combination of techniques is required to definitively identify areas of stabling waste as faecal steroid signatures have been identified when micromorphological evidence appears to be absent.

#### Lipid biomarkers

[18026a]: Faecal steroids from ruminants.

[18026b]: Faecal steroids from ruminants.

#### Macroplant

The largest components of this midden deposit were bracken, sedge some of which were identified as glaucous sedge, hairy sedge, rush, wood rush, heather and decomposed turves. These plants represent old, decomposed floors deliberately disposed of within the midden. The only other finds were weed species and moss which were either accidental inclusions of the old floors and turves or were plants that had colonised the edges of the midden. There were two carbonised cereal caryopses identified as one six-row hulled barley and one barley. These cereal caryopses are likely re-deposited inclusions within the decomposed floors as there is no surviving evidence to suggest this layer within the midden was used for the deliberate and large-scale disposal of domestic food debris.

#### Insects

Insect remains were sparsely represented relative to the amount of plant material: a 4 l sample produced a minimum of 30 beetles and bugs of 23 taxa and occasional fly puparia. The low numbers could simply be a result of 'dilution' by the abundant plant material, notably substantial amounts of bracken (Robertson, plant report). Poor preservation might potentially also have been a factor, but all the insect remains were well-preserved with few signs of decay. Alternatively, the disused litter making up this layer could have been cleared from buildings relatively quickly before a substantial community of insects had time to colonise it.

*Latridius minutus* group, representing a house fauna, suggests that the deposit contains at least some discarded floor litter. Records of tick (*Ixodes ricinus*) nymphs, and a single adult male specimen, might possibly suggest that some discarded litter came from buildings where animals were kept, but ticks are probably equally likely to have been brought onto the site with cut vegetation such as bracken. Samples examined for faecal sterols indicated that herbivore dung was present in this deposit (Mackay, lipid biomarker report for 2019 season). *Ulopa reticulata*, a plant hopper found exclusively on heathers (*Calluna* and *Erica*) and represented by two individuals, may relate to the use of heather or moorland turves within buildings. Insects from outdoor habitats were well represented relative to decomposers which is consistent with an external midden layer, with some taxa reflecting habitats on the settlement

or in its immediate surroundings rather than cut vegetation used within buildings. Occasional *Trioza urticae* nymphal skins suggest that nettles were growing on or very close to the midden, perhaps attracted by increased nitrogen-rich conditions from dung or other sources. *Longitarsus* species (the most abundant taxon in the whole assemblage) most likely lived on herbaceous vegetation, probably in grassy places, whilst the weevil *Sciaphilus asperatus* can be found in a wide variety of grassy and wooded habitats.

### 3.1.6.7 [18027]

#### Micromorphology

Sampling of [18027] was undertaken within the base of sample ST3/M12/K1 and hypothesised to comprise a dump of stabling waste or old flooring. When viewed in thin section [18027] displays numerous characteristics consistent with Type A and Type B flooring materials found within ST2. It has a weakly lenticular microstructure and dominant coarse organic component which is aligned at an angle of approximately 45° to the base of the slide. Bracken leaves and stems were commonly identified, as well as cellulose rich woody fragments with high birefringence. Anthropogenic indicators include charcoal (10%) and rare (<5%) charred peat. A single fragment of ashy fuel slag was also noted.

The dipping angle of the bands of coarse organic components suggests that the material has been deliberately dumped into the midden at this angle. The relatively high incidence of anthropogenic indicators as well as similarities to Type A and Type B floors are consistent with a dump of old flooring material rather than stabling waste. Furthermore, analysis of faecal sterol and bile acid ratios from these samples revealed no evidence for faecal matter within this context.

#### Lipid biomarkers

No faecal input detected.

#### Macroplant

This deposit differed from [18026] in that there was no evidence of decomposed turves. Instead, the waterlogged assemblage was dominated by the presence of flooring waste in the form of layers of bracken, roundwood, wood fragments and sedge alongside smaller quantities of hazel buds and bark. It was speculated that some of these floor remains may be stable waste (Chapter 9.6.6) and the emmer and wheat chaff present in the deposit could have been used as animal feed. The weed assemblage was large and these were either accidental inclusions in the discarded flooring material or had colonised the edges of the midden.

The carbonised finds totalled eight cereal caryopses along with some peat fragments. The cereal species were three emmer, three wheat, one two-row barley and one cereal. The only other food item was waterlogged hazelnut

shell. The small quantities of domestic debris suggest that they had previously been trampled into the decayed floors rather than representing direct disposal of food waste into the midden.

#### Bone

The bone assemblage consisted of 14 components (797.2 g) and preservation ranged from poor to excellent although most were recorded as adequate. None was burnt nor was there any evidence of butchery, pathologies and bone working. The species present were cattle (4), sheep/goat (2), pig (1), L/M (6) and M/M (1).

The cattle skeletal elements were composed of two skull fragments, one with the horn still attached, a scapula and a metacarpal. The scapula was fused which means this individual was older than seven months at time of death.

The sheep/goat skeletal elements were two left mandibles from two separate individuals. Analysis of tooth eruption and wear reveals that the youngest died between the age of three and five months whereas the other was older than 21 months.

There was one pig maxilla but there was no surviving evidence of tooth eruption or wear to estimate an approximate age of death.

The L/M fragments consisted of one scapula, two ribs, two long bone shafts, of which one was a tibia. The M/M bone was a radius shaft.

#### Insects

A large beetle and bug assemblage was produced from a 5 l sample (297 individuals of 142 taxa; 59 individuals l<sup>-1</sup>). Diversity was high reflecting mixed origins and an outdoor location ( $\alpha = 107$ , SE = 10). Aquatic beetles (9% of the assemblage) included *Ochthebius minimus* and *Dryops*, both associated with wet, waterside mud and *Oulimnius tuberculatus* and *Elmis aenea* found in running water or on stony lake shores.

Decomposers (RT 38%,  $\alpha$ RT = 17, SE = 3) included a house fauna (10%) indicating that the midden material included discarded floor litter. Human fleas (*Pulex irritans*) were also present. *Anotylus tetracarinatus*, the most numerous species in the assemblage, occurs in decaying organic matter, especially if it is relatively dry, and its larvae develop in various kinds of organic matter, particularly dung (UK Beetles website). Faecal sterol and bile acid ratios from a single sample, as well as micromorphological work, provided no evidence for dung in this deposit, however.

Outdoor insects were common (39% of the assemblage). Some of these, such as *Conomelus anceps* and nymphs of *Livia junci*, both found on rushes (*Juncus*), could have come from surrounding marshland or have been imported with wetland vegetation used as floor litter. The most likely source of numerous disaspidid scale insects is on discarded roundwood for which there was good evidence in this deposit (Robertson, plant report). A small bark beetle (Scolytinae) and *Temnostethus*

*gracilis*, an anthocorid bug associated with lichens especially on bark, may also be associated with the roundwood, although an origin on nearby trees or shrubs is also a possibility since woody vegetation nearby was suggested by *Ocys harpaloides*, a small ground beetle typically found in woodland, and *Isochnus foliorum* and *Crepidodera* both found on willows. A notable find from this deposit was a wooden bowl filled with willow leaves. Leaves were also present in the surrounding sediment so their presence in the bowl may be incidental rather than deliberate. There do not appear to have been other types of willow remains identified amongst the plant macrofossils (Robertson, plant report). Whilst deliberate importation of leaves cannot be discounted, records of *Isochnus foliorum* and *Crepidodera* from samples elsewhere on the site suggest that willows in some form were growing close to the settlement. Young willows, or any that were cut down regularly, would not necessarily produce flowers or seeds, but they would attract various insects feeding on the foliage. The larvae of *I. foliorum* are leaf miners and the adult specimens recorded here could conceivably have emerged after deposition, but none of the remains seen here were soft or unexpanded which would indicate unemerged or newly emerged beetles.

Nettles and docks, indicated by *Brachypterus*, *Trioxa ?urticae* and *Gastrophysa viridis*, probably colonised midden material and nutrient-rich ground in its vicinity. Disturbed ground with weedy vegetation was suggested by *Chaetocnema concinna* or *picipes*, associated with Polygonaceae, especially knotweeds (*Polygonum*), and *Meligethes* which has larvae that feed on various wild and cultivated Brassicaceae. Grassland in the wider environment was suggested by *Dascillus cervinus* and *Phyllopertha horticola*.

#### 3.1.6.8 [18029]

##### Macroplant

This deposit was rich in bracken, sedge, rush, roundwood and wood fragments along with smaller inclusions of hazel buds used as packing between the logs. The weeds and moss were small and were accidental contaminants of the flooring material. The absence of any food refuse and the small number of weeds indicates that this deposit was rapidly deposited.

## 3.2 Structure 2 (ST2)

### 3.2.1 Introduction

ST2 is the most fully excavated of the Episode 1 roundhouses so it is presented first because many of the partial features displayed by the other houses can be better understood in relation to it. The house consists of a double outer wall and two internal post-rings, built around a massive central hearth, with a S-facing entrance. In trenches totalling 114 m<sup>2</sup> in area, just over half of the original area of the building has been exposed (Figure 3.17). This includes

the hearth mound and the entrance, as well as most of the W half of the house.

The E half of the house could not be investigated because of the presence of large trees. There is no evidence that the superstructure, ie the walls and post-rings, were ever replaced but the hearth, entrance structure and floor surfaces were all refurbished twice after the primary construction.

The roundhouse was excavated over the course of two seasons; as the entrance was not uncovered during the 2015 season one of the aims of the 2016 season was to locate it by extending out the original trench beyond its S and W baulks. Whilst this was successful, one of the consequences has been that the critical junction between the main body of the house and the entrance was only ever partially exposed at any one time, with some loss in our understanding of the construction techniques employed.

Across Trench 2, in which ST2 was exposed, the surface of the peat dips down from N to S by as much as 0.6 m (Figure 3.18). The house may have been built over a natural hollow in the peat (see below) which was then deepened by the combined weight of the hearth mound and the entrance structure. The outcome has been a dramatic decay trajectory across the house from N to S, with much better preservation of the deposits in the S half of the house, whilst to the N the deposits taper out and all that survives is a thin skin on the surface of the peat.

### 3.2.2 Chronology

ST2 was built in 435 BCE but preparation for construction had begun a year to 18 months previously in the winter/spring of 437/436 BCE when some of the oaks were felled. The location of the dendro-dated oak timbers indicates that the superstructure was erected as a single event using stockpiled timber (Figure 3.19). Ash stakes used in the double outer wall [232] and [233] were also felled over a period of two years, indicating stockpiling in preparation for construction.

The alder timbers from the foundation structure [277], the sillbeams [223] and the inner post-ring [263] were all felled within a felling band of four years, whilst hazel stakes in the double outer wall were felled within a felling band of seven years (see Chapter 7.1.1 for discussion of felling bands). In both cases one to two years of this spread of felling dates could therefore be accounted for by stockpiling. There is structural evidence for three phases of refurbishment in ST2 but it is not credible that these key structural components, the foundations, sillbeams, post-ring and wickerwork walls were not constructed in the same year. If there was replacement of any timbers it must have taken place within the span of the felling band.

Some 17 radiocarbon dates were obtained from ST2, mainly from the stratified floor deposits and hearth deposits (Table 2.2 & Chapter 8.3.2). Their modelling,

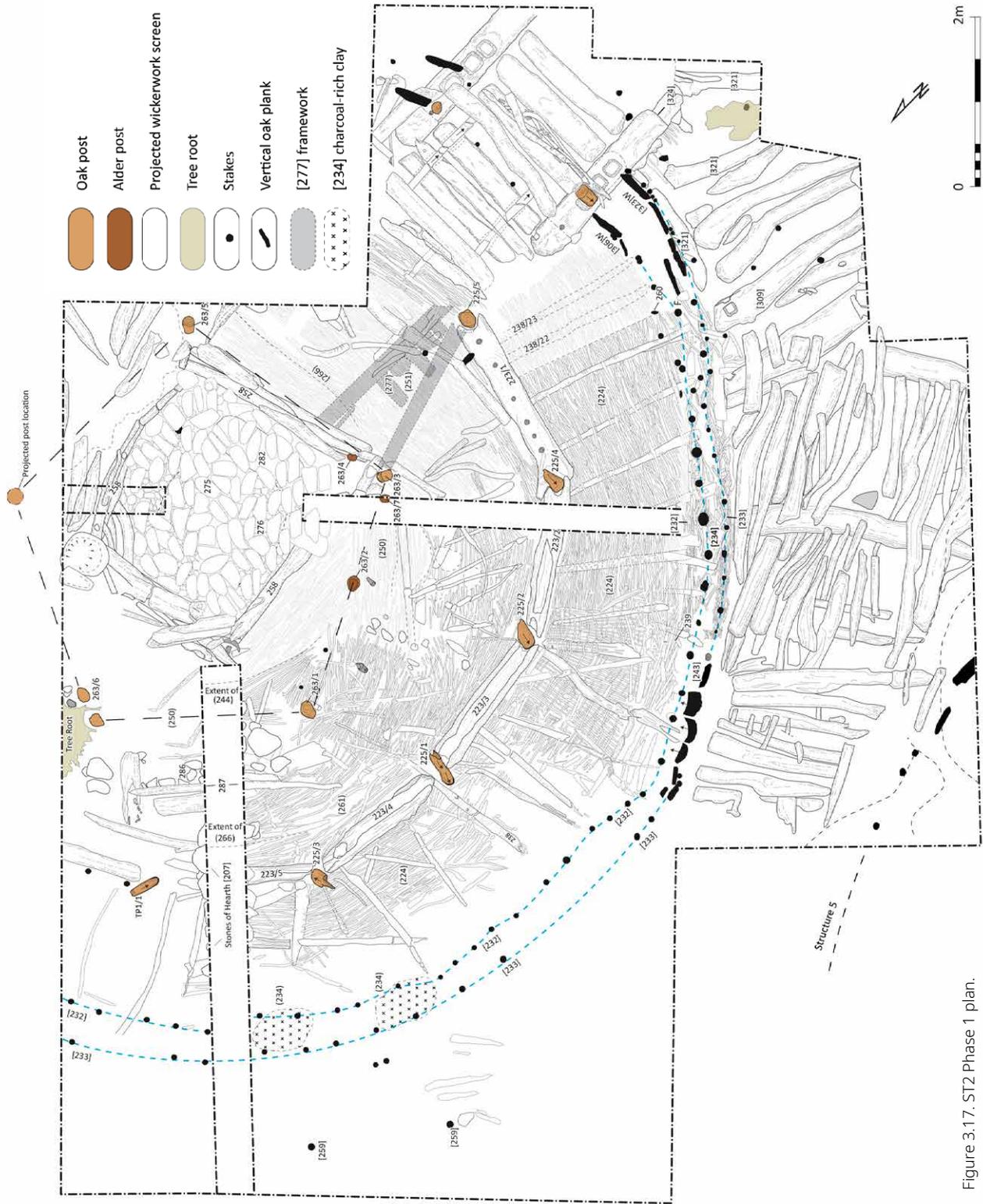


Figure 3.17. STZ Phase 1 plan.

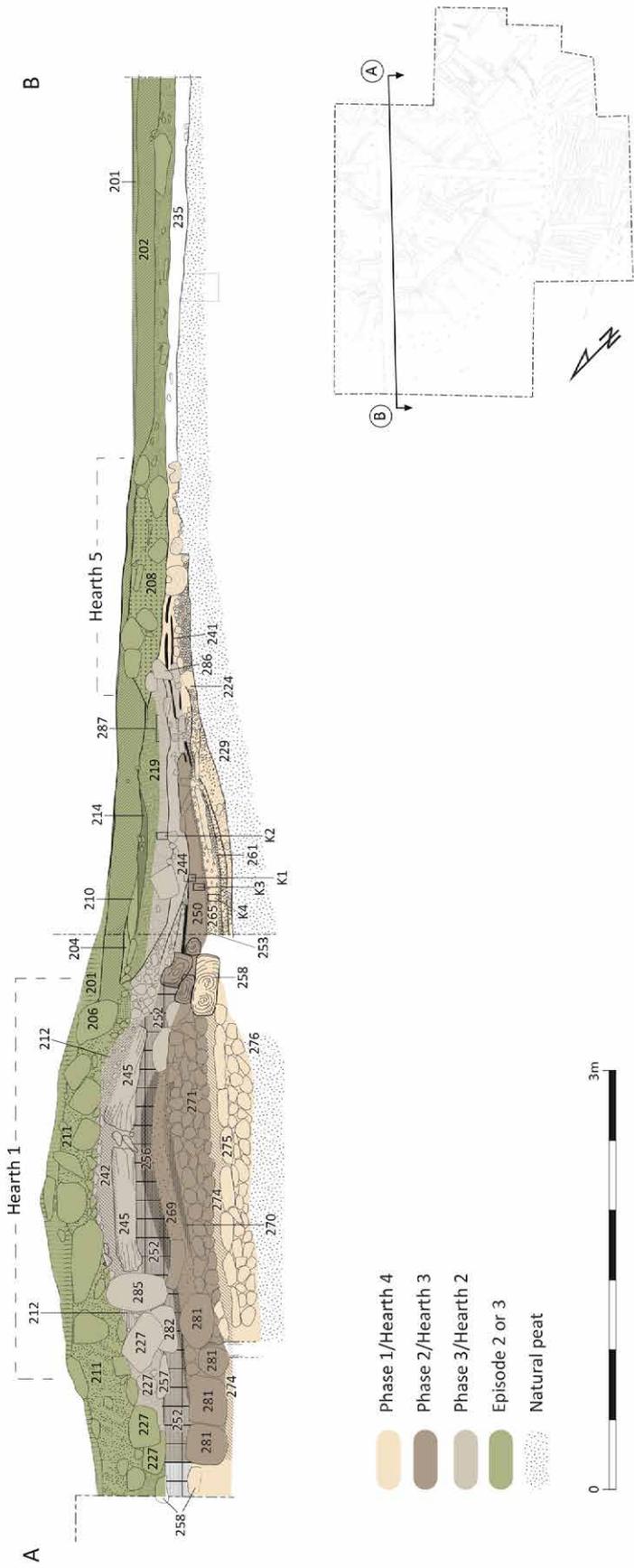


Figure 3.18. ST2 Section AB.

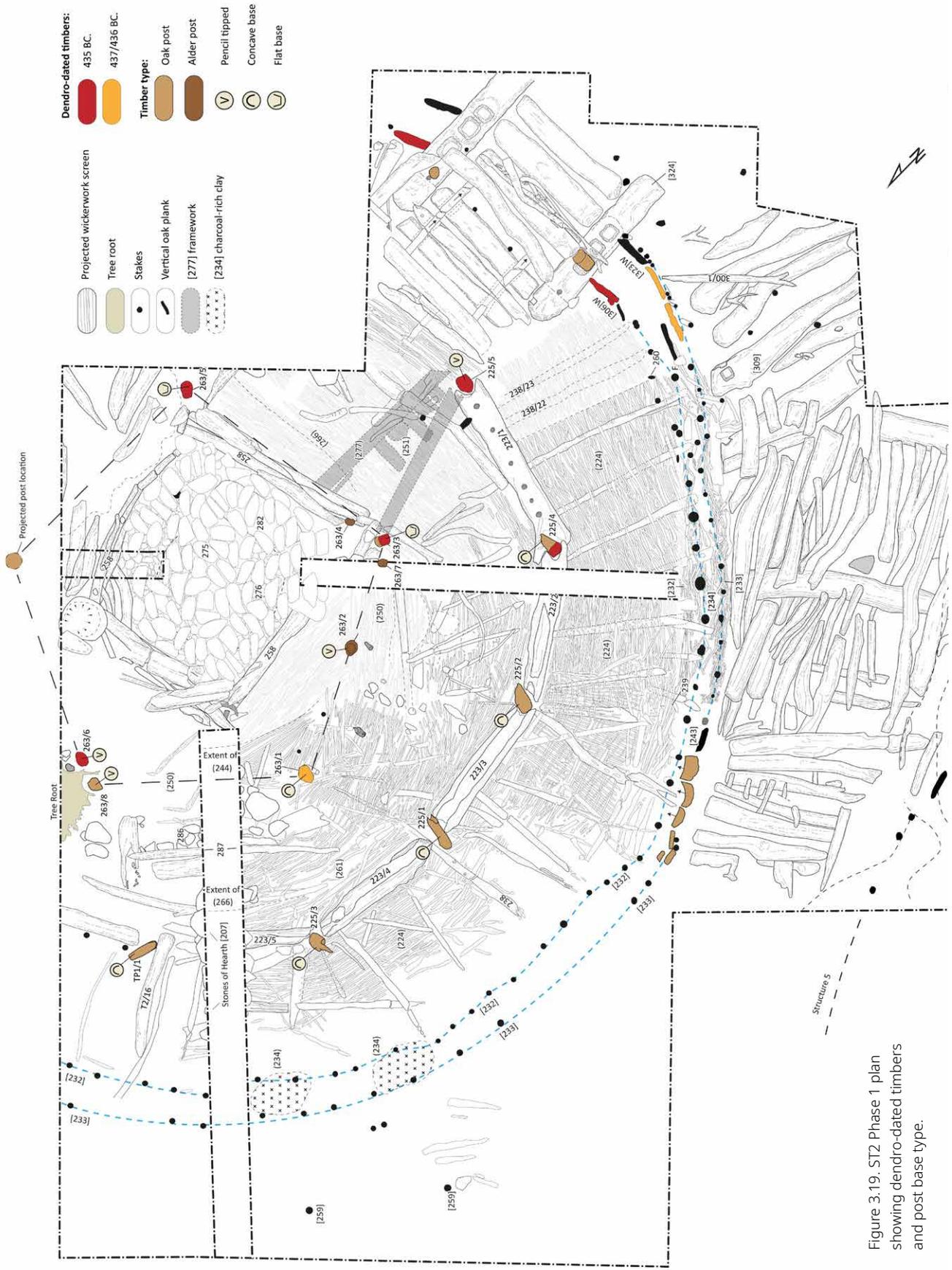


Figure 3.19. ST2 Phase 1 plan showing dendro-dated timbers and post base type.

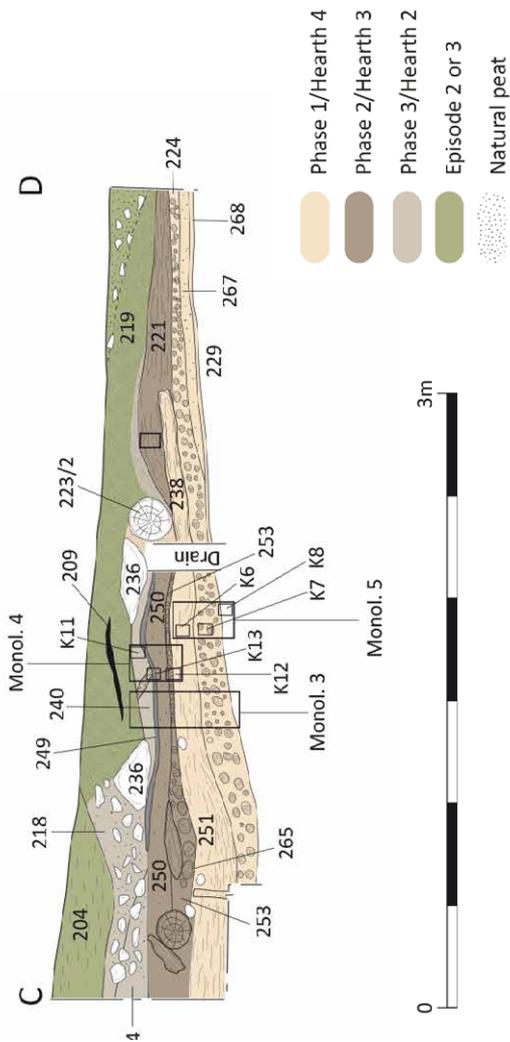
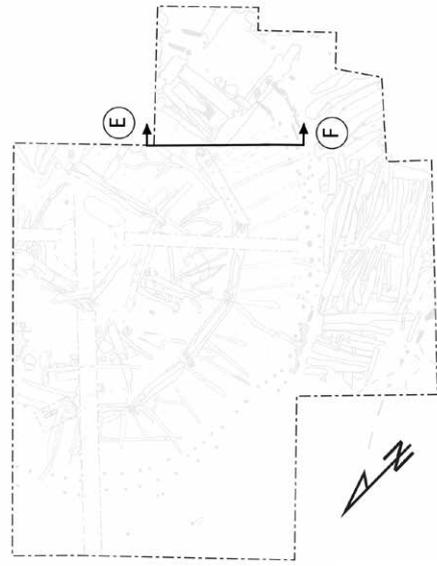
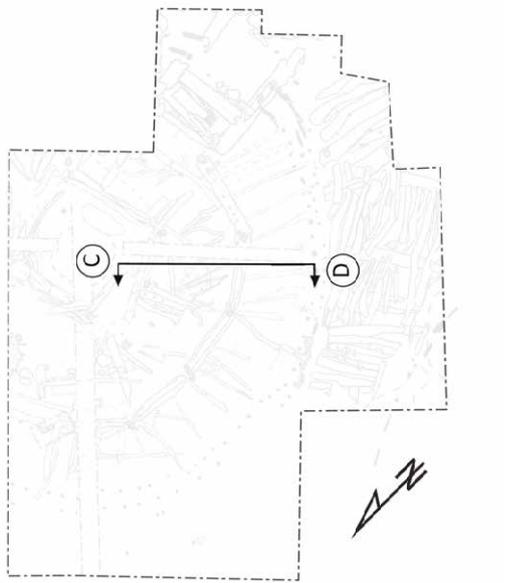


Figure 3.20. ST2 Section CD.

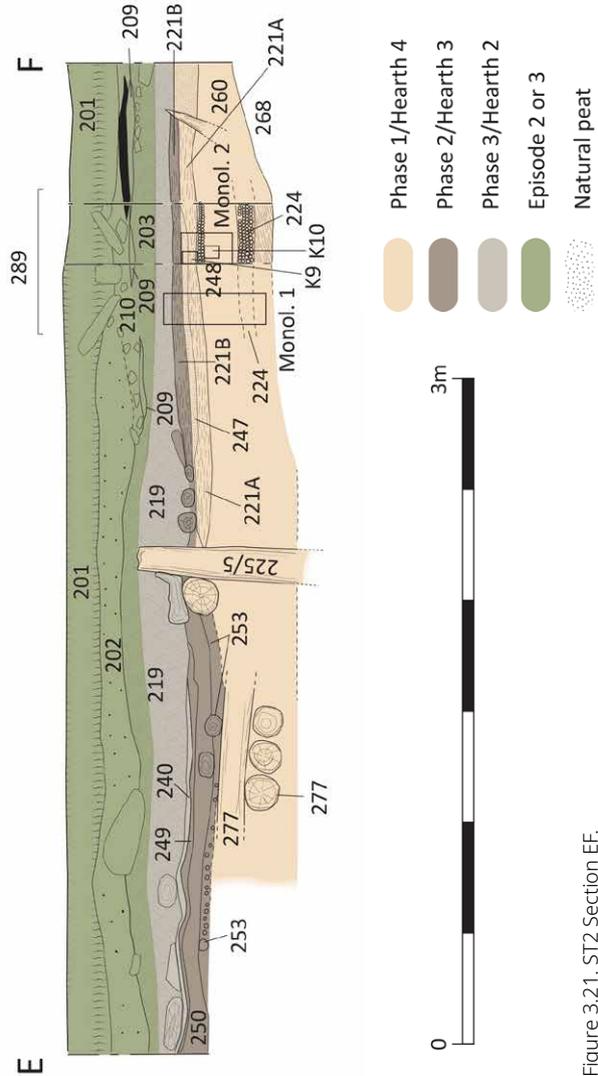


Figure 3.21. ST2 Section EF.



Figure 3.22. The double-skinned outer wall. The inner wall [232]/[260] is to the fore, the sub-floor radials [238] projecting out through the wall. The outer wall [233] is marked by tags, the trackway abutted up closely behind it.

constrained by the dendro dates for construction and the later activity on the footprint of the house (Chapter 5), suggests that activity in ST2 could have lasted for between 10 and 40 years (95% probability) or 15–35 years (68% probability), and ended in 430–400 cal BCE (95% probability), or in 420–405 cal BCE (68% probability).

### 3.2.3 Phase 1

#### 3.2.3.1 Foundation deposits (Figures 3.20 & 3.21)

ST2 was built directly onto the surface of the natural peat [229]. This was a moderately humified peat so the surface of the island had sat above the water table for some time before construction (MM).

It was found that [267] consisted of a lower layer of bracken and an upper layer of sedge and rush (MM) which had been laid down directly over the peat. The exceptional preservation of the plant remains and the absence of any anthropic residues in this layer (MM) indicate that it must have been sealed almost immediately by the overlying deposits, so it was perhaps laid down to initially define the footprint of the roundhouse. These primary deposits also included small patches of [264], a deposit which consisted primarily of woody debris and sedges and, unlike [267], did include small amounts of burnt bone and charcoal suggestive of trample (MA). IN suggests that [267] may have incorporated discarded floor litter.

A deposit of plant material [268] some 0.1 m thick was laid down over [267] in the S part of the house, possibly to fill in the natural hollow surmised above. This deposit consisted mainly of woody debris but, like [267], the insect fauna suggests that decaying plant litter may also have

been present (IN) and MM suggests that it was left exposed for some time.

#### 3.2.3.2 The superstructure

Evidence for the superstructure of the building consists of a double outer wall, a post-ring linked by tangential sillbeams and an inner ring of posts circling the hearth (Figure 3.17). Apart from the entrance there is no evidence, stratigraphic or dendrochronological, that these elements of the structure were ever replaced or refurbished; they represent a single construction event.

The building defined by the structural elements described below consists of a roundhouse some 12.8 m in diameter with a N/S aligned axis bisecting the central hearth and the S-facing entrance. The building is remarkably symmetrical around a central point which lies at the very centre of the Phase 1 hearth. The internal area of the building within the inner skin of the outer wall would have been 113 m<sup>2</sup>.

#### The structure of the outer wall

The outer wall of the roundhouse is a double-skinned construction, consisting along most of its circuit of two wickerwork walls set 0.4 m apart, [232]/[260] comprising the inner wall and [233] the outer (Figure 3.22).

Along part of its W circuit the outer wall has been strengthened by the insertion of a line of six oak planks [243]. On either side of the entrance both the inner and outer walls consist of similar oak planks, [306] forming the inner wall and [323] forming the outer.

*The wickerwork walls:* The stakes of the wickerwork walls are primarily hazel (64%), with smaller amounts of birch (14%), ash (14%) and alder (7%). The stakes are spaced

at intervals which are on average 0.3 m but vary from 0.22 m and 0.5 m. Along the better-preserved W circuit they are spaced more regularly, between 0.29 m and 0.36 m apart. Along the N circuit the stakes had survived to depths of only 0.3 m on average, but this probably reflects the decay trajectory described above, the upper parts of the stakes having decayed away. Along the W circuit the [232] stakes varied in depth from 0.2 m to 0.86 m but there was no pattern to the depth to which they were inserted. The [233] stakes also varied in depth, from 0.45 m to 1.1 m, but in this stakeline the stakes increased in depth towards the S. It was also clear that, along the W circuit, the stakes of the inner wallface [232] were

significantly larger than those of the outer wallface [233], 0.081 m average diameter compared to 0.054 m.

The inner stakeline [232] is continuous around the exposed circuit but there are gaps in the outer stakeline [233], one of which is as much as 2.6 m wide. There is no evidence that the stakes had been removed in this gap although, given the variation in depth observed along the better-preserved segments, they could have been very shallow at this point and subsequently decayed.

The wickerwork had survived around the stakes along the W circuit, [302] around the outer wall and [314] around the inner. All the withies were hazel. To the S there were up



Figure 3.23. The wickerwork around the walls can be seen in cross-section, the ends of the withies appearing as light circles in section.



Figure 3.24. The withies woven around stakes in the outer wall [233].

to six courses of withies surviving around both stakelines (Figure 3.23).

The weave was a simple in-and-out around each stake (Figure 3.24), although occasionally a withy would be taken along the outside of up to three stakes before being woven around the front of the next stake again.

Pairs of withies, and occasionally bundles of three to four withies, were also observed being woven around at the same time. A cache of eight quartz pebbles was found tucked under the base of the wickerwork [302].

No evidence for daub on the outer faces of the wickerwork walls was observed and, as at least some trace

of a mineral deposit would have survived and been visible against the predominantly organic matrix, we argue that the walls were not daubed.

*The plank walling:* Along the W circuit the outer wall has been supplemented by a line of six oak planks [243]. The planks had been inserted vertically into the ground and abut each other, thus forming a near continuous line some 2 m long (Figure 3.17). They appear to sit just inside the outer stakeline [233], although this is not particularly clear as the stakeline becomes discontinuous at this point. Dendrochronological analysis shows that one of the [243] planks had been cleft from the same tree as one of those

Figure 3.25. The plank walls at the entrance, which lies to the left in the photo. The outer planks [323W] can be seen at the top of the photo, their internal surfaces charred, whilst the planks [306W] form the inner wall.



Figure 3.26. The plank wall to the right of the entrance. The tops of the planks are charred, as is the remains of the mortise in the Phase 3 radial timber.



in the entrance facade [323] (Chapter 7.2.2.2) so the [243] planks must represent part of the original construction and not a later renovation. This is the point where the trackway is at its narrowest as it passes between ST2 and ST5 so the planks may have been inserted along this length of the wall to strengthen it from damage by passing traffic.

A line of oak planks had also been inserted into the outer wall at its junction with the entrance, forming a facade on either side (Figure 3.25).

Four oak planks, [323W] had been inserted vertically just inside the outer stakeline, and two planks [306W] continued the circuit of the inner stakeline around to its junction with the entrance. The wallfaces splayed apart at the junction with the radial beams of the entrance, widening from 0.4 m to 0.5 m and, together with the oak posts [307W] (see below), formed a terminus to the wall. This construction was seen on the E side of the entrance where the inner and outer wallfaces were represented at the junction with the entrance by single oak planks [306E] and [323E] (Figure 3.26). No evidence for the stakelines was found on the E side of the entrance.

Oak planks [323W] form a facade 1.6 m long; some of the planks had survived up to 0.4 m above the original ground surface. The edges of the three planks nearest the entrance abut each other but the plank furthest from the entrance, [323/1], had been displaced and had fallen into the cavity between the wallfaces. The planks sat tightly inside the outer stakeline [233], the wickerwork walling continuing around in front of the planks. When removing plank [323/4] another stake was uncovered and it was clear from its position that it had already been in place when the plank had been rammed in, so perhaps the stakeline, with a few courses of withies had been used as a guide for the insertion of the planks. Several forked branches were observed on the brushwood surface [300] which lay outside the house (see below), aligned radially to the house and with the forked ends pointing away from the wallface; although their inner ends could not be exactly matched up with any of the *in situ* stakes [233] immediately in front of the plank wallface [323W], it is possible that these forked branches represent collapsed stakes (Figure 3.42). The most complete of these branches was 1.6 m long and was identified as alder.

Large cobbles and large oak offcuts [325] were found packed against the outer face of [323W] in places, but a cut into which the oak planks were inserted was not observed. It seems most probable that a narrow trench no more than a spade wide was cut into the peat which then closed over once the planks and packing were inserted. The planks had been inserted to depths up to 1 m.

*Cavity packing:* It is assumed that the cavity between the double-skinned wall would have been filled with some form of insulation. Between the walls on the W circuit, traces of a charcoal-smear orange clay [315] were

observed over the lowermost withies, whilst along the N circuit there were discrete patches of a charcoal-rich, yellowish clay [234] between the walls. It was found that [315] consisted of sedges, rushes, bracken, wood and some heather, so as well as the standard plant materials used as flooring throughout the house (see below) turves may also have been used in the packing (MA). There were also trace amounts of food debris, whilst the insect assemblage from [315] contains typical house fauna as well as fauna associated with decaying plant debris and foul organic matter (IN). This could mean that either these insects had crept into the wall cavity from the internal floor deposits or that occupation litter was deposited within the cavity. Both [315] and [234] also contained large quantities of carbonised hazel roundwood, so either the cavity was filled with bundles of brushwood and withies, or this charcoal represents the burnt remains of the wickerwork wall. Localised burning is also attested by the presence of charred flooring materials, food debris and insects in [315] (MA:IN).

At the W terminal of the outer wall there was more evidence for packing within the cavity. A re-deposited peat [332] had been packed up against the lowermost course of withies [302] and over the natural peat. Over this was [322], a deposit very similar in composition to [315]. It consisted of sedges, rush, bracken, wood and leaves, much of which were charred (MA). It also contained quantities of hazel roundwood charcoal and larger pieces of partially burnt oak and alder offcuts (Table 14.4), in amongst which were patches of a grey clay which probably represent ash (Figure 3.27).

This deposit must either represent a conflagration within the cavity or the deposition of debris from a conflagration elsewhere (see below). Deposit [322] was overlain by a bank or rump of compacted plant litter [313] which extended along the length of the cavity between the plank walls [323W] and [306W]; this had been rapidly deposited and contained no domestic debris (MM), suggesting that it represented the deliberate deposition of vegetation for insulation. Finally [313] was overlain by [312], a very loosely packed brush containing large lumps of carbonised wood and bundles of reeds aligned along the length of the wall [323W] (Figure 3.28). In the E terminal a cache of offcuts [320] (Table 14.4) may represent similar packing deposits.

### The outer post-ring and sillbeams

The outer post-ring lies some 2 m inside the inner line of the outer wall and consists of six posts [225] set at intervals of between 1.8 m and 2.2 m, although most of them lie at 1.9 m intervals (Figure 3.19). It was laid out symmetrically on either side of an axis running through the centre of the hearth and entrance so that, around a projected circumference of 27.65 m there would have been 13 posts. All the posts have been fashioned from oak logs and all but one display the concave bases which were designed to fit over the radial logs of the



Figure 3.27. Packing [322] in the cavity at the W terminal of the wall. Charred wood and ash are visible.



Figure 3.28. Packing [313] and [312] in the cavity of the outer wall.

sub-floor [238] (see below). The exception is [225/4] which is pencil-tipped. This post lies at the junction between the sillbeam and the entrance structure and therefore had a different structural function to the other posts, because it had to secure the superstructure to the entrance framework [277].

In between each post was a large alder sillbeam [223] which had been laid directly over the wickerwork sub-floor [224] (Figure 3.29).

Most of these timbers were too decayed to see any original carpentry details but the best-preserved example, [223/1], on the S circuit of the post-ring had been roughly squared, had five stakeholes cut along its length and had also been shaped at either end to fit snugly around the posts, utilising a branch junction at one end to form this joint (Chapter 14.3.3).

### The inner post-ring

Some 2 m inside the outer post-ring is another circle of posts [263] (Figure 3.19). These are a less homogenous group than those in [225] and the circle they define is positioned quite asymmetric to the hearth mound.

The inner post-ring [263] includes a mixture of three alder and five oak posts and a mixture of base designs.

The oak posts include two with flat bases, [263/3] and [263/5], one with a concave base [263/1], and two closely set posts with pencil-tips [263/6] and [263/8] ([263/8] was not lifted as it proved too difficult to extract and for this reason it is assumed that it was pencil-tipped). Despite these differences in style the dendrochronological analysis demonstrates that all the sampled oak posts are contemporary with each other and with the oak posts of the outer post-ring and the oak planks in the outer wall (Chapter 7.2.2.2). The variation in base design presumably reflects the function of the posts around the circle. The two flat-based oak posts sit on either side of the hearth where it abuts the entrance structure (see below); [263/3] sits at the inner end of the radial logs in the entrance structure [277] where one might have expected a pencil-tipped stake to pin the framework in place. The pair of pencil-tipped oak posts lay behind the hearth on an axis that bisected the hearth and entrance and may have provided an anchoring function for this inner ring. The oak posts are all spaced roughly 3 m apart (treating the paired posts as one); a conjectured fifth post lying to the E of the hearth and equidistant from [263/5] and [263/6] would have formed



Figure 3.29. Sillbeam [223/1], shaped to fit around the posts at either end. The wickerwork screen in the background is the sub-floor structure [224] and beyond that is the arc of stakes in the inner wall [223].



Figure 3.30. The Phase 1 entrance structure after the removal of the brushwood surface [317], facing into the house. The sillbeam between the post-ring is just visible in the section behind the entrance and some of the planks of the wall façade are still *in situ* to the left of the mortised sleeper beam.

a five-sided polygon with the S edge of the hearth forming the S side of the polygon (Figure 3.19).

All the alder posts in [263] are pencil-tipped and they all cluster around the SW corner of the hearth. Although sampled as part of [263] it now seems more likely that their function was to secure [258], the timber framework around the hearth (see below) in place, and they are not in fact part of the superstructure of the building.

### 3.2.3.3 The entrance structure

The entrance into the house consisted of a heavy framework of jointed logs which ran from the outer wall

to the S edge of the central hearth, presumably to provide a firm foundation for traffic into the interior. It was constructed in two sections, an outer structure straddling the annulus between the outer wall and the outer post-ring, and an inner structure which continued the entrance from outer to inner post-ring up to the edge of the hearth.

#### The outer entrance

The primary entrance framework was built directly onto the surface of the peat (Figure 3.30).

As the most complex example of multi-component carpentry in the settlement the woodworking aspects

of the structure are described in more detail in Chapter 14.4 and only the overall structure is presented here.

The entrance was defined by two radial sleeper beams [113] & [114] fashioned from alder logs 2.3 m long and 0.4 m and 0.47 m in diameter. Some 0.63 m in from the outer end a flat platform, 1.2 m long and 0.044–0.048 m deep, had been cut into the surface of both logs, and within this a row of three through-mortises had been cut, just at the point where the outer wallfaces meet the entrance. These mortises would have held posts, approximately 0.23 × 0.22 m square, like those found still *in situ* in the Phase 2 entrance (below), thus forming a terminal to the double outer wall.

The sleeper beams had been set 1.70 m apart and nine logs had been snugly fitted across the space between them, leaving a gap between the outer five logs and inner four. The innermost of the logs could not be retrieved as they lay under the baulks. The outer four logs ([101], [104], [105] & [112]) had not been worked, the bark was still in place, and there were gaps between them. The inner three logs ([106], [107] & [108]) had been treated very differently. Their upper surfaces had been dressed flat and they had been jointed together by laying two small roundwood poles [102] and [103] into grooves roughly 0.12 m wide cut across the four logs. This jointing would have prevented sideways movement, whilst the surfaces of the logs and of the inner ends of the sleeper beams may have been flattened so that planks could be laid across them. Just inside the inner end of the flat surfaces cut into the sleeper beams were the stubs of two oak pegs which may have secured the plank flooring.

The ends of the sleeper beams projected some 0.7 m beyond the circuit of the outer wallface [323] so there may have been a porch structure. A post was observed just beyond the end of beam [113] but could not be retrieved.

A thick deposit of brushwood and small branches [317] covered the surface of the tangential logs. A surface like this would certainly have been necessary over the outermost undressed logs, but if there had been a plank floor over the inner logs then this had been removed before this deposit was laid down. It may have been laid down to bring the surface of the entrance level with the sillbeam.

There is a significant step down at the junction between the sillbeam and the entrance structure and this appears to have been a problematic area which required constant re-levelling. Re-used oak timbers [316], a log with a lap joint at one end and a plank were laid down immediately in front of and parallel to the sillbeam, together with bundles of small branches and brushwood [317B].

### The inner entrance

The inner section consisted of framework [277] built entirely of alder logs; this was never fully exposed because of rising water levels so only its W edge was recorded, and it was initially thought to be a single build. However, it is now clear

that each level within the framework relates to the various phases of entrance refurbishment, so each phase has been labelled A and B.

The primary construction [277/A] had been built directly over the basal deposit [267]. A radial log, on the same alignment as the W sleeper beam of the Phase 1 entrance, had been jointed between post [225/5] at its outer end and post [263/3] at its inner end, the joint consisting of a concave cut at each end (Figure 3.31).

Behind the radial log a surface of tangential logs had been laid down, at right angles to the radial, their ends chopped flat and abutting the radial log (Figure 3.32). A layer of brushwood [280] was laid over this log surface; this equates to brushwood [317] over the outer entrance (see above).

### 3.2.3.4 Hearth 4

Rising water levels prevented the full excavation of the hearth stack and the lowermost levels were seen only briefly. Hearth 4 was the earliest in the sequence; peat was only 'felt' below the cobbles but comparison with the level of the natural peat seen in the S baulk suggests that Hearth 4 was indeed built directly on the peat surface. This hearth consisted of a mound of loose cobbles up to 0.25 m deep [276], topped by a surface of flat stones [275] up to 2.10 m across. The hearth was probably contained within the timber framework [258] (see below) but this could not be demonstrated. Lying on top of the flat stone surface was a thin charcoal-rich deposit [274], which represents the final fire in this phase; as well as charcoal this deposit also contained food debris, discarded floor coverings and possibly faecal matter (MA).

### 3.2.3.5 The sub-floor

A sub-floor structure had been laid down over the foundation layers [267] and [268]. Stout radial logs [238], primarily alder, were laid down first (Figure 3.33) to provide the foundation for the concave-based posts of the post-ring. The ends of these radial logs were found projecting under the inner wickerwork wall [232] and into the cavity between the wallfaces (Figure 3.22), so either the radial logs were laid down before the wall was built, or the radials were jammed into the wall space after the wall was built.

A sub-floor of roughly-made wickerwork screens [224] was then laid over the radial logs, best-preserved in the outer annulus between the inner stake line [232] and the outer post-ring [225] (Figure 3.29). The sillbeams jointed between the posts of the outer post-ring had been laid down directly over the wickerwork [224] (Figure 3.34), indicating that it was indeed a sub-floor, and not exposed for long, as MM also confirms. Bands of silt and fine sand within [224] suggest that this area suffered a number of small-scale flooding or pooling events (MM). Human/horse faecal matter was detected in [224] in the central area but



Figure 3.31. The inner entrance framework [277], the radial jointed between post [225/5] at its outer end and post [263/3] at its inner end. The large boulder of the Phase 2 Hearth 3 is visible to the left.



Figure 3.32. The inner entrance framework [277] after the removal of the posts and with the tangential logs and brushwood layers exposed.



Figure 3.33. The radial logs [238] forming the primary sub-floor structure.

Figure 3.34. The wickerwork sub-floor surface [224] lying immediately below one of the sillbeams.



Figure 3.35. Screen [254] forming part of the Phase 1 sub-floor surface.



Figure 3.36. Caches of small quartz pebbles found under the wickerwork sub-floor surface.





Figure 3.37. Section through three phases of flooring. The horizontal log to the right of the drain is one of the sillbeams, the wickerwork sub-floor surface [224] below it lying over the natural peat.

in the outer annulus no evidence for faecal matter was found (LB).

In the central area, ie within the outer post-ring, the primary sub-floor structure was very jumbled, possibly because of subsidence caused by the weight of the hearth. Additional brushwood and brash [261] had been laid down and wickerwork panels may also have been used but they had become too broken up to be distinguishable. MA shows that the brash in [261] consisted of distinctive layers of mainly bracken and wood but it contained no domestic debris, indicating that it had been laid down quickly and covered over. MM suggests that peaty turves were also present in [261] and together with the bracken might have been used as damp-proofing membrane. The exceptional preservation of some of the plant matter in [261] indicates that it was laid down in a saturated environment, suggesting that this was an area of the house which was often damp, with other indicators reflecting a fluctuating water table (MM). IN indicate that both dry, mouldy and damp foul conditions existed at times in the floor and the presence of biting lice may reflect hide or fleece preparation.

The sails of the [224] screens are spaced between 0.6 m and 0.8 m apart and are aligned radially within the structure, the withies lying tangentially. There were probably numerous screens, but they could not be identified individually. One area, approximately 2 m wide and lying around the W circuit, displayed a very different weave, more like basketry with evenly spaced horizontals and verticals, and represents a discrete screen [254] (Figure 3.35).

All the sampled wickerwork, in both [224] and [254] was a mixture of alder and hazel. In some places bundles of larger branchwood (239) has been laid tangentially along the outer edges of the wickerwork screens. Small

quartz pebbles had frequently been placed below this primary sub-floor surface, individually or in small caches (Figure 3.36).

### 3.2.3.6 The active floors

In the NW corner of the structure the surface of the peat dipped down dramatically; as discussed above there may have been a natural dip in the peat which may have been enhanced by the weight of the nearby entrance structure. This must have happened soon after construction because a deposit of branchwood and brash [248] some 0.4 m thick was laid over the wickerwork surface. MM indicates that in this area the surface of [224] was subjected to frequent inundations, resulting in bands of fine mineral material amongst the wickerwork and plant litter. The branchwood and brash [248] appears to have been laid down over it in drier conditions (MM); [248] consisted primarily of bracken and woody brash with smaller quantities of other plant matter. Small amounts of domestic debris throughout the deposit suggest this was an active surface into which debris was trampled (MA). Evidence for human/ horse faecal matter was detected (LB) and insects associated with herbivore dung were also present (IN). IN also indicates a build-up of foul litter but drier conditions existed at times. Sheep lice were also present, but this probably represents wool cleaning rather than living sheep.

Lying over [248] was [221A], a highly compacted deposit, the upper surface of which became hard and shiny when trowelled. Around the N perimeter it survived only in small patches, probably as a result of the decay trajectory across the site. It consisted primarily of layers of bracken, sedge and rush, the dominant plant type varying from sedge at the top to bracken at the bottom,

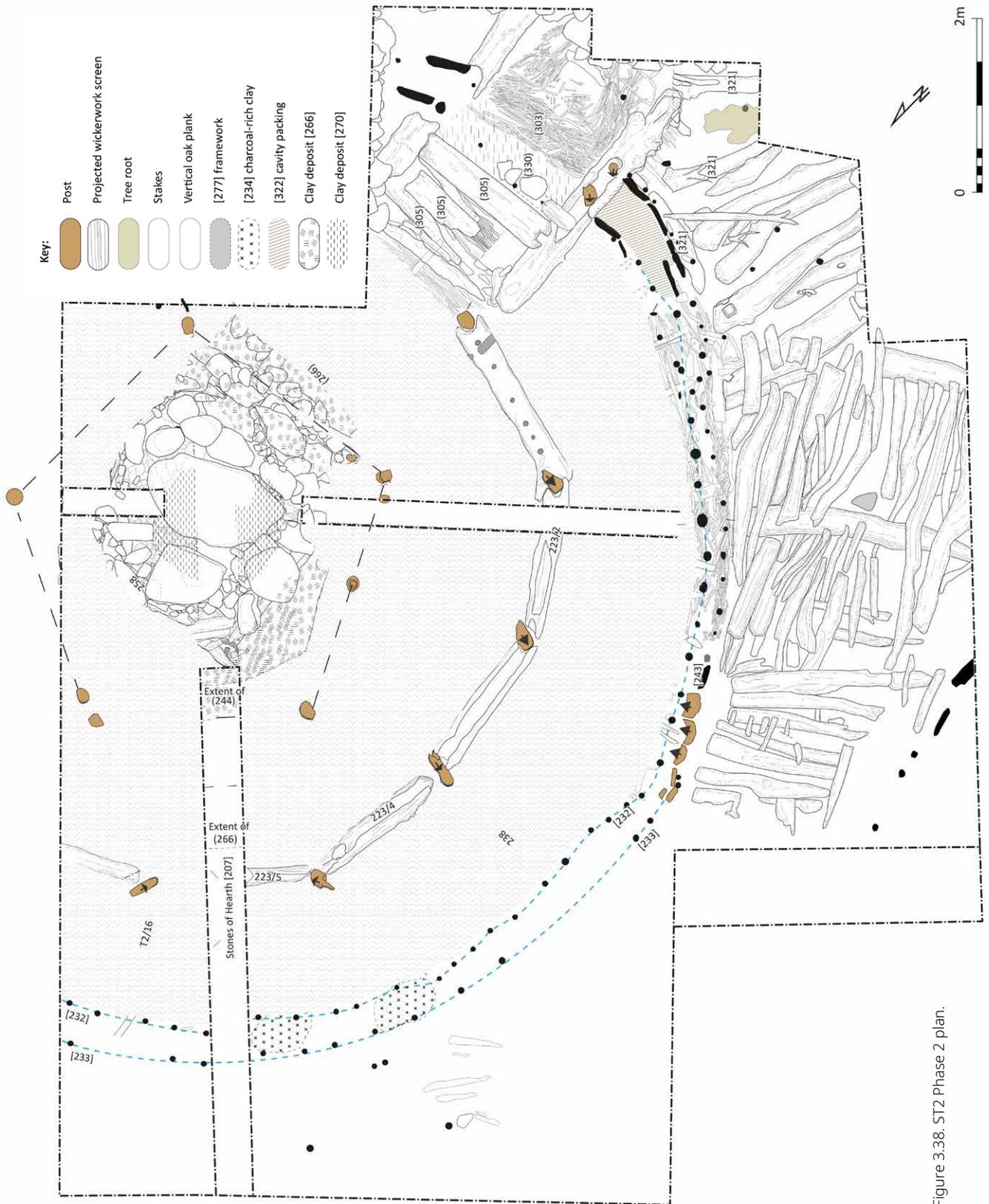


Figure 3.38. ST2 Phase 2 plan.

possibly reflecting seasonal availability (MM). The layers also alternated between well-preserved and decayed, the type of decay suggesting that it had occurred during a dry period, perhaps the summer months. Unlike the other floor deposits there was little to no evidence of domestic debris (MA), suggesting that this area of the house, the annulus between the post-ring and outer wall, was kept cleaner than the area around the hearth. However, evidence for ruminant and pig faecal matter was detected (LB) suggesting that the area was routinely cleaned and fouled plant litter removed. IN testifies to the presence of foul, damp and decomposing matter; this is also reflected in the high numbers of house fly in this deposit.

Within the central area the active floor surface was [251], a deposit of compacted plant litter up to 0.3 m thick (Figures 3.20, 3.21 & 3.37).

The multiple floor surfaces identifiable within [251] consisted of layers of bracken, sedges, rushes and possibly cereal straw, into which food debris, possible faecal matter and soil from outside had been trampled (MA:BO:MM). The source of the faecal matter was mixed; both human/ horse, pig and ruminant were detected (LB). These anthropic indicators increased towards the top of the deposit; this might reflect a change in function in this part of the house during the use of this floor, with less cleaning taking place. IN indicates that a range of conditions existed, from relatively dry to somewhat foul, perhaps reflecting the same change. A more trampled version of this floor surface is probably represented by [265], a deposit identified close to the hearth. This contained layers of compacted plant matter, predominantly bracken with some roundwood, alternating with lens of mineral sediment; [265] probably represents successive deposits of floor covering followed by

trampling and was probably laid down and buried rapidly in a relative soggy area of the house (MM).

### 3.2.4 Phase 2

Phase 2 of ST2 is shown in Figure 3.38.

#### 3.2.4.1 The entrance structure

##### The outer entrance

Levelling deposits were laid over the Phase 1 entrance structure prior to construction of a new entrance framework. A tangential log [101] longer than the tangential logs of the Phase 1 entrance structure, its ends lying on both sleeper beams, may have been laid across the central gap between the logs prior to the construction of the new entranceway. The old brushwood surface [317] was covered by [319], a deposit some 0.2 m thick in places which consisted of re-deposited peat but also included bracken, sedge and rushes (MM). There were few anthropic inclusions suggesting that it had been covered over quickly.

Additional deposits were laid down to level the area in front of the sillbeam. Investigation showed that [318] consists of compacted layers of rushes, sedges and bracken laid over brushwood [317B]. This area appears to have continued to cause problems because [318] probably represents multiple episodes of resurfacing; there are bands of coarse minerals and anthropic materials between the plant layers which were probably trampled in, whilst compression of the plant matter provides further evidence of trampling (MM). Immediately in front of the sillbeam another deposit of compacted plant litter [304] was laid down over [317B], again consisting primarily of sedge, rush, bracken and brash, with turves also possibly present (MA).



Figure 3.39. The Phase 2 entrance structure. The oak planks [305] lie inside the inner wall, the orange clay [329] and stones [330] lie just in front and beyond that is the surface of brushwood bundles [303].

The framework was much more shoddily built than the Phase 1 entrance (Figure 3.39).

New radial sleeper beams [310/W] & [310/E] were laid directly over the sleeper beams of the earlier entrance. These were fashioned from undressed half-logs of alder, the curved surface of the log uppermost; it is possible that they are the halves of the same log. The logs displayed branch junctions along their length and [310/W] tapered noticeably towards its outer end.

The beams were much longer than those of the Phase 1 entrance; the fully exposed W sleeper was 3.4 m long and extended 1.2 m beyond the circuit of the outer wallface. It was supported at this end by a tangential alder log [321], suggesting that there may have been an external porch structure. Mortises had also been cut into the beams but these were less carefully crafted than those in the earlier entrance. A single long mortise 1.2 m long had been cut through [310/W] spanning the position of the mortises in [113]. The wood around the mortise in [310/E] had decayed leaving the mortise as a gap in the beam some 0.9 m wide. The wood of both beams was in poor condition, but it looks as though the outer face of [310/W] had been notched to fit around the oak planks of the wall terminal; the beam was also charred at the junction with the wall terminal. In both mortises squared oak posts had survived *in situ*, two in [310/W] (posts [307/W]) and three in [310/E] (posts [307/E]).

Immediately in front of the sillbeam thin oak planks [305] were bedded into levelling deposit [304], spanning the width of the entrance with their ends resting on the radial sleeper beams [310]. This surface lay just inside the inner wall, covering that part of the entrance which lay in the interior of the house. Beyond these, in alignment

with the inner plank wall, a line of rounded stones [330] had been laid out across the width of the entrance and then covered with an orange clay [329]; the stones may have been designed to act like a rumble drain across the entrance at the point where subsidence appears to have been a problem. The surface of the entrance from this point out to the ends of the sleeper beams consisted of bundles of alder brushwood [303] laid down just inside of, and parallel to, the mortised radials and then covered with bundles laid tangentially across the entrance. The brushwood had been laid directly over the levelling deposit [319].

### The inner entrance

In this phase the inner entrance was refurbished by replicating the Phase 1 framework [277/A]. It was found that [277/B] consisted of a radial log forming the W edge of the framework which had been laid down over brushwood [280] but at a different angle to that in the lower framework (Figure 3.40).

Another layer of tangential logs was laid out behind the radial; these were covered by a layer of brushwood [278] and plant litter [279] which equate to deposits [303] and [304] in the outer entrance (see below).

#### 3.2.4.2 Hearth 3

Hearth 3 is contained within [258], an approximately square framework 2.8 m x 2.6 m constructed of roughly squared oak and alder timbers stacked two high on all sides and pinned in place by the pencil-tipped alder stakes [263] at the corners (Figure 3.41).

Within this framework a layer of medium-sized stones [281] had been laid down along the S edge and the rest of the space filled with a mound of cobbles [271], some 0.35 m



Figure 3.40. The Phase 2 inner entrance framework [277/B]. The earlier framework [277/A] can be seen below.



Figure 3.41. Hearth 3. A mound of cobbles [271] lies within the wood framework [258]. The large boulder [282] lies along the S edge of the hearth and just visible under the build-up of hearth deposits seen in section is the second boulder.

high piled over the final deposit [274] in Hearth 4. Charred food debris and charcoal had trickled down into the cobble mound. One of two very large oval boulders [282], 1.2 m long, had been placed parallel with the S edge of the timber framework, effectively reducing the area of the hearth. A patch of thin clay [270], 1.6 m in diameter, formed the hearth surface but it did not fully cover the cobble mound [271] below. Fuel and food debris had become incorporated into the surface (MA:BO). The base of this clay is yellow/ white in section where it survives between the cobbles but the upper surface was charcoal-rich and subsequently grey in colour. The second large oval boulder [282] lay over this surface immediately in front of the first; it is possible that it tumbled off and had originally formed a stacked kerb on this side of the hearth.

There is a build-up of deposits within Hearth 3; [283], a yellow/ brown, charcoal-flecked gritty sand is topped by a thin lens of charcoal-rich clay [284] followed by a thick deposit of light orange sandy clay [269] and finally a greyish gritty clay [256]. This sequence probably represents a build-up of soils thrown in to extinguish fires, although [256] probably represents the final use of Hearth 3 as it contained a large quantity of charcoal and burnt bone (BO).

### 3.2.4.3 The sub-floor

The floors around the hearth were resurfaced. Within the post-ring large radial alder logs [262] and a layer of small twiggy branchwood [253] were laid down over the plant litter floor [251]. The branchwood layer may have raised the surface well above the water table because the organic content of the layer was more decomposed than the underlying layer (MM). Ruminant faecal matter

was detected in [253] (LB) suggesting that it had been exposed for some time. Small ash and alder posts [272] were scattered about the area within the post-ring in no observable pattern; they could be the remnants of internal divisions but equally they may have been used to pin down these sub-floor deposits. Around the S and W sides of Hearth 3 a thick gritty grey clay [266] was spread out abutting the timber framework of the hearth [258]; a similar spread of grey clay [247] had also been laid down in the SW quadrant of the house between the post-ring and the outer wall. Both of these deposits were free of fuel, food debris and faecal matter so probably represent minerogenic deposits deliberately brought onto the site for resurfacing (MM: LB).

### 3.2.4.4 The active floors

Over these minerogenic surfaces a deposit of plant litter up to 0.1 m thick, [250] in the centre and [221B] around the outer annulus, was laid down. It was found that [250] consisted primarily of layers of bracken, sedges and rushes, with bracken comprising 30–50% of the plant matter in some places (MM). There was very little domestic debris in [250] suggesting that the active, and therefore dirty, surface was removed every time the floor was refurbished with a new covering of plant litter (MM). Nonetheless, ruminant faecal matter was detected in [250] (LB) and the insect fauna reflects foul decomposing floor litter as well as some cattle and human fleas (IN). The outer annulus may have been kept very clean because no faecal matter was detected in [221B] (LB) and the only food debris found were a few oat caryopses (MA).

Immediately overlying [250] in large patches within the post-ring was [249], a layer of carbonised plant litter

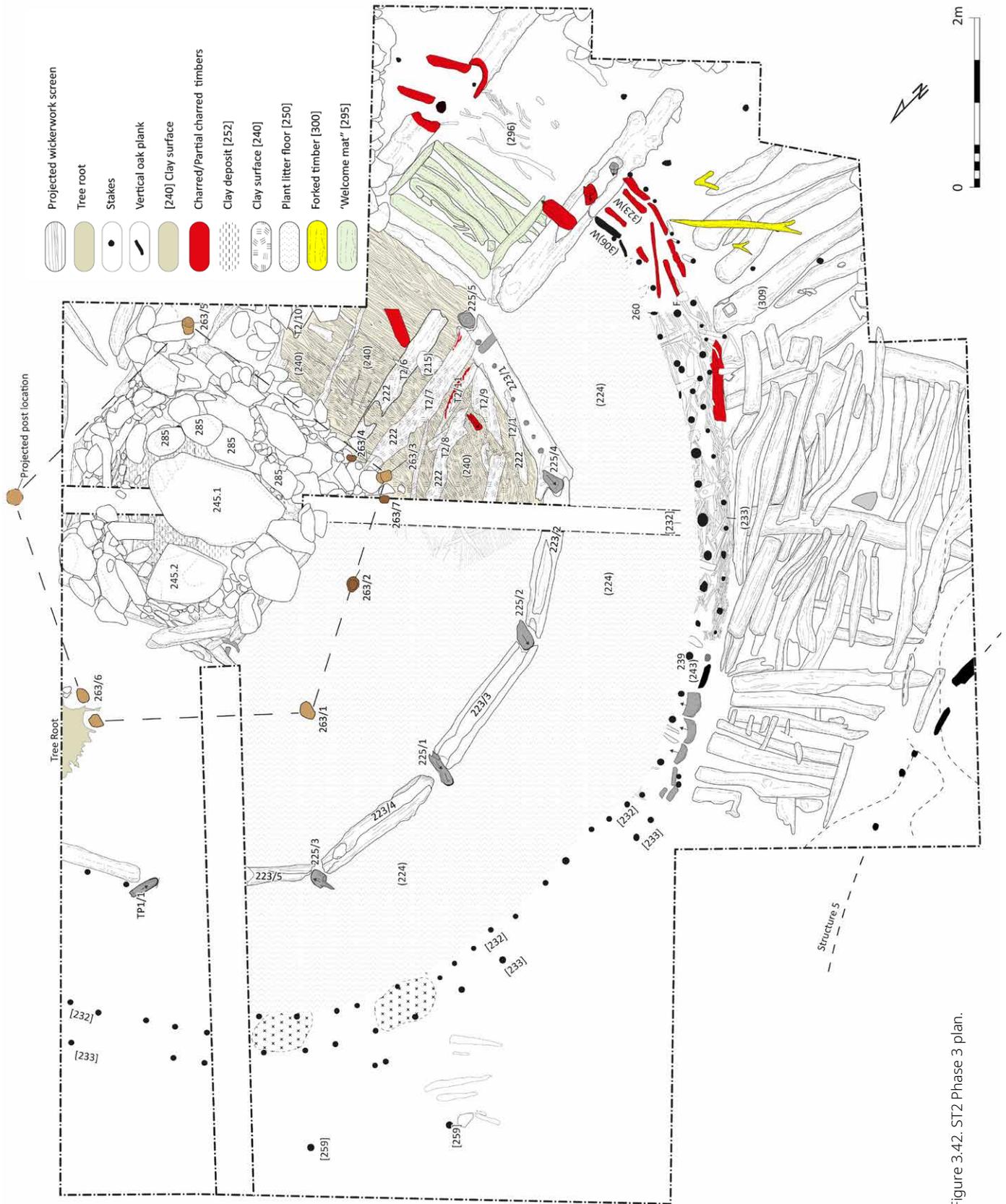


Figure 3.42. ST2 Phase 3 plan.



Figure 3.43. The Phase 3 entrance structure. The ‘welcome mat’ of alder timbers [295] lies inside the inner wall and in front is the compacted organics and brushwood surface [296].

between 0.03 m and 0.04 m thick. This may have been the burnt upper surface of [250] or it could have been freshly laid plant litter (see below). The survival of considerable quantities of charcoal, charred and reddened plant and fine mineral material suggests that the fire was of a relatively low temperature (MM). The most likely explanation is that a spillage from the hearth caused the fire, which was prevented from spreading into the outer area beyond the post-ring by a screen of some sort. One other possibility is that the fire was set to deliberately clean off the old flooring (MM) but it contained very few insects and there was no faecal matter present (IN:LB) suggesting that the floor may have only just been laid down before it caught fire. This conflagration probably signalled the end of this phase of activity in the house and a new hearth was built and new surfaces created.

### 3.2.5 Phase 3

Phase 3 of ST2 is shown in Figure 3.42.



Figure 3.44. Timbers [222], possibly part of the Phase 3 inner entrance structure. The surfaces of some of the timbers are charred, and the remains of a possible mortise is visible in the foremost timber.

#### 3.2.5.1 The entrance structure

##### The outer entrance

The final phase in the entrance area consisted of resurfacing rather than reconstruction and probably happened rapidly after Phase 2 because the new surfaces lay directly over the old with no evidence of any build-up of debris.

The resurfacing consisted of a rectangular area of alder timbers [295] (referred to as the ‘welcome mat’ during excavation) which had been laid directly over the oak plank surface [305] (Figure 3.38). It was 2.2 m by 1.4 m, defined by two radial timbers between which a continuous surface of tangential timbers, a single timber thick had been laid (Figure 3.43). The timbers were poorly preserved, so it was difficult to determine whether they had been shaped in any way, but they appeared to be mainly small logs, no more than 0.2 m in diameter.

Figure 3.45. Hearth 2. The stone kerb [257] can be seen in the right-hand corner lying just inside the wooden framework [258]. The greywacke slabs [245] lie over the orange/ grey clay surface of the hearth.



Figure 3.46. The final deposit in Hearth 2, [242], survives as a discrete mound of mottled orange clay suggesting that kerb [285], which survives on the left-hand side, had been removed around the rest of the hearth.



The surface of the entrance beyond [295], between the terminals of the outer wall, consisted of [296], a deposit of compacted plant litter, brash and brushwood some 0.18 m thick in places. Like [318] in Phase 2, [296] probably represents multiple episodes of resurfacing; it displays weak banding consistent with a gradual build-up of plant layers (MM). In its lower levels it contained quantities of charred materials in an ashy matrix (MA: MM); this may represent a deliberate dump of debris, possibly from the fire that ended Phase 2. Investigation showed that [296] had been laid down directly over the brushwood surface

[303] and, although poorly preserved, it was clear that it also contained bundles of brushwood and brash laid down tangentially across the entrance. The plant litter component of the deposit consisted of sedge, rush, bracken and woody brash (MA). Patches of hard, compacted plant litter had survived in places. The insect fauna was dominated by species that may have been imported in with the materials used to construct the surface as well as outdoor species that probably reflect its position near the entrance (IN). A house fauna was present, suggesting that the entrance area was occasionally foul, and that dung had been trampled in.



Figure 3.47. The orange clay surface [240] visible between the hearth (in the background) and the post-ring (defined by the sillbeam in the foreground).

### The inner entrance

S of the hearth and within the post-ring a layer of large alder timbers [222] had been laid down immediately on top of the orange clay surface [240] (see below). These timbers appear to have been laid down quite haphazardly; some lie roughly tangentially and some more radially within the structure (Figure 3.44), but they are quite decayed and may have suffered some disturbance. The upper surfaces of some of these timbers were heavily charred. Two of the timbers, [222/6] and [222/10], lie radially to the hearth and are on the same alignment as the entrance. They are very decomposed but they both display rotted gaps which may be the remains of mortises, so they may have formed part of the Phase 3 entrance structure.

#### 3.2.5.2 Hearth 2

The size of the hearth appears to have been reduced in this phase. Hearth 2, measured from the inside of the boulder kerb [285] on the S side to the edges of the greywacke slabs [245] on the N was approximately 2 m by 1.75 m.

A loosely constructed kerb of medium-sized, sub-angular stones [257] was laid just within and over the timber framework [258] and a layer of orange/grey clay [252]/[255], flecked with charcoal and containing burnt bone (BO), was spread over the area within the timber framework to form the foundation for Hearth 2 (Figure 3.45).

A huge greywacke slab [245.1] 1.70 × 0.9 m across and 0.14 m thick lay over this surface. A second slab of similar thickness [245.2] but only 0.78 m by 0.68 m across lay to the N but had slipped down the side of the hearth mound. Patches of pinky grey clay [212] lay over this slab and other smaller slabs which had also slipped off the mound. It may be that [212] was an attempt to consolidate or level this side

of the hearth mound; it contained an unburnt cattle molar and other burnt bone (BO). It appears that [246] is a variant of [212] but with small cobbles packed into it.

At some point the hearth had been reduced in size. A line of four large oval boulders formed an inner kerb [285] which lay just above the large boulder of Hearth 3. This kerb was only found on the S side of the hearth but it may have been removed from the other sides of the hearth because the final deposit in the hearth, [242], forms a raised circular area some 1.4 m in diameter suggesting that it had been packed down inside a kerb which had subsequently been removed (Figure 3.46).

Deposit [242] was a hard compact sandy orange clay some 0.12 m thick which contained a small quantity of carbonised cereal grains and burnt bone (MA). It could represent the final use of the hearth but it looks more like a capping deposit into which some hearth debris has become incorporated. A loose grey/black ashy soil with lots of small angular stones [218] lay around the slopes of the hearth mound and over [244] (see below) and is interpreted as debris/overspill from Hearth 2. It contained a quantity of carbonised cereal remains (MA) and a large quantity of burnt bone, some of which appear to have been left exposed for some time before being covered over (BO).

#### 3.2.5.3 Associated surfaces

The final deposit of the Phase 2 activity, the carbonised plant litter surface [249], was covered with a surface of orange clay [240] up to 0.05 m thick which was found in extensive patches all around the hearth (Figure 3.47) and extended out as far as the sillbeam in front of the entrance (Figure 3.48).

The boundary between [249] and [240] is sharp, suggesting that the latter was laid down soon after the

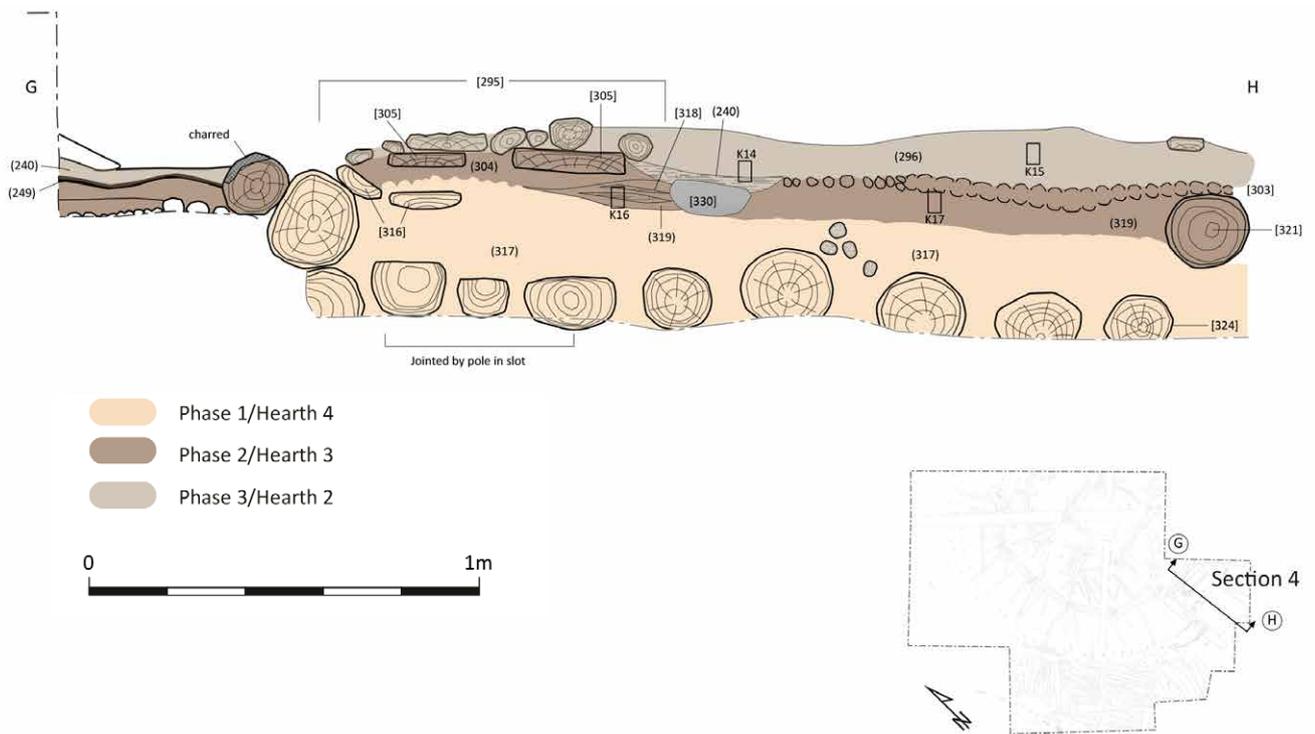


Figure 3.48. ST2 Section through the entrance.



Figure 3.49. Logs [333] packed tangentially around the outside of the plank walling [323].

burning event (MM). The orange clay [240] incorporated deposits from a range of sources, suggesting that they had been swept or dumped together, and included burnt bone (BO), ash and possible coprolites (MM). There was also molecular evidence for faecal matter in [240] but origin could not be determined (LB).

Deposit [244], of fire-shattered stones in a loose peaty matrix with frequent wood fragments, charcoal and burnt bone (BO) up to 0.2 m thick in places, lay around Hearth 2. MM and MA show that it contained horizontal and compacted layers of plant material identified as rush, sedge, heath grass and wood, indicating that it was an active floor into which domestic debris had been trampled. MM

also shows that the floor was subject to periodic flooding or puddling and IN confirms the presence of moist and foul decaying plant matter.

Both [244] and the timbers [222] of the inner entrance structure were covered by [219], a deposit of smooth, light brown peaty clay, occasionally mottled with yellow clay which covered much of the excavated area and was up to 0.3m thick in places. MM has identified layers of trampled plant litter within it. This deposit is interpreted as occupation debris which has built up within the house and then has decayed and become mineralised above the water table. Of particular note is that at the base of the sample closest to the hearth there is evidence within [219] of hearth debris and *in situ* burning (MM); burnt bone was also found (BO). This may relate to a localised burning event that charred the tops of the [222] timbers. In the basal depths of [219] where it lies over the outer annulus the faecal signal of human/ horse, pigs and ruminants was detected (LB).

### 3.2.6 External surfaces around ST2

Artificial surfaces had been laid down around the outside of the house. Tangential logs [333] had been packed tightly against the outer wallface [323] on the W side of the entrance (Figure 3.49) and over these large alder logs [309] had been laid down in a radiating pattern for a distance of roughly 3 m around the perimeter of the house (Figure 3.7). They were 0.3 m in diameter on average and over 2 m long; their full lengths were not exposed. They butted up neatly against the outer wallface of ST2, their ends having been trimmed by axe to a roughly flat profile. Many of them displayed hourglass-shaped tow-holes at this end.

The outer ends of the [309] logs laid directly on the natural peat surface so it is possible that the tangential logs [333], which lay under the inner ends of the [309] logs, lay within the cut into which the plank walls were inserted (see above), otherwise the [309] logs would not have created a flat surface.

The [309] logs did not form a continuous surface; there were gaps of 0.2–0.3 m between them (although this may have been a result of post-depositional movement). They were covered by a thick deposit of brash [308] which had been pinned in place by small, short stakes [311], presumably to create a flat surface. The longitudinal logs in the trackway had been expanded out to lie over the [309]/[308] surface and, where they abutted the outer wall of the house, their surfaces were charred. The surface level of the trackway was continued around towards the house entrance with bundles of brushwood [300] which were laid radially to the outer wall.

The stratigraphic sequence revealed around the exterior of ST2 indicates that the house was built first, the log surface [309] was then laid down and after that the trackway was built. The charring of some of the longitudinal logs which abutted the outer wall may relate to the destruction of the house (see below).

### 3.2.7 A final conflagration?

There is evidence to suggest that a controlled burning event may have signalled the end of the house. The tops of many of the oak planks and posts on either side of the entrance were charred, as were the inner faces of all the planks abutting the entrance (Figure 3.42). Both the Phase 2 radial sleeper beams had been charred, [310/W] at its junction with the plank wallfaces, whilst on



Figure 3.50. A sequence of charred plant litter, yellow clay and compacted floor litter can be seen overlying the carbonised tops of the inner wallface plank [306E].

[310/E] the mortise hole had entirely burnt away. There is also evidence of localised charring within the wall cavities on either side of the entrance (Figure 3.25). One of the deposits within the cavity, [322], consisted almost entirely of carbonised wood and plant remains, some of which were only partially burnt; these include fragments of planking (ie [322/1], [322/5a] & [322/5b] – Table 14.4) which could have fallen off the *in situ* plank walls. Further along the cavity to the W of the entrance was deposit [315], which contained large quantities of charred withies as well as charred insects which suggest that the burning was *in situ*. There is no evidence of burning within the entrance area itself, but some of the trackway logs lying alongside the walls of the house were charred, as were the tops of the Phase 3 inner entrance framework timbers [222]. Thin spreads of charcoal [X286] over the entrance area and [241] over the post-ring in the N half of the house may also relate to this event. The evidence points to fires set within the cavity walls, the spread of which was subsequently controlled. The mechanics and implications of this event are explored in Chapter 18.5.1.

Compacted into the carbonised tops of the inner wallface [306/E] and the [307/E] posts, and dipping into the cavity between the walls of the eastern terminal, was a sequence of deposits consisting of charred plant litter overlain by yellow clay overlain by compacted floor litter (Figure 3.50).

This sequence looks exactly like that of the charred plant litter flooring [249] and yellow clay [240] seen in the interior and abutting the sillbeam in front of the entrance (Figure 3.48). However, this stratigraphy makes no sense because it suggests that the walls were no longer standing when these deposits were laid down. The most likely explanation is that these deposits have slumped and deformed over the oak posts and planks which continued to stand proud as the organics around them have decayed and conflated (see Chapter 1.6 for discussion).

### 3.2.8 Summary of ST2

Approximately 50% of ST2 was investigated, mostly the W side of the structure, as access to the E half was restricted by the presence of large trees. Nonetheless, along with the later ST3 at BLoM (Chapter 4.2) ST2 is probably one of the best-preserved roundhouses of Iron Age date in the British Isles. The key features of its construction and use are summarised below.

#### 3.2.8.1 Construction

ST2 was built directly on the surface of the peat, a sub-floor of radial timbers and wickerwork being laid down to raise it above the damp surface. Throughout the use of the house every effort was made to keep the active floors dry and insulated by laying down thick deposits of plant litter and replenishing them regularly. There were three phases of

activity in ST2, each phase defined by the refurbishment of the hearth, the entrance and the floors; there was no evidence of refurbishment to the superstructure.

The superstructure of the house consisted of an outer double wall, inside which there were two post-rings to support the roof. The outer wall of the house consisted of a double line of stakes, with a façade of oak planks, one either side of the entrance way and another line of planks where the wall abutted the trackway. There was no evidence that the outer wallface was ever daubed but the cavity between the walls had been filled with re-deposited peat, plant litter and brushwood, presumably as a form of insulation.

The innermost wall would have enclosed an internal floor area of 107 m<sup>2</sup> but this area was broken up, by the main post-ring and wickerwork walls set into sillbeams, into an outer annulus and inner annulus each some 2 m wide. Both post-rings were laid out symmetrically on either side of an axis running through the centre of the hearth and entrance. This axial symmetry raises the possibility that the roof may have had a ridge-pole construction rather than a conical roof structure (see Chapter 18.2.2 for discussion).

The focal point of the house was the prominent stone hearth which lay at its very centre; the outer wall and the post-ring all lie concentric to the central point of the Phase 1 hearth. The hearth is, however, positioned asymmetrically within the innermost post-ring, a polygonal arrangement of posts the S side of which is aligned with the S side of the hearth whilst on the N side it expands out, possibly to create a private space behind the hearth. The construction and size of the hearth varied with each refurbishment, stone kerbs replacing a primary wooden framework and the surface changing from stone slab to clay and back to stone slab.

The entrance is also aligned in axial symmetry with the hearth; the alignment of the framework [277] and timbers [222] within the main post-ring suggest that a visitor to the house would enter through a gap in the wickerwork screen and be guided directly to the front of the hearth. The primary entrance structure was a carefully designed and well-executed construction. The Phase 2 entrance mimicked its design but was more shoddily built, whilst in Phase 3 all that was done was to refurbish the surfaces.

#### 3.2.8.2 Use of internal space

The design of ST2 created a strongly annular division of space in the interior. No evidence for fixed radial divisions was found, although it is possible that the small posts [272] found in the central area are the remains of such a division. The use of sillbeams supporting hurdle screens to create the annular division makes it very likely that similar but portable screens would have been used for that purpose elsewhere in the house. There was also no clear evidence as to how the inhabitants moved around the house. For instance, how and where did they

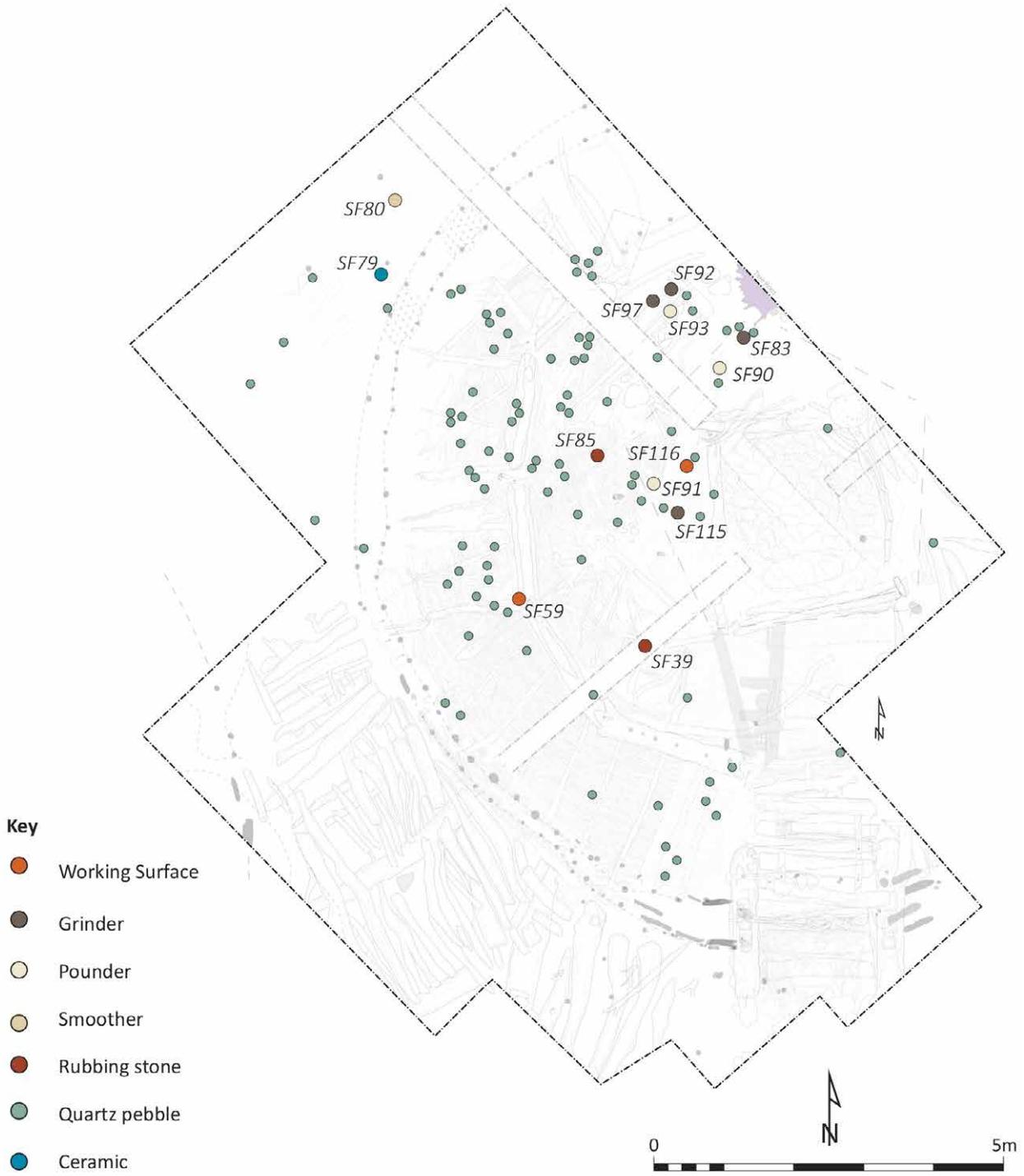


Figure 3.51. ST2 artefact distribution.

access the outer annulus? Did they access it from the entrance structure, moving left or right just inside the outer wall? This would have involved the trample of dirt from outside but the faecal signal was stronger in the centre of the house than in the outer area, suggesting that the latter was kept cleaner. It seems most likely that access into the outer annulus was blocked off from the entrance so that it could only be accessed from the inner area, possibly in some part of the house which was unexcavated.

There was also no evidence for the demarcation of spaces using different types of flooring material, as is seen in ST1 and ST3. The evidence for different activity areas within the house comes from the quantitative analysis of anthropic indicators which show that some parts of the house were kept cleaner than others. Food and fuel waste was concentrated in deposits around the hearth and all the artefacts were also found only in the central area (Figure 3.51). There was also a stronger faecal signal in this area. There were trace amounts of food and fuel waste in the outer annulus, as well as a weaker faecal signal, but the quantities suggest that this could have been brought in as trample and, overall, the evidence suggests that this area was kept relatively clean and free of domestic refuse, whilst most domestic activity was concentrated around the hearth.

### 3.2.8.3 Duration of occupation

The dating evidence (see above) suggests that the house was occupied for four decades at most and may have been abandoned as little as a decade after it was built. There are three distinct phases of activity reflected in the rebuilding of the hearths and the refurbishment of the entrance way and floors but we can only speculate as to what triggered these events (see Chapter 18.2.4.2). Phase 2 may have been brought to an end by a fire, as suggested by the burnt plant litter flooring [249], whilst the evidence from the entrance area suggests that the Phase 3 refurbishments took place immediately after the conflagration because the new surfaces in the entrance were laid directly over the old Phase 2 surfaces without any evidence for the build-up of debris.

### 3.2.9 ST2 ecofact summaries

Table 3.2 summarises the type of ecofact analysis undertaken for each of the contexts described below.

#### 3.2.9.1 [212]

##### Macroplant

The only charred macroplant was one naked barley and three cereal caryopses, probably representing food waste that was accidentally incorporated into this surface.

CONTEXT	MM	LB	MA	BO	INS
[212]			*	*	
[218]			*	*	
[219]	*	*	*	*	
[221A]	*	*	*		*
[221B]	*	*	*		*
[224]	*	*			
[234]					*
[240]	*	*	*	*	
[242]			*		*
[244]	*		*	*	
[247]	*	*	*		
[248]	*	*	*		*
[249]	*	*	*		*
[250]	*	*	*		*
[251]	*	*	*	*	*
[252]				*	
[253]	*	*	*		
[255]					*
[256]					*
[261]	*		*		*
[264]			*		*
[265]	*				
[267]	*		*		*
[268]	*		*		*
[270]			*	*	
[271]			*		
[274]			*		
[296]	*		*		*
[304]			*		
[313]	*				
[315]			*		*
[318]	*				
[319]	*				
[322]			*		

Table 3.2. Summary of ecofact analyses for ST2 contexts.

##### Bone

There were 28 fragments (8.8 g). Of these, seven were unburnt cattle molar fragments which belonged to a single tooth. The remaining 21 burnt fragments were smaller than 50 mm.

### 3.2.9.2 [218]

#### Macroplant

There were 94 charred cereal caryopses identified as wheat (30%), emmer/ spelt (25%), barley (19%) emmer (5%), bread/ club wheat (2%) and cereal (19%), as well as a single fragment of hazelnut shell. The presence of food waste accords with the interpretation of this deposit as hearth clear-out.

#### Bone

There were 491 fragments (97.2 g), of which 481 were burnt. The only unburnt fragments were a cattle premolar, an L/M incisor and long bone shaft. Other identifiable fragments were an L/M long bone shaft, an M/M scapula, one femur and five long bone shaft fragments. Some of the fragments had suffered damage attributable to weathering and exposure to water. This suggests they were left exposed before finally being covered over. Context [218] represents the debris from the last use of Hearth 2 which may explain why such a large concentration of burnt bone was not cleared away.

### 3.2.9.3 [219]

#### Micromorphology

Deposit [219] has a complex microstratigraphy with variation in the nature of the deposit recorded both stratigraphically and spatially across the context. Where sampled close to the hearth the internal organisation of coarse components within [219] is chaotic and typical of a Type D deposit, standing in stark contrast to the finely laminated organisation of components within [219] when sampled in the outer part of the structure where it was observed to be typical of a Type B deposit.

Within the Type D deposits, close to the hearth, the concentration of charcoal within the lowermost units and its association with reddened matrix deposits and general low proportion of organic matter may be indicative of *in situ* burning. However, other units, whilst also containing fuel residues, do not appear to have been burnt *in situ* as indicated by the common occurrence of unburnt organic matter. Sharp boundaries and the complex mix of material in the upper units may be indicative of hearth rakeout where the act of moving and dumping the material resulted in the juxtaposition of the different matrix material. It thus appears that [219] within the inner part of the structure reflects changing patterns of internal use from a hearth or burning area lower in the deposit to an area used for the dumping of hearth waste material.

When sampled away from the hearth [219] is characteristic of a Type B deposit and is not directly associated with burning or hearth material and more indicative of general accumulation of occupation debris with organic matter as

a frequent component. Observed pedofeatures and the general relatively poor level of preservation of organic matter are indicative that this context was generally not saturated at the point of deposition allowing for partial decomposition and breakdown of the organic matter.

#### Lipid biomarkers

Faecal steroids from ruminants, pigs and humans/ horses were present.

#### Macroplant

There were 70 carbonised cereal caryopses and the species were emmer/ spelt (37%), wheat (16%), barley (16%), bread/ club wheat (9%), hulled barely (6%), emmer (4%), naked barley (1%) and cereal (11%). The only other find was a fruit endocarp. The charred food waste testifies to the presence of occupation surfaces within this deposit.

#### Bone

There were 26 burnt fragments (44.5 g). One cattle molar and one sheep/ goat humerus were identified. There was also an L/M long bone shaft, metapodial and an M/M humerus shaft.

### 3.2.9.4 [221A]

#### Micromorphology

Deposit [221] is represented in units 1–6 of sample ST2/K5 and units 1 and 3 of sample ST2/K9. In some parts of the structure [221] appeared to bridge the gap between Phases 1 and 2 but within sample ST2/K9 the context is dissected by a grey clay [247] which forms a clear boundary between the lower [221A] (Phase 1) and upper [221B] (Phase 2). Investigation showed that [221A] comprises a sequence of organic Type B deposits. The observed variations in preservation and proportion of fuel residues are indicative of anthropic alteration of the deposits and their periodic accumulation. The platy microstructures are consistent with those observed in floor layers (Courty et al 1989; Milek 2012). However, any other indicators of trampling which may have originally existed have likely been removed through the post-depositional saturation and alteration of the organic matter. The uppermost unit of the deposit has a vughy microstructure and preservation of plant material is poorer than in the immediately underlying layer. Void spaces identified within plant matter are indicative of partial desiccation followed by saturation (ie wetting and drying) indicating perhaps that this surface was left exposed following deposition. Layers with signs of decay also have a higher compaction due to loss of porosity and fragmentation of detritus (dopplerite) following exposure to oxygen and drying out. These layers are buried by better preserved layers and thus indicate that the decay occurred during drier phases in the occupation of

the site, perhaps during the summer months when water levels were lower (see Kenward & Hall 2000). Variations in the dominant plant type (changing from bracken in lower layers to sedge in upper layers) may also reflect seasonal variation in plant growth in and around the site.

Observed pedofeatures include iron/ manganese impregnated nodules and accumulations indicative of the build of sesquioxides throughout the context. The presence of dusty clay coatings on voids is indicative of mineral mobilisation through water ingress throughout the context. High water tables and soil acidity have also caused local mobilisation of phosphorus to form amorphous iron and phosphate-rich void infills and matrix.

The relative absence of anthropic indicators is indicative that [221A] was kept relatively clean. This context may thus be a 'clean' bedding/flooring area with observed layers of plant materials representing successive bedding layers and use of seasonally available plant materials. If such an interpretative scenario were correct it would be likely that any dirty or used bedding/ flooring would have been regularly removed from the site and thus the surviving layers would represent only a fraction of the original plant 'bedding' layers. The possibility that [221A] represents a Type H stabling waste deposit must also be considered. Although micromorphological evidence for coprolitic material within the layers was rare, yellow probably phosphatic infillings were identified and the lipid biomarker analysis revealed evidence for both pig and ruminant faecal matter within the context. It remains possible therefore that these layers of organic material are Type H deposits and represent the remains of animal bedding/ stabling deposits with the majority of the dirty trampled material having been removed, leaving behind only trace micromorphological evidence and the identified lipid biomarker signal.

### Lipid biomarkers

Sampling was undertaken at 20 cm (A1) and 16 cm (A2). The source of the faecal steroids in A1 was ruminants while the source of the steroids in A2 was pigs.

### Macroplant

A large waterlogged macroplant assemblage dominated by building material was recovered from both the bulk and monolith sample collected from this floor; weeds and especially food remains are a much more minor component. There were layers of white sedge, glaucous sedge, hairy sedge, jointed rush, toad rush, hard/ soft/ compact rush, wood rush and bracken. Fragments of wood and leaves were intermixed within these layers, but these were only a minor inclusion. This floor survived as distinctive laminated layers that were easily peeled apart during processing. This suggests every time a floor surface became trampled it was re-covered with a new layer of material rather than removing the dirty surface.

Given the excellent preservation this indicates that this floor was rapidly built up, using a very specific suite of plants, presumably the resources available when this floor was laid.

### Insects

This 5 l sample was collected and analysed prior to re-interpretation of the deposit as representing two distinct phases separated by a thin grey resurfacing deposit. Samples from [221A] and [221B] representing the separate phases of occupation were also recorded.

A minimum of 101 beetles of at least 34 taxa were recorded from a 5l sample (20 MNI l<sup>-1</sup>). Decomposers accounted for well over half of the assemblage (RT 62%) and a house fauna was very well represented (*Cryptophagus* spp., *Atomaria*, *Latridius minutus* group; 31% of the whole assemblage). Eurytopic decomposers accounted for a further 28% of the assemblage, including *Cercyon analis*, *Carpelimus bilineatus* group and *Oxytelus sculptus*, all associated with damp decaying plant matter, the last of these generally with somewhat foul, mouldering, open-textured litter (eg Kenward & Hall 1997). Taxa specifically associated with foul organic matter (4%) included *Cercyon melanocephalus*, *C. unipunctatus* and *Acrossus rufipes*. *C. melanocephalus* and *A. rufipes* are typically associated with the dung of large herbivores, and the synanthropic *C. unipunctatus* with various forms of foul decaying organic matter including manure and rotting vegetation (Hansen 1987: 152). Some *Cercyon* specimens (MNI 6) were not closely identified. Beetles associated with moist substrates were common, the most frequent being *Carpelimus* species (15% of the fauna). Many of these beetles would have formed part of the insect community that developed within the floor litter. *Orthoperus* species, generalist decomposers found amongst damp mouldy materials including plant litter and wood, probably also found a suitable habitat in the floor layers.

Wetland beetles, all represented by single individuals, were most likely imported into the building with vegetation used as flooring; *Lesteva punctata* is commonly associated with wet moss near streams, and *Plateumaris sericea* typically with bur-reeds (*Sparganium*), but sometimes also with sedges and other waterside plants. *Olophrum fuscum/ piceum* commonly occurs in wetlands and bogs, and in detritus at the edge of standing water, whilst many *Agonum* species occur across a range of wetland environments including bogs and banks of streams and other waterbodies. Two *Hydraena brittani* or *riparia*, associated generally with moss and litter at water margins, were the only aquatic beetles represented. Trees and woodland habitats were represented by *Dromius quadrimaculatus*, commonly found under bark, and *Orchestes testaceus* which is associated with alder (*Alnus*).

Low numbers of Muscidae and Sphaeroceridae puparia were present. The majority were of house fly (*Musca domestica*) which is associated with dark, moist and relatively warm environments.

**Context [221A]:** This sample represents the earlier phase of flooring identified within deposit [221]. Beetles were abundant with a minimum of 365 individuals recovered from a 4 l sample (91 MNI l<sup>-1</sup>). The assemblage gives an impression of damp litter that was probably rather foul, at least in places. Decomposers accounted for half of the assemblage (RT 49%) and the majority were generalists associated with damp decaying organic matter. *Cercyon analis* was the most numerous species with 95 individuals. Other taxa in this category (MNI 1–5) included *Megasternum concinnum* agg., *Gyrophypnus fracticornis*, and *Oxytelus sculptus*. A house fauna was represented by *Cryptophagus* spp., *Atomaria* and *Latridius minutus* group (5%). Foul matter was indicated by *Cercyon pygmaeus*, *C. unipunctatus* and *Chilothorax distinctus*. Some *Cercyon* remains were not identified closely (MNI 29) and these could potentially include other obligate foul matter taxa. Aleocharinae species were particularly abundant in this sample (MNI 114, 31% of the fauna), and although these were not closely identified, many would doubtless have formed part of the decomposer component, exploiting a range of conditions from damp to foul that developed amongst the floor litter. A *Eutheia* species was common (MNI 10) but not identified closely. Some rare members of the genus are found in association with bark and plant litter in deciduous woodlands and with ants and mites (Hyman 1994), but the most common species occur in cut grass, manure and rotting vegetation (Darby 2006) so it is possible that the species represented here lived amongst the decomposing plant litter.

*Bisnius cephalotes* occurs in patch habitats with high concentrations of insect larvae including decomposing plant litter, carrion and dung (Atty 1983; Lott & Anderson 2011: 154), its occurrence almost certainly reflecting the relatively high concentration of Muscidae puparia in this deposit. These were predominantly of house fly (*Musca domestica*), but this was one of only two samples from ST2 that contained Agromyzidae puparia, the larvae of which are mostly leaf miners that were probably imported with plant material. An indeterminate biting louse (Trichodectidae) abdomen could potentially indicate the presence of animals or animal products such as hides or wool.

Outdoor insects (14% of the fauna) were chiefly from wetland and grassland habitats: *Stenus juno*, *S. flavipes* and *Plateumaris* are found in a variety of wetland habitats, *Sepedophilus pedicularius* is commonly associated with fenland (Whitehead 1992), and the ground beetles *Pterostichus diligens* and *Poecilus versicolor* are typical of marshland and damp grassland. *Stenus ossium* occurs in both marsh and dryish grassland (Lott & Anderson 2011: 38) and *Agriotes obscurus* and *Phyllopertha horticola* are typical inhabitants of grassland where their larvae feed at plant roots. Aquatics included *Hydraena britteni*, a species common in peaty-fen environments with wet moss.

### 3.2.9.5 [221B]

#### Micromorphology

Deposit [221B] is a Type B floor characterised by a dominance of reddish-brown organic plant matter aligned parallel to the base of the slide. It has a porphyric related distribution and a complex microstructure which was most commonly observed to be platy to lenticular. Like [221A] it is formed of bands of organic material although boundaries between any discrete layers have been blurred by decomposition of organic material and post depositional shrink swell processes. Despite the similarities between the microstructure and composition of [221A] and [221B], analysis for faecal steroid lipid biomarkers did not identify faecal signatures within [221B], demonstrating that the differences between these units transcends what is visible even at the microscale. Thus [221B] is distinguishable as a later phase deposit mainly as a consequence of its stratigraphic separation from [221A] by the intervening [247] and its different faecal steroid lipid biomarker signal.

#### Lipid biomarkers

Faecal steroids were not detected (low organics in sample).

#### Macroplant [221B M2]

See [221A] above. Evidence of domestic debris was minimal and the only food items were oat caryopses noted in [221B M2]. The near absence of domestic refuse within these distinct floor layers is again evidence as to how rapidly this surface was built up.

#### Insects

This deposit represents a later phase than [221A] following resurfacing. The concentration of beetle remains was lower than in [221A], a 5 l sample producing a minimum of 89 individuals (18 MNI l<sup>-1</sup>). Decomposers were the best represented ecological group (RT 42%). *Oxytelus sculptus* and *Cercyon analis* were relatively common, both typical of rather damp decomposing vegetable matter. *Carpelimus* and Aleocharinae species were likely also living amongst the decomposing floor litter. Three scarabaeoid dung beetles were present including a dor beetle (*Geotrupes s.l.*) and *Agrilinus ater* which is commonly associated with a variety of dung and decaying vegetable matter (Jessop 1986: 25). Foul decomposers (3%) could be under-represented in the statistics because unidentified *Cercyon* species (MNI 10) might potentially include obligate foul matter species. A house fauna accounted for 9% of the assemblage (*Cryptophagus*, *Atomaria*, *Latridius minutus* group). Muscidae puparia were common and almost entirely of house fly (*Musca domestica*).

Outdoor insects made up 19% of the fauna and aquatics were relatively well represented (7%). *Hydraena testacea*

occurs in stagnant or slowly flowing lowland waters with a well-developed line of marginal vegetation (Foster et al 2020: 46). *Epuraea melanocephala* is often associated with flowering shrubs, herbs and trees in a variety of woodland environments (Duff 1993).

### 3.2.9.6 [224]

#### Micromorphology

Deposit [224] is present in sample ST2/K7 and ST2/K10 which were removed from the outer part of the structure at the W and S edges respectively. This deposit is predominantly a Type B floor surface although an anorthic patch of well sorted brown greyish silt with a clear to sharp boundary with the surrounding matrix was observed within Unit 2 of sample ST2/K10. Roundwood fragments within [224] frequently have intact pith and are identifiable as alder with hazel more frequently identified within Unit 2 of sample ST2/K10. Charcoal fragments are rare across the context as a whole. The excellent preservation of organic matter coupled with observed ferruginous pedofeatures and vughs and rare diatoms are indicative of deposition of a damp reducing environment (see Lindbo et al 2010). The frequently disaggregated, part humified, blackened organic matter and fungal material within wood is indicative of the initial breakdown of plant material. It suggests a period of limited exposure to the elements prior to its burial, perhaps following initial construction of the floor when it would have been raised above the water level on top of foundation layers [267] and [268]. The period of exposure was evidently followed by deposition of subsequent successive layers of plant material in damper conditions. The banded distribution of fine to medium sand sized quartz grains located in void spaces between plant material within Units 2–3 of sample ST2/K7 is indicative of in-wash, suggesting that localised elements of this context were subject to deposition of silt and fine sand material in-washed during inundation by water following their deposition. These observed bands of material are very thin (2–3 mm) and probably represent low energy erosion events, possibly seasonal and prompted by local flooding/water pooling within ST2.

#### Lipid biomarkers

[224] *inner*: Sampling was undertaken at 36 cm (A2) and 40 cm (A1) through the deposit and faecal steroids were present in both samples. Bile acid profiles indicate that the steroids in A1 were solely of human origin whereas in A2 they came from mixed sources, ruminants, pigs and humans/ horses.

[224] *outer*: Absence of evidence of faecal matter input (bile acids were not detected and low ratios of 5 $\beta$ -stanols were present).

### 3.2.9.7 [234]

#### Insects

*Hydraena britteni*, typically associated with standing water and shaded seepage and often common in peats, was the most frequent beetle in the small insect assemblage recovered from this deposit (15 individuals of eight taxa). Its abundance may suggest that the peat formed part of the packing material within the cavity. *O. troglodytes* is a riffle beetle (Elmidae), a family that is typical of running waters, but this species occurs in a number of lowland lochs in SW Scotland and many of the records for elsewhere in Britain are also from lakes (Foster et al 2020: 126-127; Foster & Merritt 2021). *Crepidodera plutus* is associated with willows (*Salix*). The remaining taxa (*Latridius minutus* group, *Atomaria*, *Clambus*, *Cercyon*) suggest both drier and somewhat damper litter.

### 3.2.9.8 [240]

#### Micromorphology

Deposit [240] has a complex structure which has originated through the juxtaposition of materials that are the byproduct of general occupation accumulation. Periodic combustion also evidently played a role in the formation of this deposit; fine ash layers are interleaved between partially reworked deposits displaying a mixture of charcoal, plant remains, possible coprolites and mineral components.

Layers of heavily bioturbated and reworked deposits are interleaved between deposits rich in anthropic indicators such as charred fragments and compacted matrix material typical of Type A and D occupation layers. The fine matrix of these units is composed of organic matter that has been worked by soil fauna. The ultimate origin of this organic matter may be from Type B plant flooring material, dung and other organic waste which included Type E peaty turves. The variability in the sedimentary characteristics of this context thus provides evidence that it incorporates deposits from a range of sources which have been swept or dumped together. The characteristics of [240] are demonstrative of the highly variable and patchy nature of deposits throughout the structure which reflect the complex interplay of different occupation activities juxtaposed with variable preservation conditions.

#### Lipid biomarkers

Faecal steroids from herbivores were present (bile acids were not detected, which prevents further refinement of faecal source identification).

#### Macroplant (M4)

There were only a few fragments of waterlogged bracken and peat along with five carbonised wheat glumes which had become trampled into this inorganic surface.

### Bone

There were 61 fragments (70.2 g), of which 51 had been burnt. Those fragments identified were 11 pieces of an L/M long bone shaft along with two M/M mandibles, a rib, vertebra and a long bone shaft.

### 3.2.9.9 [242]

#### Macroplant

The carbonised plant remains were 13 cereal caryopses identified as emmer/ spelt (23%), barley (15%) and cereal (62%). There was also a single hazelnut shell fragment and two pale persicaria. The small number of charred macroplants probably represents residual material from the hearth.

#### Insects

There was a relatively low concentration of beetles in this deposit and a correspondingly limited range of taxa was recovered from a 2.4 l sample (19 individuals; 8 MNI l<sup>-1</sup>). The assemblage was similar in composition to elsewhere in ST2. It included a house fauna (*Atomaria*, *Latridius minutus* group, *Cryptophagus*) as well as taxa that would live amongst moister litter (*Cercyon analis*, *Oxytelus sculptus*, *Micropeplus staphylinoides*) and obligate foul matter beetles such as *Cercyon terminatus* which is associated with both foul decaying plant matter and dung.

### 3.2.9.10 [244]

#### Micromorphology

This context is a Type A deposit sequence composed of a mix of horizontally lain plant material with evidence for domestic fuel and food preparation in its upper layers. The incorporation of loam fragments is observed elsewhere (see [251] and [224]) and is indicative of trampling of material from outside the structure. Observed bands of fine sand within pore spaces within Unit 2 of sample ST2/ K1 are indicative of in-wash following water inundation and likely indicate that the floor was subject to periodic localised and low-energy flooding or puddling.

The observed variation in the preservation of the plant material within two samples located at such close spatial proximity indicates the role of local variation in preservation within this site and also appears to indicate better preservation in the lower, more densely compacted, plant material as opposed to the upper layers which contain evidence for human activity. The greater compaction of the lower layers and better preservation of plant material may be an indication that these layers were deposited as a foundation layer for the upper floor and were not exposed as a floor surface. They may, however, also represent the lower plant remains left behind after upper 'dirty' floor surfaces were cleaned and removed

elsewhere. The compaction of this sediment and its subsequent exposure to water saturation has blurred any boundaries that may have been present within this deposit.

#### Macroplant

This deposit contained decomposed flooring material, food, weeds and moss. The floor materials included hard/ soft/ compact rush, sedge, heath grass and wood. There were also several cereal caryopses. The carbonised macroplant assemblage was two cereal caryopses and two glume fragments.

The presence of poorly preserved waterlogged floor material suggests that the surface in this location suffered from high levels of degradation due to periods of aeration. It is also likely that sections of the floor decomposed whilst in use and were covered over by a new layer sealing the rotting material underneath. The waterlogged cereal caryopses are food debris which was spilled onto this surface prior to cooking, whereas the charred cereal remains was cleaning debris from the hearth reworked into the floor.

#### Bone

There were 20 fragments (21.9 g), of which 11 had been burnt. The only identifiable element was a fragmented unburnt cattle molar.

### 3.2.9.11 [247]

#### Micromorphology

Deposit [247] was a mixed and heterogeneous mineral deposit with no observable anthropic indicators. The random orientation, distribution and unsorted nature of mineral and organic components provide little indication as to its origin but confirm that it is unlikely to have been waterlain. Observed pedofeatures such as iron/ manganese nodules and clay staining around voids are indicative of redoximorphic processes following deposition. The massive microstructure and low porosity are consistent with a Type F 'constructed floor'. In view of the predominantly organic nature of the majority of deposits observed elsewhere across BLoM it is likely that this deposit represents the intentional importation of mineral material possibly as a means of raising/ waterproofing the floor. The relative absence of anthropic indicators and its placement between organic layers and between Phase 1 [221A] and Phase 2 [221B] deposits suggest that it was used as a foundation deposit upon which to lay down floor materials, possibly in advance of the second phase of occupation.

#### Lipid biomarkers

Faecal steroids were not detected (low organics in sample).

### Macroplant (M2)

Elements of the plant litter floors above and below from [221] have become incorporated into this essentially minerogenic surface. The plant litter from [221/244] was composed of bracken along with white sedge, glaucous sedge, hard/ soft/ compact rush, hazel buds and wood fragments. The floor layers were well preserved and easily peeled apart during processing. There was evidence that new plant litter was placed over the lower decomposing floor. Other finds included heather, moss and peat that may be from turves used to line the base of this sub-floor to create a waterproof lining.

Small quantities of cess might have been trampled into this surface, represented by the raspberry and blackberry seeds but, other than that, this surface was relatively clean of domestic debris. The only carbonised find was one raspberry seed.

#### 3.2.9.12 [248]

### Micromorphology

The heterogeneous nature of [248] and frequent evidence for anthropogenic input in the form of charcoal and charred food remains are indicative that it is part of a general occupation horizon Type D deposit; ie the remnants of a floor surface. The coarse organic component is primarily represented by wood species and disarticulated plant matter; the elongated plant matter frequently observed elsewhere is rare. Unlike many of the other contexts observed in thin section, [248] does not appear to have been deposited/ immediately buried within a water saturated environment and decomposition is advanced. Post-depositional disturbance through burrowing soil micro- and meso-fauna is indicated by channel pedofeatures which are part infilled with faecal material and provides further evidence of a terrestrial rather than aquatic depositional environment. The alignment of coarse organic components at 45–35° is indicative of dumping of materials or their accumulation on an uneven surface.

### Lipid biomarkers

Sampling was undertaken at 30 cm and 36 cm through the deposit. Faecal steroids from human/ horses were present.

### Macroplant

This levelling deposit consisted of bracken and wood along with smaller inclusions of white sedge, hard/ soft/ compact rush, buds, leaves, bark and worked wood offcuts. The food remains were a mix of both cultivated crops and wild resources. These were wheat, hazel and raspberry which were reworked into the deposit when the surface was stabilised.

The presence of weed species such as yellow water-lily, broad-leaved pondweed and cinquefoils, are

environmental indicators that this area of the structure was noticeably damp.

The charred macroplant consisted of a single hazelnut shell fragment, a fat hen seed and a pale persicaria fruit. There was also a small quantity of moss and charred peat.

### Insects

A minimum of 130 individuals was recovered from a 4 l sample (33 MNI l<sup>-1</sup>). Diversity was relatively low. Decomposers accounted for over half the assemblage (RT 55%) and *Oxytelus sculptus* was the most abundant species (27 individuals; 21% of the assemblage). *Cercyon analis*, *Leptacinus pusillus*, *Micropeplus staphylinoides* and *Rugilus orbiculatus* or *erichsoni*, amongst others, would probably have been attracted to a similar type of decaying litter to *O. sculptus*. *Cercyon melanocephalus* and *Nimbus contaminatus* are typically associated with herbivore dung, and *Philonthus albipes* with both herbivore dung and decaying plant litter (Duff 1993). Although much of the assemblage indicates a rather foul build-up of litter, a house fauna associated with relatively dry, mouldering plant material was well represented (*Cryptophagus*, *Atomaria*, *Latridius minutus* group; 15%). *Corticaria punctulata* also occurs amongst mouldy litter of various kinds. Fly puparia were of Sphaeroceridae spp., and low numbers of house fly (*Musca domestica*) and stable fly (*Stomoxys calcitrans*). Larvae of the latter are associated with foul matter such as manure and decaying vegetables (Hogsette & Farkas 2000). *Bovicola ovis*, a biting louse found exclusively on sheep, was firmly identified, most likely suggesting wool cleaning rather than the presence of living sheep. Several louse abdomens were not closely identified.

Outdoor taxa accounted for 15% of the assemblage, most probably imported with wetland and dryland vegetation. Aquatic (3%) and wetland taxa included *Hydraena britteni*, *Chaetarhria*, usually found in moss at the water margins or floating rafts of vegetation, and a *Plateumaris* species associated with marginal and emergent vegetation. *Agriotes obscurus* and *Oulema* sp. are typically found in relatively dry open grassland environments (Koch 1992; Laibner 2000), *Perapion curtirostre* is found on docks and sorrels (*Rumex*), and *Trichosirocalus horridus* is specifically indicative of thistles, mainly *Carduus nutans* and *Cirsium vulgare* (Morris 2008; Drane & Warrington 2009).

#### 3.2.9.13 [249]

### Micromorphology

Unit [249] comprises the burnt remains of an organic floor, an interpretation supported by the frequent charcoal and charred plant material and associated phytoliths observed in thin section. This unit is substantially coarser and less organic than the majority of contexts studied, indicating that substantial quantities of organic material have been burnt

away. The survival of considerable quantities of charcoal, charred and reddened plant and fine mineral material suggests that the fire(s) that affected/ contributed to this unit were of a relatively low temperature (around 400°C), typical of a fire within a prevailing damp environment in which combustion was incomplete due to a deficiency in oxygen (Courty et al 1989). However, it seems that the fire temperatures were high enough to ash the uppermost portion of the context, forming thin lenses of silt-sized black and grey ash material. Below the surface, however, temperatures were lower, resulting in only charring of the organic material. The high water table and soil acidity have also probably contributed to the weathering of ash, and phosphate has been locally mobilised to form the observed amorphous iron and phosphate-rich coatings to charred material and matrix cement.

The cause of the fire that resulted in the burning of flooring material cannot be ascertained from micromorphological evidence. It may have been accidental overspill of material from the hearth which resulted in a minor conflagration charring of the upper surfaces. Alternatively, it could have resulted from the deliberate destruction of flooring material. Whilst it may have been possible to initially manage floors by adding more plant material, some form of floor maintenance would have been required (see Guttman et al 2003). Eventually the organic flooring comprising [249] may have become sufficiently foul that destruction through fire was deemed necessary. The stratigraphic location of this context at the boundary between Phases 2 and 3 may indicate that the old flooring material was burnt as a means of cleaning older materials in advance of a later phase of occupation.

#### Lipid biomarkers

Faecal steroids were not detected (low organics in sample).

#### Macroplant (M4)

The carbonised plant assemblage is composed of sedge, rush stems, leaf fragments and peat, confirming the interpretation of this deposit as a burnt plant litter floor. The waterlogged assemblage was small and included rush, sedge, wood rush, bracken, leaves and wood fragments which were also part of the decomposed floor. The only other waterlogged finds were goosefoot, peat and moss.

#### Insects

Beetles were present in low concentrations (25 individuals of 12 taxa from a 4 l sample; 6 MNI l<sup>-1</sup>). The majority were decomposers including a house fauna (*Atomaria*, *Cryptophagus*, *Latridius minutus* group) and taxa suggestive of damp, open-textured, somewhat foul litter (*Cercyon* spp., *Carpelimus bilineatus* group, *Oxytelus sculptus*).

### 3.2.9.14 [250]

#### Micromorphology

Deposit [250] is characterised by dominant organic matter and is a Type B floor deposit. Linear compaction and striation of coarse inclusions indicate pressure from trampling in some samples. The presence of rare macro wood charcoal, charred plant fragments and evidence for woodworking in the form of truncated bark chips with sharp boundaries provide the only limited evidence for anthropogenic input.

This context evidently formed through the artificial addition of plant material, predominantly bracken with some sedge/ reeds and roundwood. The relative absence of anthropic indicators within a floor close to the central hearth is intriguing and likely indicates that dirtier floors were repeatedly removed and replaced with clean, fresh plant coverings. It is also probable that the plant materials were brought into the structure in an attempt to alleviate wetness through the creation of a drier, cleaner floor covering.

#### Lipid biomarkers

Sampling was undertaken at 14 cm and 10 cm through the deposit. Faecal steroids from ruminants were present in both samples and there were reduced decay indicators.

#### Macroplant (M4)

The waterlogged plant assemblage was large and was composed of materials used in floor construction. Specifically, these were hard/ soft/ compact rush, jointed rush and bracken alongside smaller numbers of white sedge, buds, leaves, bark and wood fragments. This material formed distinct laminated layers and it was possible to identify varying levels of preservation within them. It appeared that when part of the floor became compressed and worn through trampling, a new layer of plants was placed directly on top.

This practice of continually rebuilding on old surfaces, rather than removing the underlying layers, appears to have been the favoured building method in this structure. The only evidence for food was a few fragments of hazelnut shell. Weed species were noted along with some moss and peat fragments. The carbonised finds were one orache and some peat fragments. Although this floor was being continually re-laid, it was therefore kept relatively clean of domestic debris and this suggests that this floor built up rapidly.

#### Insects

An assemblage of 146 beetles dominated by decomposer taxa was recovered from a 5.2 l sample (28 MNI l<sup>-1</sup>; RT 59%). The diversity of both families and habitat groups was relatively high. Eurytopic decomposers accounted for half of the fauna (50%). *Carpelimus bilineatus* group, *Cercyon analis* and undifferentiated *Cercyon* species were the most numerous taxa, all associated with damp decaying plant matter and

litter. *Oxytelus sculptus* was also relatively well represented and other species associated with relatively moist decomposing plant material included *Rugilus orbiculatus*, *Leptacinus pusillus*, *Gyrophypnus*, *Ptenidium*, *Acrotrichis* and *Clambus*. Dry decomposers making up a house fauna were also quite well represented (*Latridius minutus* group, *Cryptophagus*, *Atomaria*; 8%). *Corticaria serrata* and *C. punctulata*, represented by single individuals, are also associated with mouldy plant debris and are common in anthropogenic environments such as houses, barns and stables. Foul decomposers included *Cercyon quisquilius* and *Aphodius prodromus/ sphacelatus*. Insect ectoparasites were relatively common: they included *Bovicola bovis*, found on cattle, and human flea (*Pulex irritans*) and abdomens of biting louse (Trichodectidae) that were not identified closely. Puparia of house fly (*Musca domestica*) and lesser dung flies (Sphaeroceridae) were frequent but not abundant.

Insects from outdoor habitats accounted for around a quarter of the assemblage (24%), many of them associated with damp ground and water margins (*Bembidion guttula/ mannerheimi*, *Stenus clavicornis*, *Pterostichus anthracinus*). *Bryaxis* species are commonly found in damp moss and *Dyschirius globosus* is associated with open places such as riverbanks, bogs or meadows (Fedorenko 1997). Beetles of drier pasture/ meadowland included *Adrastus pallens*, *Calathus melanocephalus*, *Trichosirocalus horridus*, typically associated with thistles (*Cirsium* and *Carduum*) in open dry areas, and *Sitona obsoletus* found on clovers (*Trifolium*). Aquatic taxa (3%) included an *Oulimnius* species that would have been associated with clear running water or lake shores (Holland 1972).

### 3.2.9.15 [251]

#### Micromorphology

Seven distinct sedimentary units were identified within [251] and are representative of sequential episodes of deposition of plant material within a prevailing damp environment. The finely stratified organic layers within [251] share numerous micromorphological properties with organic Type B floor layers identified within ST2, specifically [221] and [250]. However, in contrast to these layers [251] contains a higher number of anthropic indicators including charcoal, more typical of Type A deposits. Thus [251] represents a general accumulation of both Type A and Type B occupation deposits, not unlike those observed within [265].

Anthropogenic indicators, in particular charcoal, increase towards the top of the context which may reflect a change in use within this part of the structure in the later phases of deposition which incorporated a higher proportion of domestic waste.

The embedded anorthic patches of soil clasts and loam material are consistent with a trampled floor deposit and may have been trampled in from outside the structure and

are characteristic of the loam incorporated into organic Type A floor deposits. Some of the anorthic sediment patches were observed to be darker reddish-brown and very organic rich and have been interpreted as possible dung fragments which may have been similarly trampled into the structure. The presence of possible dung fragments is consistent with ruminant and human faecal matter signals.

#### Lipid biomarkers

Faecal steroids from ruminants, pigs and humans/ horses were present.

#### Macroplant (M4) & (M5)

A large quantity of waterlogged plant remains were recovered from this deposit which include building material, food and intrusive weeds. The only carbonised finds were two cereal caryopses and some burnt peat fragments.

The floor was constructed using distinctive layers of white sedge, glaucous sedge, hairy sedge, jointed rush, hard/ soft/ compact rush, wood rush and bracken alongside fragments of wood, birch buds, buds, leaves and bark. These laminated floor layers were well preserved and peeled apart easily. Intermixed within the floor layers were noticeable inclusions of cereal chaff and caryopses, some of which were identifiable as barley. Other food items included hazelnut shell and raspberry seeds. The large number of raspberry seeds could perhaps be representative of faecal matter.

The inclusion of food, cereal processing waste and fuel debris within these floor layers indicates this part of the structure was not kept as clean and, instead, new layers of plant matter were placed directly on top of the old dirty floor surfaces below. Given the excellent level of preservation the continued formation of floor layers in this part of ST2 was a regular occurrence.

#### Bone

Seven fragments of bone (1.6 g) were present in this context, of which five were either completely calcified or partly charred. There was an L/M long bone shaft and an M/M rib. The rib fragment had a single cut mark.

#### Insects

An assemblage of 83 beetles was recovered from a 5.2 l sample (16 MNI l<sup>-1</sup>), decomposers accounting for just over half of the taxa (RT 52%). The most numerous beetles were *Carpelimus bilineatus* group and other *Carpelimus* species, suggesting a damp substrate. *Cercyon analis*, undifferentiated *Cercyon* spp., *Corticarina* and *Oxytelus sculptus* were all represented by several individuals, and a house fauna was well represented (*Cryptophagus*, *Atomaria*, *Latridius minutus* group; 10%). In combination, these indicate that a range of conditions had developed within the floor litter, ranging from relatively dry and mouldering, to damper and perhaps somewhat foul. The only obligate foul matter species closely identified was

*Chilothorax distinctus*, a scarabaeid beetle associated with various types of dung. Puparia of house fly, stable fly and lesser dung flies were present in relatively low concentrations, perhaps suggesting less foul conditions in the floor in this part of the structure. *Bisnius cephalotes* preys upon fly larvae.

Outdoor taxa accounted for 19% of the assemblage and included a number of taxa that are typical of fen and peatlands. Water beetles (5%) included *Hydraena testacea*, whilst *Pterostichus diligens*, *Erichsonius cinerescens* and *Cyphon* spp. all occur on damp to wet ground. *P. diligens* prefers peaty substrates, whilst *E. cinerescens* is common in litter and moss in fens and bogs, the records all possibly relating to the use of peat as fuel in the hearth. The weevil *Sirocalodes mixtus* lives on climbing corydalis (*Ceratocarpus claviculata*), a plant of acid soils, including peat, although it also occurs on common fumitory (*Fumaria officinalis*), a common plant of disturbed ground. *Sitona obsoletus* is associated with clovers (*Trifolium*), and the nearby presence of willows was suggested by *Crepidodera plutus*.

### 3.2.9.16 [252]

#### Bone

There were 172 burnt fragments (30.9 g). There were two L/M long bone shaft fragments and 16 fragments of an M/M long bone.

### 3.2.9.17 [253]

#### Micromorphology

Saturated organic matter is a primary constituent of [253] with evidence for woodworking and low quantities of charcoal indicating anthropogenic influence. The relatively poor preservation of organic matter and its partial humification are indicative that, in contrast to the underlying layer [251], this context was not immediately buried in a reducing environment and has been subject to some aerobic decay and decomposition. The observed layers appear to have been formed through deposition of small twigs (roundwood) deliberately deposited upon the bracken dominated floor/ bedding layers below. It is possible that the use of small roundwood twigs as opposed to bracken reflects seasonal availability of plant material and may also be representative of a need for more robust flooring materials during a wetter period. The deposition of the roundwood material would potentially have served to raise the floor surface above the water table, thus allowing for partial decomposition of the more fragile organic matter and preferential preservation of the more robust roundwood material.

#### Lipid biomarkers

Faecal steroids from ruminants were present and there were reduced decay indicators.

#### Macroplant (M4)

The waterlogged assemblage was large and dominated by branchwood bark, roundwood twigs, wood fragments and some offcuts. There were also small quantities of sedge, rush, wood rush, bracken and leaves intermixed with the branchwood. The only other waterlogged finds were some weed species, moss and peat.

The carbonised finds consisted of five emmer and three emmer/ spelt alongside one bud and peat fragments, food and fuel debris which became intermixed as the branchwood was laid down. It is also possible the sedge, rush, wood rush and bracken are from the underlying plant litter floor and became reworked into the upper branchwood laid on top.

### 3.2.9.18 [255]

#### Bone

There were 220 bone fragments (48.0 g), only one of which was unburnt. There were three long bone shafts from an L/M and 14 M/M fragments which included one skull fragment, one scapula, one rib and 11 long bone shaft fragments.

### 3.2.9.19 [256]

#### Bone

There were 119 burnt fragments (16.2 g); one of these was identified as an M/M long bone shaft.

### 3.2.9.20 [261]

#### Micromorphology

Deposit [261] is an organic banded deposit comprised of bracken and other partially decomposed plant material resembling a turf or peat Type E deposit. The near absence of anthropic indicators suggest that the sampled part of this context was not subject to exposure to anthropogenic inputs from nearby occupation activities associated with the hearth. The plant material was evidently rapidly deposited within a saturated environment, which allowed for exceptional preservation and may be indicative of deliberate importation of peaty turves and bracken from outside of the structure as a means of raising the ground surface above the water table and providing a damp-proofing membrane. The observed differences in the preservation of plant material and constituent components of the context likely reflect their position in the stratigraphic profile and subtle changes in the season of deposition and changes in water saturation regime. The banded distribution of medium to fine sand-sized quartz between organic layers and in void spaces is indicative of in-wash during flooding/ water saturation. Diatoms were observed in the lower part of the context and provide further evidence of damp conditions. Plant tissue fragments and observed cracks and fissures in the

sediment matrix are indicative of the subsequent drying out of this deposit following a period of saturation. The fluctuating hydrological regime is likely to be at least partly responsible for the observed banding and differences in preservation throughout this context.

### Macroplant (M5)

The waterlogged macroplant assemblage contained large quantities of brash formed of distinctive layers of bracken, wood fragments, wood offcuts, birch buds and hazel buds intermixed with smaller inclusions of bark, glaucous sedge and rush. This sample was unusual in that there was no sediment present. Instead, this deposit was composed primarily of bracken and wood laid down in distinctive layers. The preservation of this material was excellent and this floor appears to have been rapidly built up which may explain the absence of sediment. The favouring of bracken and wood over sedge and rush may reflect seasonal options, in that these species may have been the only plants available when this floor was laid.

The weed assemblage was large and it is possible the orache and fat hen either grew in this location or were deliberately added to the brushwood to create a more stable surface. The only carbonised find was a single wheat glume.

### Insects

A rather small assemblage of 62 beetles dominated by decomposers was recovered from a 3.9 l sample (16 MNI l<sup>-1</sup>; RT 65%). A combination of relatively dry and mouldy, and damper fouler conditions within the floor litter were indicated. Eurytopic decomposers made up half of the whole assemblage, with *Oxytelus sculptus*, *Cercyon analis* and undifferentiated *Cercyon* spp. most numerous taxa amongst this group. *O. sculptus* is associated with open textured, somewhat foul matter. A house fauna consisting of *Atomaria* and *Cryptophagus* spp. was well represented (15%).

Biting lice (Trichodectidae) found on mammals were represented by abdomens that were not identified to species level. Whilst these could potentially point to the presence of animals in the structure, there is little other evidence to suggest this had occurred on a regular basis (Mackay et al 2020, micromorphology and faecal sterol reports) so an alternative explanation for their presence may be an association with the working of hides or wool processing. Fly puparia recorded in low numbers were mostly stable fly (*Stomoxys calcitrans*) and Sphaeroceridae associated with decaying organic matter and animal waste.

There were few outdoor insects (5%), none of which were aquatic. *Crepidodera* species are associated with willows and poplars and *Euplectus* sp. with rotting wood and bark (Alexander 2002).

### 3.2.9.21 [264]

#### Macroplant

The plant assemblage was formed exclusively of waterlogged finds composed of layers of white sedge, glaucous sedge, hairy sedge, toad rush and wood fragments. These were all intermixed to create a waterproof surface. The only potential weed was heath grass, but this species may have been deliberately added to the foundation layer if it was easily accessible. The absence of any domestic debris demonstrates this surface was rapidly laid down and is similar in its construction to foundation deposit [267]. The layers of plant litter were notably more compressed in the lower section, and this may have been caused by the weight of the upper layers pressing downwards. It is unlikely this was caused by trampling as the foundation deposits were never constructed to be walked on but were designed to create a level, waterproof surface for construction.

#### Insects

A moderately sized assemblage of 99 beetles that appear to have chiefly come from the natural peat was recovered from a 3.5 l sample (28 MNI l<sup>-1</sup>). Aquatic taxa made up over half of the assemblage (55%) and taxa representing waterside and fen environments were also well represented (9%). The whole outdoor component accounted for 70% of the assemblage.

The most numerous water beetles were *Hydraena britteni* or *H. britteni/ riparia*. *H. britteni* is common in peaty-fen environments with wet moss, whilst *H. riparia* is more eurytopic, occurring at the margins of vegetation-rich waterbodies (Merritt 2006). All *Hydraena pronota* identified from ST2 belonged to *H. britteni* and there is a strong likelihood that the less diagnostic elytra also belong to this species. Wetland and waterside taxa included *Elaphrus cupreus*, which occurs on sparsely vegetated muddy banks of water bodies, *Contacyphon* species associated with vegetation near freshwater, and *Philorhizus sigma* and *Lesteva sicula* sub-sp. *heeri* which are common in marsh and fen environments. *Donacia simplex* and *Plateumaris sericea* are usually found on bur-reeds (*Sparganium*), although the latter in particular also occurs on sedges (*Carex*) and bulrushes (*Typha*). *Bryaxis* species are generally associated with damp moss.

Decomposers were less well represented than in most other samples from ST2 (RT 25%) but the range of taxa was consistent with that seen in samples from floor layers. A small house fauna (*Atomaria*, *Cryptophagus*; 3%), and taxa associated with damper or somewhat foul decomposing plant litter were represented (*Oxytelus sculptus*, *Cercyon* spp., *Megasternum concinnum* agg, *Acrotrichis* and *Acrossus depressus*). Low numbers of fragmentary Muscidae puparia could not be identified to species level.

### 3.2.9.22 [265]

#### Micromorphology

Deposit [265] represents a general accumulation of both Type A and Type B occupation deposits. The preservation of microstratigraphic layers of sediment (Type A) interspersed between layers of elongate plant matter (Type B) is indicative of limited post-depositional disturbance which has allowed for their preservation. The laminations alternating between Type A and Type B may be representative of a process of successive depositions of plant material as a floor covering followed by trampling and use of the floor and its subsequent re-covering either as a means of creating a 'clean' floor surface or as a means of raising the floor level to prevent encroachment of water. The excellent preservation of the organic matter, coupled with the lenticular microstructure, is indicative of its relatively rapid deposition and burial. The spongy appearance of the organic matter is probably a consequence of its saturation following deposition causing a swelling of material and removing evidence for compression and trampling. The presence of charred fuel and food remains is indicative of general occupation debris. The increase in charred material upwards may be indicative of a change in use/ space within the structure resulting in greater incidence of incorporation of domestic food waste or perhaps a change in the frequency with which floor surfaces were re-covered or replaced.

### 3.2.9.23 [267]

#### Micromorphology

Anthropic inclusions were not observed within [267] and thus it is unlikely to represent the remains of an active Type A floor surface. Deposit [267] is comprised of two distinct sedimentary units of Type C deposits; a lower layer (Unit 2) dominated by *Pteridium* (bracken); and an upper layer (Unit 3) dominated by *Cyperaceae* (sedge) and *Junceaaceae* (rush). The sharp discontinuity boundary between [267] and the underlying peat [229] indicates that this is not a natural accumulation of wetland vegetation which grew on top of the peat layer. The exceptional preservation of coarse organic matter observed in [267] could only have been achieved following the immediate burial of the plant material in anaerobic conditions. It is thus likely that the bracken was intentionally laid as a foundation/ waterproofing layer (Winchester 2006) prior to the laying of the sedge floor. Small numbers of aquatic taxa and marsh/ bogland taxa within the insect assemblage provide indications of the wetland conditions under which this deposit was formed.

#### Macroplant (+M5)

The macroplant finds were all waterlogged and the greatest component was distinctive layers of white sedge, hard/ soft/ compact rush, bracken, mature birch buds, leaves and

wood, some of which were worked offcuts. The only other finds were a small number of raspberry seeds, weeds and moss. It is possible these plants were either already growing in this location or were accidental inclusions within the building material. It cannot be ruled out that the raspberry seeds were used as a food source. However, given the absence of any other domestic refuse the raspberry seeds are unlikely to have derived from the deliberate disposal of domestic waste in this area and belonged to plants growing in this location. The small accumulation of weeds indicates that the formation of this layer was a rapid process. The preservation of the floor layers was excellent, and it appears that this surface was never strenuously walked over or trampled. Instead, this material was laid over the natural peat and the building of the superstructure occurred shortly after.

#### Insects

Limited numbers of beetles were recovered from a 4 l sample (65 individuals; 16 MNI l<sup>-1</sup>). The range of taxa suggests the use of discarded litter from buildings in the foundation deposit. Decomposers (RT 54%) included a substantial house fauna (*Atomaria* spp., *Latridius minutus* group; 23%). Undifferentiated *Cercyon* species and *Oxytelus sculptus* were relatively common, and *Cercyon analis*, *Philonthus politus*, *Gyrohypnus*, *Carpelimus* and *Acrotrichis* were all represented by one or two individuals. Aleocharine rove beetles were well represented but not identified closely.

Outdoor insects were common (35%), notably including aquatic and wetland/ waterside taxa indicating a component derived from natural waterlain or wetland sediments. Aquatics (15%) included *Oulimnius troglodytes*, *Dryops* sp and *Hydraena britteni*. *Dryops* is associated with mud by standing water, and *H. britteni* is common in peaty fen environments. Other members of the wetland community include *Olophrum fuscum* or *piceum*, commonly found in bogs and at the edge of standing water in detrital material, *Lesteva punctata*, commonly associated with wet moss near streams, and *Agonum gracile*, found in very wet, vegetation-rich rich environments (Duff 1993). All these taxa are associated with peatlands and probably represent *in situ* materials derived from the underlying peats or build-up from adjacent peat deposits to create a solid foundation. The weevil *Orchestes quercus* is associated with oak (*Quercus*), overwintering under bark and feeding on leaves (Koch 1992) and probably represents material from nearby over-hanging trees or brought on site as part of brushwood layers.

### 3.2.9.24 [268]

#### Micromorphology

Deposit [268] is comprised of exceptionally well preserved roundwood fragments separated by organic and highly compacted sediment which has been trampled between the

roundwood and is organised with reference to the wood fragments. Evidence for partial decomposition of plant material, formation of fine organic detritus bioturbation indicators (excremental pedofeatures, channel and chamber microstructure) is consistent with a Type C deposit left open for sufficient time to allow for partial reworking of sediment and disaggregation and humification of organic matter but insufficient time for their complete decomposition.

#### Macroplant (+M5)

Apart from a single carbonised sedge nutlet, the large macroplant assemblage recovered from this deposit was preserved entirely through waterlogging. The largest component was layers of brash formed of wood, worked woodchips, immature buds and leaves intermixed with smaller quantities of white sedge, jointed rush, hard/ soft/ compact rush and bracken. Wood was clearly favoured in the construction of this surface and this may reflect which plants were available.

The noticeable decrease in the quantity of bracken, sedge and rush coupled with the presence of immature buds could indicate this material was collected later in the year. During winter to spring bracken and grasses begin to die back but wood is available year-round. The presence of immature buds could mean that this material was collected in late winter and/ or early spring. However, this argument can perhaps be discounted as the foundation floors were all laid at the same time. Therefore, the predominance of wood within this deposit may be because this material source was either deliberately selected for this layer or that it was easier to use what was immediately at hand and, in this instance, this was wood working waste. Other finds included moss leaves and peat fragments.

#### Insects

A minimum of 50 beetles was recovered from a 4.2 l sample (12 MNI l<sup>-1</sup>), over half of which were decomposers (RT 58%). The most numerous taxa were *Oxytelus sculptus* (six individuals) and undifferentiated *Cercyon* species (eight individuals with a single *Cercyon analis* firmly identified). A house fauna was also well represented (*Cryptophagus*, *Atomaria*, *Latridius minutus* group; 20%). Aleocharine rove beetles were common but not identified closely. The generalist decomposer group contains taxa associated with decaying vegetation including *Margarinotus brunneus*, *Ptenidium* sp. and *Oxytelus sculptus*. *M. brunneus* is also commonly found in carrion. Fly puparia were mainly of stable fly (*Stomoxys calcitrans*) and house fly (*Musca domestica*).

Low numbers of aquatic and wetland beetles included *Hydraena britteni* and *Contacyphon* which is associated with vegetation near freshwater bodies. *Blemus discus*, a small ground beetle, occurs on bare ground near water and is possibly associated with small mammal runs (Duff 2012: 159).

#### 3.2.9.25 [270]

##### Macroplant

Waterlogged remains consisted of cereals, wild foods, flooring and weeds. The food remains were wheat glumes and hazelnut shell fragments. The flooring consisted of small quantities of decomposed sedge, rush, buds, wood fragments and bark which may have been thrown onto the hearth for burning.

The carbonised finds totalled 32, of which 29 were cereal remains. The cereal species were emmer (80%), barley (10%), six-row hulled barley (3%) and cereal (7%). There was also a single hazelnut shell, one fat hen seed, some bracken and peat. The cereal and hazelnuts are food refuse whereas the peat was likely used as a fuel source. The small size of the macroplant assemblage suggests this hearth was kept relatively clean.

##### Bone

There were 49 burnt fragments (10.5 g). The only identifiable element was an M/M long bone shaft.

#### 3.2.9.26 [271]

##### Macroplant

The waterlogged macroplant assemblage was small and consisted of bark, wood, sedge, rush and orache. The charred macroplants were one barley and one cereal caryopses. There were also two hazelnut shell fragments. These finds have derived from decomposed floor material and food waste which have trickled down into the cobbles of the mound.

#### 3.2.9.27 [274]

##### Macroplant

Both the waterlogged and the carbonised plant assemblages were small and were dominated by food remains. The largest component was hazelnut shell, of which two were carbonised, and there were also some raspberry seeds. Other waterlogged finds were a small quantity of sedge, rush and fragments of wood which may have formed part of a decayed floor. This appears to represent a mix of domestic debris from the hearth, possible faecal matter and some floor material which has been dumped in the hearth.

#### 3.2.9.28 [296]

##### Micromorphology

Deposit [296] is predominantly a minerogenic Type A peaty deposit with high amounts of monocotyledonous material. The lower unit of ST2/K17, however, is a minerogenic Type G deposit with a high quantity of charred material embedded within an ashy matrix and likely represents the dumping of hearth waste or a small domestic fire.

The upper units contain more frequent evidence for post depositional alteration. The occurrence of anthropogenic indicators is high throughout the deposit and, coupled with the heterogeneous nature and its location within the building, likely is consistent with general accumulation of occupation debris. Preservation of weak banding of material and polyconcave voids within the centre of the deposit hint at gradual build-up of layers of plant material, similar to the layers of occupation and plant material observed within the more central parts of the structure.

### Macroplant

There were well-preserved waterlogged plant remains composed of large quantities of flooring and weeds alongside much smaller inclusions of food, some of which had been partly charred. The floor was constructed using layers of sedge, rush, wood rush, bracken and fragments of wood. These had become laminated and peeled apart easily into distinct layers. The food remains consisted of waterlogged cereal caryopses and hazelnut shell, some of which were partly charred. The food remains were accidental inclusions of domestic refuse trampled into this surface.

The large numbers of weeds within the entrance deposit that included black bindweed, fat hen, pale persicaria, common chickweed and stinging nettle are unlikely to have been gathered deliberately. Instead, the taphonomic pathways responsible for the weeds accumulating within the entrance were probably accidental. The most obvious methods by which these plants could have become incorporated is from the inhabitants trampling them into the deposit as they enter the structure and from seeds being blown into the doorway from plants that grew nearby.

### Insects

A moderately-sized insect assemblage was recovered from a 4 l sample, its high diversity suggesting mixed origins (90 beetles and bugs of 58 taxa; concentration 23 MNI l<sup>-1</sup>;  $\alpha = 70$ , SE = 14). The assemblage is consistent with the interpretation of the deposit as flooring. Decomposers made up just over half of the assemblage (RT 54%,  $\alpha$ RT = 16, SE = 4) and included a good-sized house fauna (*Latridius minutus* group, *Cryptophagus* spp., *Atomaria*; 11%). Other decomposers included both generalist and fowl matter species, suggesting that plant litter making up the floor had a range of moisture contents and degrees of foulness. Obligate fowl matter taxa were well represented (10% of the assemblage) and they included *Cercyon haemorrhoidalis*, *C. impressus* and *C. terminatus*, and a group of scarabaeoid dung beetles (*Geotrupes* s.l., *Nimbus contaminatus* and *Melinopterus prodromus* or *sphacelatus*). The relative abundance of this group may suggest that dung *per se* was present in this part of the structure, but

this is unclear since moister parts of the floor litter might well have become similarly foul.

Outdoor insects accounted for almost a third of the fauna, which is high for an internal deposit. The position close to the entrance may account for this to some extent, but some species were probably brought in with cut marshland vegetation, and scale insects (Coccoidea: Diaspididae) would almost certainly have arrived in the structure attached to wattle or brushwood. Plant-feeders included *Ramphus*, a weevil whose leaf-mining larvae live on a limited range of trees, *Notaris acridulus*, associated primarily with reed sweet-grass (*Glyceria maxima*) and possibly other semi-aquatic grasses, *Conomelus anceps*, found on rushes (*Juncus*), and *Chaetocnema arida* group which more generally associated with grasses, sedges (*Carex*) and rushes. Sedge seeds and sedge and/ or rush stems were common amongst the plant macrofossils (Robertson, plant report). A poorly preserved leg fragment was tentatively identified as *Phyllopertha horticola*.

### 3.2.9.29 [304]

#### Macroplant

A large quantity of waterlogged macroplants were present in this floor. The largest components were sedge, rush, bracken and wood fragments along with smaller numbers of glaucous sedge, alder buds and bark. Fragments of heather and *Sphagnum* sp. moss were noted and these could have been introduced as the inclusions of turves. There were also some weed species. The only carbonised find was one charred bud. There was no surviving evidence of any food remains.

### 3.2.9.30 [313]

#### Micromorphology

Deposit [313] is an organic deposit rich in plant tissues and organic residues which extended along the cavity between the plank walls. The excellent preservation of organic matter in this context is indicative of deposition within a saturated environment and also indicative of a relatively high deposition rate with limited post-depositional reworking. Anthropogenic indicators are limited to fine charcoal likely to be indicative of in-washing of charcoal from surrounding surfaces rather than *in situ* burning. In view of the location of this deposit between two structural walls it is likely that it represents the deliberate deposition of vegetation into the cavity as a form of insulation and waterproofing.

### 3.2.9.31 [315]

#### Macroplant

Both the waterlogged and carbonised plant assemblages contained building materials, food, some weeds and moss.

The waterlogged building material consisted of glaucous sedge, rush, bracken and wood. There was also some heather which could suggest that turves were used as packing within the cavity. It was noted that some of the building material, such as the sedge, rush, bracken and alder buds, had been charred.

The food remains were composed of waterlogged cereal caryopses and chaff, some of which were identifiable as emmer. The carbonised food remains were one wheat glume, three cereal caryopses and one blackthorn stone which was only partly charred. The suite of waterlogged building materials found in the cavity were the same as those used elsewhere in the house as flooring materials and appear to have been used in this context as insulation within the wall cavity. The presence of food debris in the cavity does raise the possibility that old, discarded flooring was being packed into the wall cavity but the numbers are so small that they could simply represent accidental inclusions.

### Insects

A minimum of 183 beetles and bugs of 68 taxa was recovered from a 2 l sample (concentration 92 MNI l<sup>-1</sup>;  $\alpha = 39$ , SE = 5). The assemblage as a whole was less diverse than that from floor [296] because outdoor taxa were less common (15% of the fauna compared to 31% in [296]), presumably due to the enclosed nature of the wall cavity. Decomposers were the dominant ecological group (RT 57%,  $\alpha$ RT = 20, SE = 3) and a house fauna associated with relatively dry mouldering accounted for 7% of the assemblage. Other decomposers were mainly eurytopic taxa associated with decaying plant debris, most of which probably lived and bred within the damper parts of the occupation litter, either within the cavity itself or in associated floor layers within the structure. *Carpelimus bilineatus* group was particularly common. A smaller group of beetles (*Oxytelus sculptus*, *Cercyon terminatus*, *Cryptopleurum minutum*) was characteristic of foul open-textured litter, suggesting that somewhat stable-like conditions may have developed, perhaps within the deeper, moister parts of occupation layers within adjacent parts of the structure. Scarabaeoid dung beetles (3% of the fauna) may have been attracted to any foul organic litter within the building that had developed dung-like characteristics. *Acrossus rufipes* is associated with dung of large herbivores in the open but is also commonly attracted to light in buildings. Other Aphodiinae species will shelter in flood refuse during the winter months (Jessop 1986: 20-25) and it is possible that the structure and damp litter within it provided a similar refuge.

A small number of charred insects in this deposit included an elytron of an aphodiine dung beetle and essentially complete specimens of *Cryptophagus*, *Lathrobium* and a fly larva, suggesting they were all present in occupation litter when it was burnt. Archaeological evidence suggests that the burning had taken place *in situ* within the wall cavity (Cavers & Crone 2016: DSR 6).

Insects from terrestrial outdoor habitats may provide limited evidence for the environment outside the structure; the water beetle *Hydroporus palustris* is associated with vegetated, still or slowly flowing water and *Contacyphon* species with well-vegetated marshland, for example. However, many insects may have been imported into the structure with materials. The only plant-feeding insects recorded were four species of leafhoppers (Delphacidae) and planthoppers (Cicadellidae). Suspiciously well preserved sclerites of *Amara plebeja*, a ground beetle (Carabidae) found in moist well-vegetated places, were thought to be of recent origin.

### 3.2.9.32 [318]

#### Micromorphology

Deposit [318] is formed primarily of excellently preserved elongate plant rush, sedge and bracken with a preferred horizontal alignment and is interpreted as a Type B floor. Bands of unsorted coarse mineral and charred fuel residues are more typical of a Type A floor and represent accumulation during the exposure of each successive floor surface. Compression of plant material and polyconcave voids are indicative of trampling and are consistent with the location of this deposit at the entrance to the structure, an area that would have been subject to repeated trampling and compression. Humification indicators such as iron/manganese nodules and blackening of the epidermis of plant tissues are more frequent towards the top of the context. The higher degree of humification within the upper units reflects their stratigraphic location, indicating that this part of the context was elevated above the saturated anaerobic conditions experienced by Unit 1.

### 3.2.9.33 [319]

#### Micromorphology

Deposit [319] is represented within Units 1 and 2 of sample ST2/K17 and is a Type E deposit comprising of a mix of wood and plant material. The upper unit (2) contained a higher proportion of roundwood including 25 individual pieces with a diameter greater than 2 mm with preserved pith and identifiable as alder. Coarse organic matter in both units is low to moderately birefringent and moderately well preserved. Identifiable plant species include *Pteridium* (bracken), *Cyperaceae* (sedge) and *Juncaceae* (rush). The better-preserved elongate tissue fragments have a preferred orientation parallel to the base of the slide within Unit 1 but are arranged with reference to the larger wood fragments within Unit 2. Charcoal and charred plant remains are rare in both units but decrease in frequency upwards. In contrast to many of the sampled organic contexts, approximately 50% of the plant matter within the upper unit of [319] does not exhibit a dominant preferred horizontal orientation. This

appears primarily to be a consequence of the arrangement of coarse organic matter referred to the larger roundwood fragments rather than to the base of the slide as observed elsewhere. The general random arrangement of components, moderate preservation of plant material and low density of anthropic indicators would be consistent with a natural peat deposit with high amounts of monocotyledonous material – some possibly growing *in situ* (fleshy roots) (Huisman, pers comm), with occasional ‘drying out’ allowing faunal mixing, eg by earthworms, and later rooting and weak secondary iron mottling. The interpretation of this context as a re-deposited peat (see above) remains plausible and indeed would be a means of raising the entrance surface above the water table in a similar way to the intentional laying down of plant material. Re-deposited peat deposits were also found at Cults Loch crannog and displayed similar micromorphological characteristics (Roy 2018).

### 3.2.9.34 [322]

#### Macroplant

The plant matter was composed of large quantities of waterlogged plants along with a smaller number of carbonised finds. The dominant components were glaucous sedge, sedge rush, bracken, wood and leaves. There were also many examples of burnt sedge, rush, bracken and some buds. The weeds derived from small inclusions of invasive plants that were both waterlogged and charred. The only evidence for food was two carbonised wheat glumes.

As with wall cavity packing deposit [315] the same materials used for flooring throughout the house appear to have been used as insulation within the wall cavity. The inclusion of the charred cereal is likely intrusive. The presence of both waterlogged and burnt material within this cavity deposit could indicate that old flooring material, some of which contained burnt material, was recycled as wall cavity.

The weeds were generally recovered in small numbers except for fat hen and common chickweed. It is possible these two species were deliberately selected for use as a companion within the building material or as a supplementary food source. The exploitation of these two species as food can perhaps be ruled out within this context as there was no other evidence of other domestic food waste. As both these plants produce large quantities of seeds, it is likely they were collected along with the sedges and bracken and are simply overrepresented within the archaeobotanical record in comparison to the other weeds.

## 3.3 Structure 1 (ST1)

### 3.3.1 Introduction

ST1 is the northernmost mound on the island. One of the 2010 test-pits had uncovered an *in situ* alder post

and horizontal alder timbers just to the SW of the mound (Chapter 1.2) so a trench, T1A roughly 4.5 × 4.5 m square was opened up around the test-pit and T1B, a 1 m wide trench extended from the NE side of this trench over the mound for a distance of 8 m. The presence of trees and roots influenced both the alignment and shape of all the trenches. Subsequently, two additional trenches, T1C, roughly 2 × 2 m square, and T1D, 1.5 × 2 m in area, were opened up on the SE side of T1B. In total some 35 sq m were opened up.

The excavation demonstrated that the mound consists of a stack of three stone-built hearths that sits at the centre of a timber roundhouse defined by a double outer wall of wickerwork construction. There were at least three phases of activity within the roundhouse, each associated with the construction and refurbishment of a hearth. Whilst the deposits around the hearth stack had sunk under the water table and were well-preserved, decay of the organic floor surfaces in the outer annulus of the structure was well advanced, leading to conflation of the deposits. Consequently, it was not possible to distinguish the active floor surfaces associated with each hearth construction.

### 3.3.2 Chronology

The outermost growth rings on the oak posts [021/C] and [021/D] indicated that they were felled in the winter/spring of 435/434 BCE. However, the hazel stakes used throughout ST1 were cut down in the same year as those used in ST2 which was constructed in 435 BCE. The house was therefore constructed either late in 435 BCE or in the following year, using wood that had been stockpiled in preparation in the previous year. The ash had also been felled in the spring/ summer of the same year as that used in ST2 so, like the hazel, it may have been stockpiled.

The hazel stakes used in stakelines [040], [048], [015], [016] and [028] were all felled in the same year, demonstrating that stakelines [040] and [048] were not an addition but were built at the same time as the outer wall of the house. The ash logs used in foundation [046] and the sub-floor structure [022] were also all felled in the same year, confirming that these structural elements were laid down at the same time. The alder timbers used in the foundation [046], the post-ring [021], the floor surfaces [009] and [047], and the hearth framework [041] and [042] were all cut down within a nine-year felling band. As there is structural evidence for three phases of refurbishment in ST1 it is possible that some of these phases lie within that band and cannot be distinguished using tree-ring analysis. Some of the spread of end-dates may also be accounted for by stockpiling. The evidence from the hazel and ash strongly supports the thesis that ST1 was a single-phase construction whilst that from the alder suggests that any refurbishment took place within a decade at most.



Figure 3.52.  
ST1 Phase 1 plan.

Eight radiocarbon dates were obtained from ST1. They mostly came from food and fuel debris in the hearth deposits, except a rangefinder date on one of the alder posts in the post-ring (Table 2.2). Modelling of these dates, constrained by the dendro date for construction, estimates that the house was in use for 1–40 years (95% probability), or 10–35 years (68% probability) and that it went out of use in 435–395 cal BCE (95% probability), or 425–405 cal BCE (68% probability).

### 3.3.3 Phase 1

The house was built directly over the natural peat [030A] (Chapter 17.2). The surface of the peat must have been relatively dry at the time of construction because trees were growing on the surface and had been chopped and burnt down, leaving the roots and stumps [049] *in situ* (Figure 3.52).

#### 3.3.3.1 The superstructure

The evidence for the superstructure of the house consists of an internal post-ring and an outer wall of two concentric stakelines (Figure 3.52). The internal post-ring [021] consisted of an arc of three posts which lie along a

projected circuit *circa* 7.2 m in diameter. Posts [021/A3], [021/B] and [021/C] are spaced 2 m and 3 m apart and are 0.16 m in diameter. Posts [021/A3] and [021/B] were both alder ([021/B] is the stake radiocarbon-dated in 2010 – SUERC 32597) and pencil-tipped earth-fast posts. Post [021/C] was a concave based oak post which appeared to have slipped off a horizontal log lying alongside it. Posts were not found along the projected circuit in the NE quadrant but the edge of the timber sub-floor lay along the circuit (see below) suggesting that the post-ring had formed a distinctive boundary within the house. A substantial oak post [021/D] found in position immediately adjacent to the kerb on the NE side of the hearth is also part of the primary superstructure. At 0.26 m diameter it was significantly larger than the post-ring posts and its concave base suggests that it was load-bearing (in section it can be seen to have slipped off one of the foundation logs [046]) so it may represent an inner post-ring around the hearth. It displayed two holes down one face which must relate to its function in that position, possibly to support a barrier around the hearth (Chapter 14.3.6).

Post [021/A3] was subsequently replaced by [021/A1], which was driven in tightly against the earlier post



Figure 3.53. Post [021/A3] (to left) was replaced by [021/A1] (to right).



Figure 3.54. Trench 1C looking S. In the foreground are the foundation stones [052] and behind them is the log surface [046]. The kerbstones of Hearth 1 lie in front of the logs and over the foundation stones.

with a wooden wedge [021/A2] inserted between them (Figure 3.53). The dendrochronological analyses suggest that this was done within a nine-year felling band but it is not possible to say whether this happened in either Phases 2 or 3.

The outer wall of the house consisted of two concentric stakelines set some 0.5–0.6 m apart. Between the inner stakeline and the post-ring there would have been an outer annulus some 2 m wide. The inner stakeline [016] lay in an arc just beyond the ends of the sub-floor timbers [009] (see below); its projected circumference is 10.8 m in diameter and it would have enclosed a floor area of roughly 92 m<sup>2</sup>. Stakes [015] on the NE edge of the house are probably part of the same stakeline as they lie along the projected circumference. The stakes forming [016] were of varying diameter and species (birch, alder and hazel), inserted to varying depths and spaced between 0.2 and 0.6 m apart.

The stakes forming [028] displayed the same mixture of species and variety in diameter but were more regularly spaced at *circa* 0.3–0.35 m apart. The projected circumference of [028] is 11.7 m in diameter and, as stake [015/1] lies along this circumference on the NE of

the house, it is assumed to be part of the same stakeline. Whilst [016] spans the width of the trench, [028] appears to terminate half-way across, ending at the point where another stakeline [040] cuts diagonally across the circuit of the outer wall (see below). One possible explanation for the termination of the outer stakeline at this point is that this is where the outer wall changed from stake-built to plank-built, as it does in ST2.

### 3.3.3.2 The foundation deposits

The foundations of the house were best-preserved in the centre of the house where the weight of the hearth stack had sunk the surrounding deposits below the standing water table. Here deposits [050] and [051] had been laid down directly over the peat. These primary deposits are very different from each other, and this suggests that they represent bundles of material brought in from different sources to form a firm dry surface for construction. Deposit [051] contained large quantities of bracken and alder offcuts (Table 14.4), and an insect assemblage characteristic of the relatively dry, mouldering organic litter found in old buildings (IN). Whilst the offcuts may have come from the construction of ST1 the insect assemblage indicates that



Figure 3.55. ST1 Section CD.



Figure 3.56. The E-facing section of Trench 1C. The log surface [046] has been sampled and below it the reeds and brushwood layer [050] is visible. The compaction of the underlying peat surface caused by the weight of the hearth complex is pronounced in this section, the log surface sloping down to the right towards the hearths. The hearth debris [019], the dislodged packing [027] and the patches of clay [037] can be seen across the middle of the section, under the clay [002].

occupation debris from another building had been dumped in the foundation deposits. Deposit [051] also contained trace amounts of domestic debris, charcoal and burnt bone. In contrast, [050] is dominated by layers of sedge and there were no insects, offcuts or domestic debris in this deposit, suggesting a quite different source. In the outer annulus of the structure, MM suggests that the upper surface of the peat [030B] may also have been a foundation surface which has not survived as well. The use of old occupation debris in the foundation deposits suggests that there may have been earlier buildings in the settlement, although no evidence has been found.

Deposit [051] was sealed by [052], an irregular layer of large flat stone slabs, some as much as 0.6 m across and 0.11 m thick (Figure 3.54).

This layer was some 3 m wide from W to E and was abutted to SW, SE and NE by a layer of tightly packed alder logs, [046], which were up to 0.25 m in diameter (Figure 3.55).

Layer [046] was most extensive to the SE of [052], where it formed a corduroy surface at least 2 m wide (Figure 3.56), sealing the reedy deposit [050].

To the SW of [052], the surface was only three logs wide, whilst to the NE it was represented by a single ash log (Figure 3.57). Occasional small stakes [053] were observed in between the logs of [046], possibly to secure the logs in position.

### 3.3.3.3 Hearth 1 and associated surfaces (Figures 3.52 & 3.57)

The first of a series of three hearths was built directly over the foundation stones [052]. Hearth 1 consisted of a rough kerb of large boulders laid just inside [046], within which a vacuous mound of sub-angular and rounded cobbles, 0.35 m high was built up. The cobbles were also piled up over the kerbstones

and were contained within a rectilinear framework of single logs [041]. The hearth, as defined by this framework, measured 2.5 m SW–NE and at least 2.0 m NW–SE. The surface of the hearth consisted of a deposit of yellow-orange clay [044] up to 0.03 m thick (Figure 3.58). It did not completely cover the cobbles, extending 1 m from the S-facing section of T1B and 1.3 m wide from SW to NE. Deposit [044] contained fuel residues in the form of charcoal and burnt peat, and food residues consisting primarily of burnt bone with trace amounts of cereal remains (MA). A loose brown clayey soil [036] had developed in the voids amongst the cobbles. Bones of a young pig were recovered from both [036] and [044], suggesting that the animal may have been roasted in the hearth (BO).

#### Surfaces around the hearth

Abutting the alder log framework [041] on the SW side of Hearth 1 was a corduroy surface formed from smaller alder logs [047], 0.10 m to 0.12 m in diameter, slightly misaligned tangentially with [041] (Figure 3.59). Surface [047] lay directly over [046] but extended SW for 1.4 m out over the surface of the natural peat [030], ending roughly on the circuit of the post-ring. To the SE of Hearth 1 [042] may represent the same surface (Figure 3.59). It had also been laid directly over the foundation logs [046] but was more irregular, consisting of bundles of small alder branchwood, 0.08 m in diameter on average.

#### Surfaces in the SW quadrant

In the SW quadrant a sub-floor of alder timbers [009] had been laid directly over [030B] (Figure 3.60). It extended from the post-ring [021] to the inner stakeline [016]. This sub-floor consisted of radial timbers 0.10 m to 0.12 m in diameter

and of varying lengths, spaced just over 1 m apart at their outer ends, in between which were smaller radially-aligned timbers laid at more irregular intervals. Bundles of small alder branchwood [010] had been laid tangentially between and over the radially-aligned timbers; there is some slight evidence that the branchwood may have been woven under and over the radial components.

A purple-brown organic layer [003], some 0.18 m deep lay amongst and over the timbers of [009] and [010] (Figure 3.61). The active floor surface of Phase 1 must lie at the base of this layer but it probably also contains later refurbishments of the floor surface which are associated with Phases 2 and 3. MM suggests that it was a gradually accumulated occupation deposit which contained domestic debris and evidence of trample. MA identified the heavily decomposed plant matter as sedges, rushes, wood and leaves, the components of the organic floors found in other structures on the settlement, as well as charred cereals, charcoal and charred peat.

Between the stakelines lay [018], an organic-rich deposit similar to [003] but more minerogenic (Figure 3.61). It contained one of the richest assemblages of carbonised macroplants found in the house (MA), as well as large quantities of charcoal and burnt bone (BO). Waterlogged grasses, leaves and plant stems may be the remains of flooring materials. A fragment of daub (SF12) and a small ceramic sherd (SF13) were retrieved from this deposit. It was quite restricted in area and may be a dump of domestic debris in this area; similar dumps of material were observed between the double outer walls of ST2 (Chapter 3.2.3.2).

Further out beyond the ends of the sub-floor structure was an extensive spread of charcoal [029] which was up to 0.08 m deep in places and was concentrated at the junction between the stakelines [016], [028] and [040]. It overlay the end of one of the radial timbers [009] (Figure 3.52). The composition of the charcoal in [029], dominated by hazel and roundwood, suggests that this was wickerwork, possibly from the outer walls, which had burnt down. This burning event probably happened in Phase 1 because it was sealed by later deposits ([008] see below). Deposit [029] contained an unburnt rodent bone (BO).

### Surfaces in the NE quadrant

The floor structure and sequence of deposits seen to the SW of the hearth were not mirrored to the NE of the hearth. Apart from the single ash log, the foundation layer of large logs [046] did not occur on this side nor was there a surface of logs like [047] extending out from the framework [041]. Instead, bundles of small branchwood [022] had been laid down over the ash log and out beyond post [021/C] (Figure 3.57). Over these was a roughly radial structure of larger alder and ash logs [012] in between which there were sparse bundles of tangentially aligned alder branches (Figure 3.62). It was found that [012] and [022] lay directly over the surface of the natural peat [030] and may be the

equivalent of sub-floor [009] in the SW quadrant. However, unlike [009] it did not extend from the post-ring to the outer wall but stops along a projected chord across the NE segment, leaving exposed peat beyond it. In amongst the

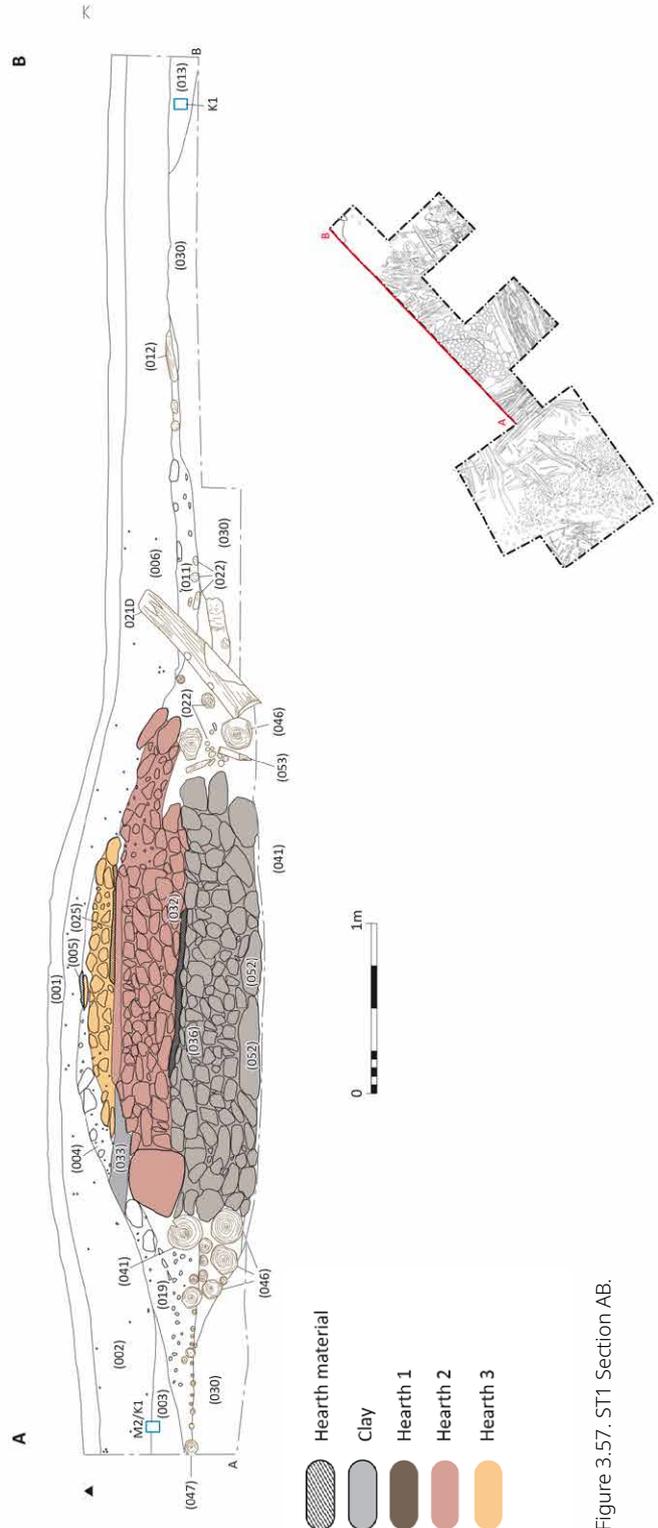


Figure 3.57. ST1 Section AB.



Figure 3.58. Hearth 1 with clay surface in place. The cobble mound below is just visible, contained within the log framework [041] visible to the left and right of the hearth.



Figure 3.59. The cobbles of Hearth 1 after the removal of the clay hearth base. The corduroy surface [047] lies to the right of the hearth and the corresponding log surface [042] lies to the top of the photograph.



Figure 3.60. The radial timber framework [009] to the W of the hearth. The tangential bundles of brushwood [010] can be seen between the radial timbers. The stone surface [008] is visible as an arc beyond the end of the radial timbers, extending SW into the upper corner of the trench.

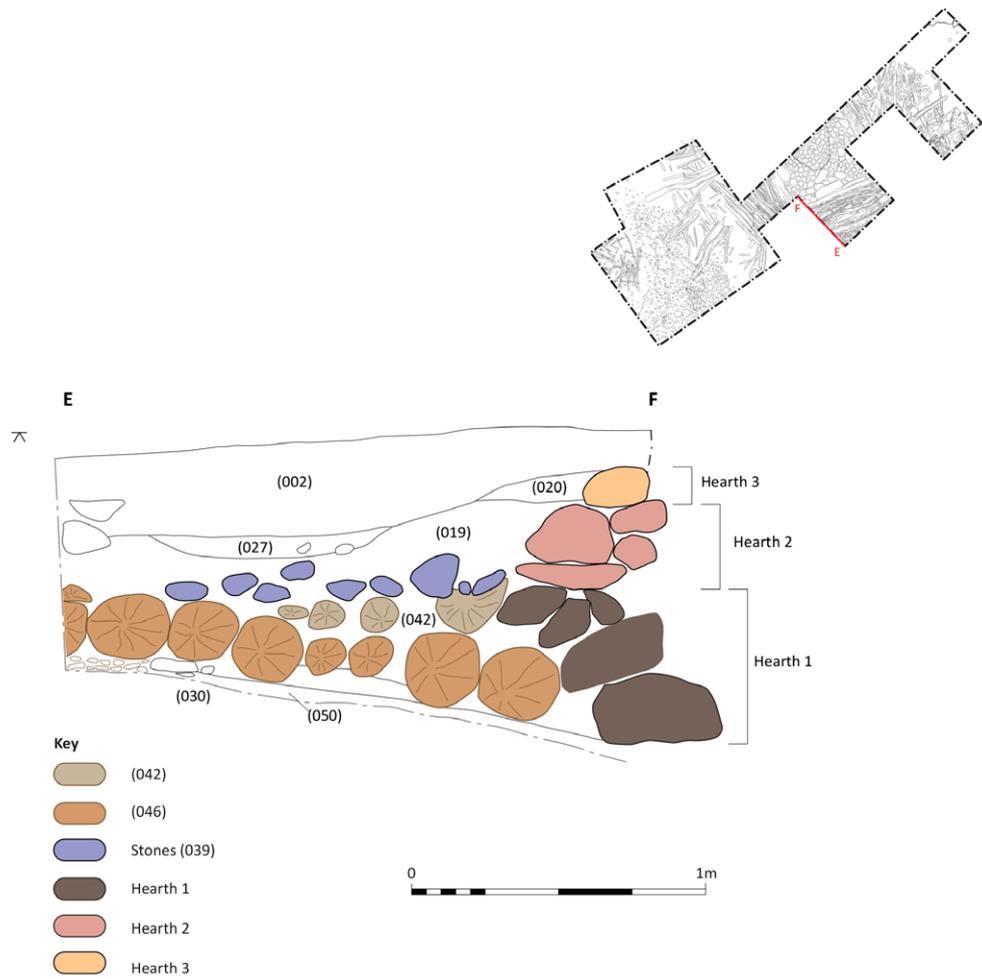


Figure 3.61. ST1 Section EF.



Figure 3.62. The radial timber framework [012] to the E of the hearth, with bundles of brushwood [022] between the radial timbers. Stones [023] lie along the edge of the radial timber framework defining a sharp edge over the natural peat surface.

timbers was an orange-brown organic deposit [011] which may be the equivalent of active floor [003] on the SW side. Like [003] it was composed predominantly of sedges and rushes but it did not contain any domestic debris (MA), whilst the insect fauna (IN) suggests that natural peat may also have been used to build up the floor. Other components of the insect fauna reflect conditions outside on this side of the house, ie damp ground, shallow pools and running water, whilst the relative abundance of dung beetles hint at domestic animals in the vicinity.

Throughout the occupation of the house the area between the post-ring and the outer wall in the NE quadrant remained clear of any floor surfaces. It is possible that there may have been a raised structure in this area which was subsequently removed. The only other deposit in this area was a patch of a very compact, fibrous organic deposit [013] which lay within the projected circuits of the outer wall lines. Deposit [013] is a highly organic deposit of decomposed banded plant matter which may be the remnants of stabling deposits (MM).

### 3.3.4 Phase 2

#### 3.3.4.1 Hearth 2 and associated surfaces (Figures 3.57 & 3.63)

The Phase 2 plan of ST1 is shown in Figure 3.63.

Hearth 2 was constructed in a similar fashion to its predecessor but was larger, measuring 2.5 m wide SW-NE and at least 2.6 m NW-SE. It was built directly over Hearth 1, a mound of loose cobbles being piled over the clay hearth surface [044] to a height of approximately 0.35 m (Figure 3.64). A loose brown clayey soil [032], very similar to [036] below the hearth base of Hearth 1, had also developed amongst the vacuous cobbles of Hearth 2. It contained no visible anthropic material other than fragments of burnt bone; this included a pig canine raising the possibility that, like Hearth 1, this hearth may also have been used to roast pigs (BO). The hearthstone was a large slab of greywacke, 1.20 m across W-E and extending out of the baulk for 0.5 m, placed on top of the cobble mound. A deposit of hearth debris [025], *circa* 0.01 m thick, lay over the hearthstone and spread over the cobble mound to the NE of the hearthstone. Deposit [025] contained quantities of both charred and uncharred hazelnut shell and a small amount of cereal grain (MA). Burnt and unburnt raspberry seeds might represent the use of dung as a fuel source. Burnt bone was present including a pig canine, raising the possibility that, as in Hearth 1 pigs had been roasted on this hearth.

The log framework [041] continued to define the SW and NE sides of the new hearth but large boulders had been placed just inside the logs to form a rough kerb. On the SE side the cobble mound spread beyond [041] and was contained by a stacked kerb of large, flattish stones

[043] which had collapsed outwards (Figure 3.63). A patch of pink-grey clay [037] and three small, poorly preserved lengths of roundwood [038] found amongst the [043] stones may represent packing to strengthen this side of the hearth (Figure 3.65).

#### Surfaces around the hearth

Abutting the kerb stones [043] was a spread of densely packed angular stones [039] which formed a surface in the SE end of T1C (Figures 3.61 & 3.65). Similar surfaces were not observed to the SW or NE of the hearth. Around the hearth to the NE and SE (where it lay over stones [039]) was a thick deposit of charcoal-rich clayey soil [019] containing lumps of burnt and unburnt daub (SF06); this contained significant quantities of carbonised cereal grain (MA) and burnt bone (BO) and probably represents numerous clear-outs of hearth debris mixed with the disintegrated clay packing around the hearth (Figure 3.56). Deposit [027], a hard-packed creamy grey clay flecked with charcoal and burnt daub, may represent dislodged patches of this packing.

#### Surfaces in the SW quadrant

In the outer annulus the active floor associated with this phase probably lies within [003] (see above). A spread of small angular stones [008] lay in an arc around the SW perimeter of the house, lying between the outer wall lines and extending into the outer annulus of the house where it appears to abut the active floor surfaces [003] and [018]. Charcoal-rich deposits [017] with trace amounts of food debris (MA) were found in discrete patches on top of [008].

#### Surfaces in the NE quadrant

A spread of small angular stones [034] in the SE end of T1D may be a continuation of the same surface as [008]. It lies in roughly the same position around the edges of the outer annulus. There was also a scatter of small cobbles [023] which lay over and around the edges of the timber sub-floor [012].

### 3.3.5 Phase 3

#### 3.3.5.1 Hearth 3 and associated surfaces (Figures 3.57 & 3.66)

The Phase 3 plan of ST1 is shown in Figure 3.66.

The third and final hearth was constructed in a similar fashion to its predecessors but it was smaller, measuring 2.5 m SW-NE but extending only 1.2 m NW-SE from the baulk. A mound of small cobbles had been piled onto the hearthstone of Hearth 2, to a height of 0.15 m. These were contained within a kerb of massive boulders on the SE and SW sides (Figure 3.67), whilst to the NE a pinky-grey clay [020], containing burnt daub and small amounts of food and fuel debris (MA), had been packed around the cobbles.

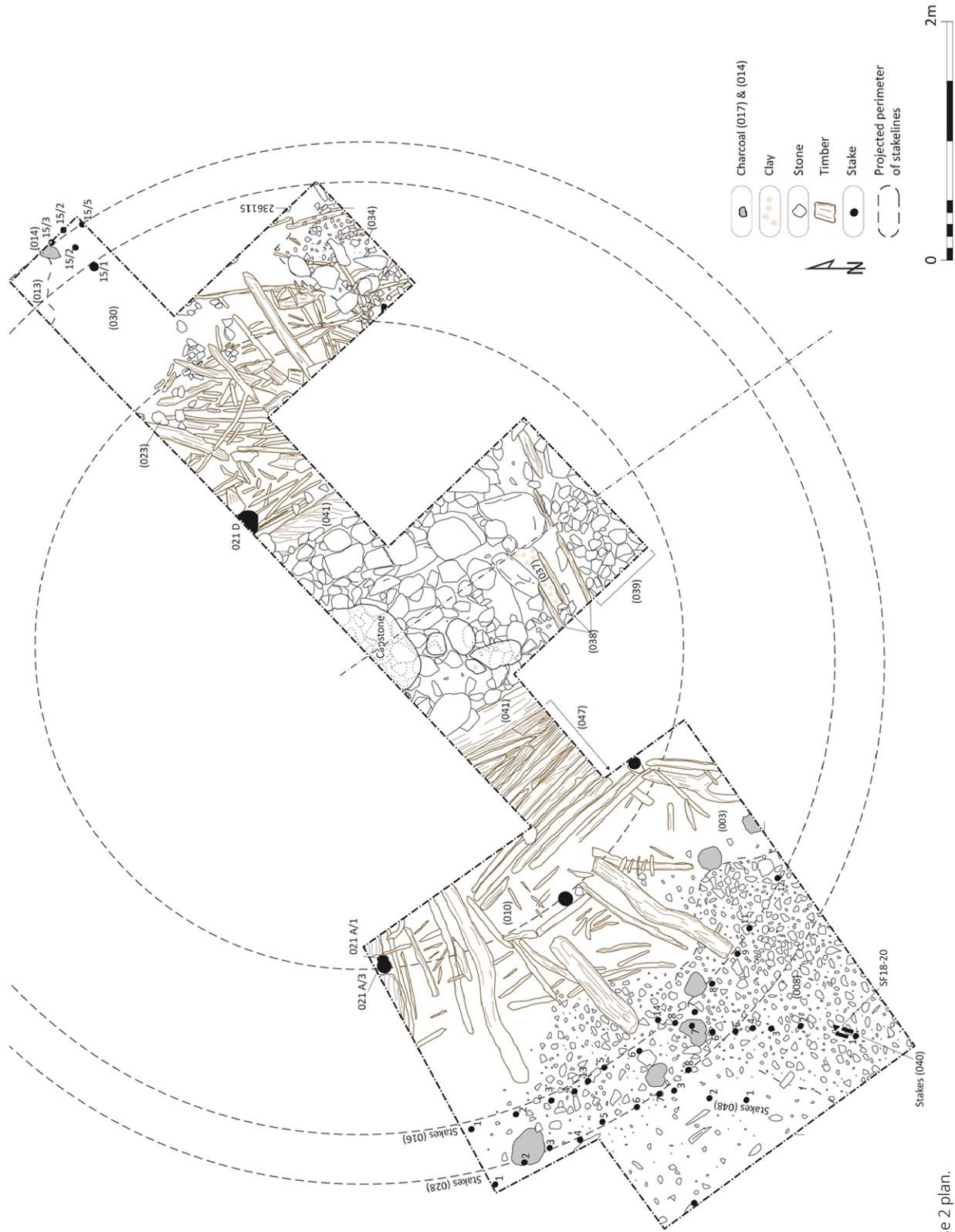


Figure 3.63. ST1 Phase 2 plan.



Figure 3.64. Hearth 2 with the hearthstone in place. The associated cobble mound is visible in the space left by the removal of one of the Hearth 1 kerbstones and in the foreground are the flat slabs [043] of the Hearth 2 kerb.

This clay packing had probably continued around the SE side because a discontinuous line of daub, some of it burnt and some unburnt (SF6), could be traced lying some 0.1–0.2 m behind the massive boulder kerb.

On the SW side of the hearth a creamy-grey clay [033], containing food and fuel debris and daub, may be the decayed remains of this packing, whilst on the SE side a charcoal-rich clayey soil [035] represents hearth clear-out; a possible polisher SF15 was retrieved from this deposit as well as food debris (MA). A large greywacke slab formed the hearthstone, 1.20 m W–E and 0.6 m N–S (Figure 3.67). A spread of heat-affected orange-red gravel [005], roughly 0.8 m in diameter and 0.02 m thick, lay over the hearthstone (Figure 3.66). Deposit [005] contained partially charred bone fragments, suggesting that domestic waste was regularly removed, thereby preventing continued exposure to heat (BO).

A charcoal-rich, grey-brown clayey soil [004] lay around the hearth and probably represents numerous episodes of hearth clear-out; it contained small amounts of charred food debris (MA) including burnt bone (BO). On the SW side it was packed in around the cobbles of the hearth and contained a number of saddle quern fragments (SF5 & SF11).



Figure 3.65. Hearth 2 after the removal of the hearthstone (still visible in the section). The flat stones of kerb [043] lie in the midground, the clay [037] and the roundwood [038] visible to the left, partially overlying some of the stones. In the foreground is the densely packed stone surface [039].

### Surfaces around the house

There was no evidence for refurbished floor surfaces around the rest of the house. These may lie within [002]/[006], a mottled yellow-grey clay which covered the site, up to 0.35 m thick on the slopes of the hearth complex but more commonly 0.1–0.12 m across the rest of the site (Figures 3.55, 3.57 & 3.61). Deposit [002]/[006] displayed the banding characteristic of trampled active floors (MM) whilst trace amounts of food and fuel debris were also found (MA). The iron ploughshare tip SF03 was found in [002].

#### 3.3.5.2 The exterior of the house

Deposits around the exterior of the house were only encountered in T1A where two stakelines extended out from the walls of the house and appear to demarcate different types of external surface (Figure 3.52). Stakeline [040] began on the line of [016] and headed in a S direction for 2.2 m. It consisted of nine stakes of birch, alder and hazel, spaced between 0.2 and 0.3 m apart. Just before the S end of the stakeline a group of three oak packing staves, SF18–20 (Chapter 14.3.8), had been driven into the ground to form a

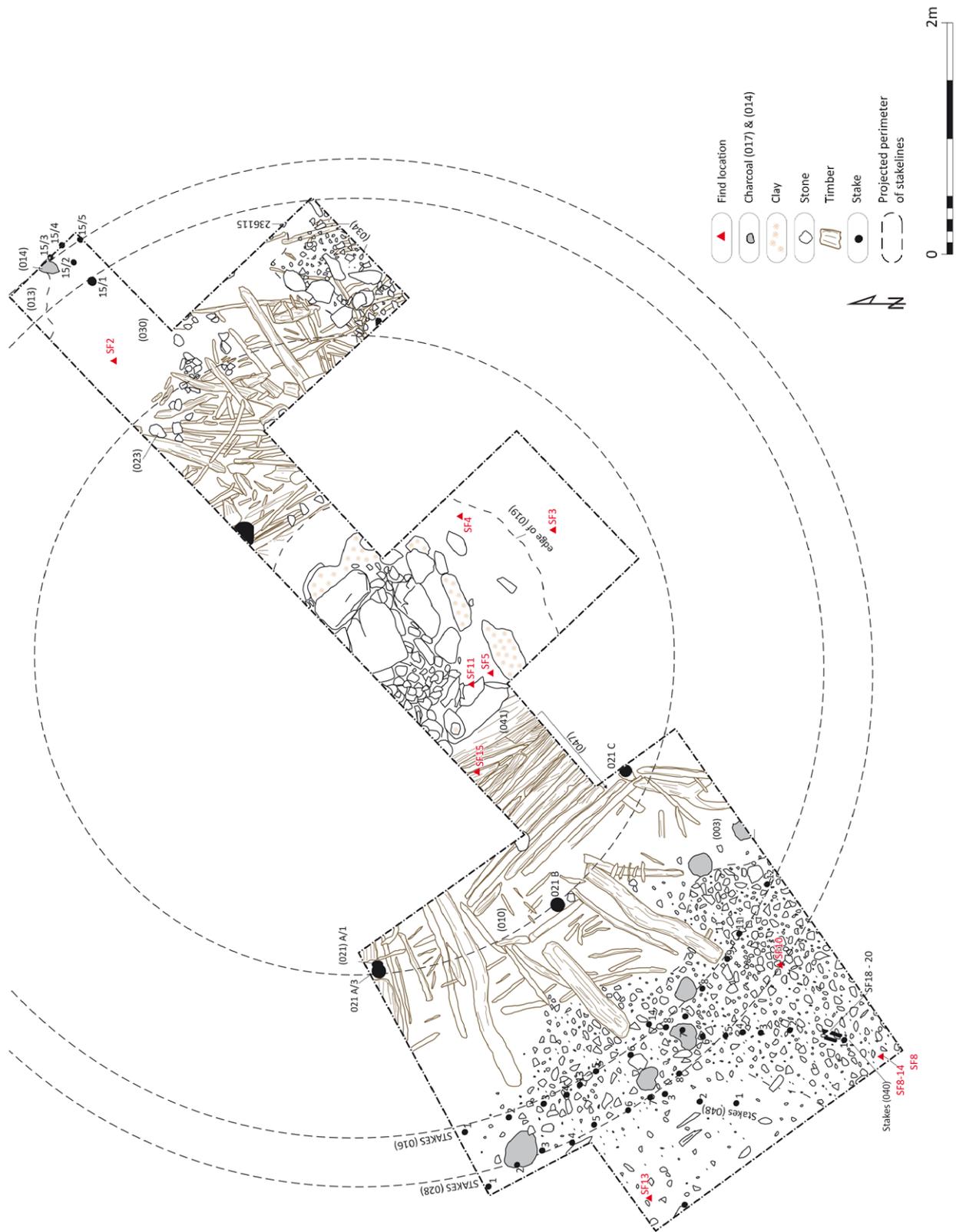


Figure 3.66.  
ST1 Phase 3 plan.



Figure 3.67. Hearth 3 after the removal of the hearth debris [005] and the clay packing [020]. The massive stone kerb is visible in the foreground and to the left.



Figure 3.68. The cluster of oak planks, SF18-20 *in situ*. The stake in the foreground is the most SW stake of stakeline [040].

very tight triangular cluster (Figure 3.68) which might have functioned as a foundation for a gatepost at the end of the stakeline. Another stakeline [048] started from the circuit of the outer stakeline [028] and consisted of only three hazel stakes running parallel to, and some 0.7 m to the W of [040].

The spread of small stones seen in the SW quadrant of the house interior, [008], extended out beyond the outer walls of the house and is very generally defined along its W edge by stakeline [040]. It is difficult to make sense of the relationships in this area. It appears that [008]

is a continuous spread, from the interior of the house, across the outer walls and around the exterior, but there is no evidence to suggest that the outer walls were not upstanding at this point. It is possible that there were interior and exterior spreads of stone, the boundaries of which have become obscured as the organic matrix has decayed away and the deposits have become conflated. Nonetheless, [008] provides evidence that areas around the house were surfaced. A randomly scattered spread of small branches [031] immediately to the W of stakeline

[048] provides evidence of other types of surfacing around the exterior of the house.

### 3.3.6 Summary of ST1

The limited size and position of the trenches means that only 27 m<sup>2</sup> (*circa* 29%) of ST1 has been exposed and consequently many aspects of its construction and history remain ambiguous. Furthermore, the deposits around the outer annulus of the house have been subjected to organic decay and subsequent conflation and mineralisation which has obscured the stratigraphic sequence. The main characteristics of ST1 are summarized below.

#### 3.3.6.1 Construction

ST1 was built directly on the surface of the peat. Trees were cut down to create the space and dumps of material were laid down over the peat to create a working surface on which the primary woodworking was carried out. A layer of large stone slabs was laid down over this surface to form a rectilinear foundation for the hearth and around this a surface of large logs was laid down. A radial and tangential timber framework of logs formed the sub-floor foundation.

The outer wall of the house consisted of a double line of stakes, the innermost of which would have had a circumference 10.8 m in diameter and enclosed an internal floor area of roughly 92 m<sup>2</sup>. A break in the outer stakeline on the SW side may signal the point at which the wall changed to a plank-built construction. The projected axis of the trackway (Chapter 3.1.2) would meet ST1 in the SE quadrant just at the point where an axial line through the rectangular hearth meets the outer wall, so this is the most likely position for the entrance into the house (Figure 3.52). There may have been a stone surface forming a yard on this side of the entrance.

Within the house the roof was supported by the post-ring which would have divided the interior into an inner space around the hearth *circa* 7.2 m in diameter and an outer annulus some 2 m wide. A large rectangular hearth had been built over the foundation slabs, its centre lying at the exact centre of the circumference defined by the outer stakelines. It had been rebuilt twice. Each of the three hearths had been constructed in a similar fashion; cobbles had been piled within a kerb of large stones and a surface, clay for the first hearth, and greywacke slabs for the later hearths, laid over the cobbles. The primary hearth mound was 0.35 m high; allowing for settlement and compression it may have originally been as high as 0.5 m above the surrounding surfaces.

#### 3.3.6.2 Use of internal space

One of the most significant results to emerge is the differences in layout within the structure and the variation in type of floor surface, particularly around the hearth. The NW side was not excavated but the

CONTEXT	MM	LB	MA	BO	INS
[002]	*		*		
[003]	*		*		
[004]			*	*	
[005]			*	*	
[009]	*				
[011]			*		*
[013]	*				
[017A & B]			*		
[018]			*	*	
[019]			*	*	
[020]			*		
[025]			*	*	
[029]			*	*	
[030B]	*				
[032]			*	*	*
[033]			*		
[035]			*	*	
[036]			*	*	*
[037]			*		
[044]			*	*	
[050]			*		
[051]			*		*

Table 3.3. Summary of ecofact analyses for ST1 contexts.

differences around the other three sides are striking. The foundation surface of alder logs is only found to the SW and SE of the hearth, as are the subsequent log surfaces. These are completely absent on the NE side where all that exists is a surface of radial and tangential logs laid immediately over the natural peat surface. The stony surface which lies to the SE of the hearth does not extend around the SW or NE sides. The occupation deposits in the SW and NE halves of the house are also strikingly different. Different types of plant litter appear to have been used for flooring, sedges and rushes on the NE and grasses and leaves on the SW, but the most significant difference is the absence of domestic rubbish on the NE side of the house. Food and hearth debris has been trampled into the floors on the SW side, bucket-loads of hearth debris have been spilt and hearth debris spilling out from the hearth has built up on only on its SW and SE edges. The artefacts were also found mainly on the SW side of the house and around the SW and SE sides of the hearth (Figure 3.66). The implication is that most domestic activity took place in the W half of the house and possibly to the N and S of the hearth. The complete absence of any evidence for floor surfaces in the outer

annulus on the NE side is also striking; one possible explanation is that there was a raised platform which was subsequently removed. There are also hints from the insect and micromorphological evidence that animals might have been stabled on the NE side of the house. The putative stabling deposit [013] lies on and beyond the boundary of the outermost stakeline so they may have been stabled outside rather than inside the house. The differences in flooring types and the spatial patterning of domestic debris suggests that, although no physical evidence for internal divisions was found, apart from that created by the post-ring, space within the house was divided both radially and concentrically.

### 3.3.7 ST1 ecofact summaries

Table 3.3 summarises the type of ecofact analysis undertaken for each of the contexts described below.

#### 3.3.7.1 [002]

##### Micromorphology

Deposit [002] is a trampled heterogeneous Type A occupation deposit that has been subject to compaction and some post-depositional pedoturbation. The strong horizontal banded distribution and organisation of components within [002] indicates that this context contains swept accumulated occupation debris. Bands of phytolith-rich, ash-like material and sub-rounded weathered charcoal are also consistent with sweeping (see Banerjea et al 2013) whilst anorthic patches of soil fabric indicate trampling in of sediment from outside the structure.

Observed pedofeatures include dusty clay coatings, which contain various silt-sized mineral and organic particles as well as clay. These types of features are generally indicators of disturbance, including cultural interaction with the soil resulting from such activities as deforestation, cultivation, levelling and construction (Jongerijs 1970; Macphail 1987, 1998) and are consistent with interpretation of this layer as Type A occupation/ flooring which developed within a prevailing damp environment.

##### Macroplants

The waterlogged remains included fragments of leaf, wood and a few goosefoot seeds. The charred macroplant assemblage was small and there were two cereal caryopses, one glume, seven fragments of hazelnut shell and peat. The cereal species were one barley caryopsis, one emmer glume and an emmer/spelt caryopsis. The macroplants recovered from [002] are representative of domestic activities such as cooking waste and hearth cleaning.

#### 3.3.7.2 [003]

##### Micromorphology

Deposit [003] is a Type A floor deposit consisting of fine occupational debris (charcoal, ash, charred material, etc) often unsorted but occasionally as alternating massive and more porous lenses and laminae. Areas with compact bedded microstructure are characterised by common horizontal referred orientation of the components, fine horizontal oriented elongated pores and vesicles usually concentrated in zones. Plant material is very strongly decomposed (*cf* Fitzpatrick 1993) and often associated with discontinuous patches of dominant phytoliths. Mosaic fabrics (where larger clasts are embedded in a dense finer groundmass: porphyric coarse-fine related distribution) are common.

##### Macroplants

The finds preserved in this floor surface through anaerobic means were dominated by building materials with smaller numbers of weeds. This contrasted with the carbonised remains which were mostly food and fuel waste.

The waterlogged building materials were formed of layers of sedge and rush stems along with fragments of wood and leaves. The weed species were small in both number and variety. The heath grass may have been a component of the flooring.

Those food plants were preserved entirely through carbonisation and were debris from the nearby hearth which had been accidentally trampled into the surface. There were 19 cereal caryopses, one fork and two glumes. These were identified as barley (23%), emmer/ spelt (18%), emmer (9%), spelt (9%), wheat (9%), six-row hulled barley (4.5%), bread/ club wheat (4.5%) and cereal (23%). Other food remains included eight fragments of hazelnut shell and one nut. There was evidence of fuel in the form of partly charred wood and peat fragments. Given the small quantity of domestic debris present this demonstrates that this active floor was kept relatively clean of daily debris.

#### 3.3.7.3 [004]

##### Macroplants

The waterlogged assemblage was small, and the most common find was raspberry seed along with trace amounts of sedge flooring material and weeds. The carbonised assemblage was equally small with one wheat, three cereal caryopses and six hazelnut shell fragments. These small quantities suggest that domestic waste was regularly cleaned and not allowed to accumulate in the hearth.

### Bone

There were 110 burnt fragments (12.6 g) of which the only identifiable fragment was an M/M long bone shaft. The small quantity of bone suggests that waste was regularly removed and not allowed to accumulate in large concentrations.

### 3.3.7.4 [005]

#### Macroplants

There were infrequent inclusions of waterlogged raspberry seeds, bark, wood fragments and moss. The carbonised assemblage consisted of only two fragments of hazelnut shell. The small concentration of domestic waste suggests that Hearth 3 was regularly cleaned, and the resulting debris was not allowed to accumulate in the near vicinity. It is also possible that this hearth was not used for an extended period thereby preventing a significant build-up of domestic debris from accumulating around it.

### Bone

There were 16 burnt fragments (1.1 g). None of the fragments were completely calcified and were only partially charred. This suggests that waste was regularly removed, thereby preventing large quantities of domestic waste from accruing in this location and becoming over-exposed to heat.

### 3.3.7.5 [009]

#### Micromorphology

Deposit [009] is a poorly sorted heterogeneous silt deposit which has accumulated between the radial alder timbers that comprise the sub-floor. It is predominantly organic but contains greater proportions of mineral material than the underlying layer [030B] including sub-angular lithic greywacke fragments. The unit also contains several anthropogenic indicators including large (>10 mm diameter) rounded cellular charcoal fragments of birch or alder (Schweingruber 1982) and several smaller cellular fragments of the same species. The plant material has a strongly expressed parallel arrangement and comprises fragments of herbaceous and woody tissues in varying states of decomposition (slightly to very strongly decomposed, following Fitzpatrick 1993). The remaining coarse material is randomly oriented and aligned but frequently has a clustered distribution. Occasional nodules of anorthic fabric embedded within the micromass are indicative of trampling in of material (possibly soil clasts) from outside the structure.

It is likely that this deposit was created primarily from sediment from the overlying units and is formed of elements that were trampled into gaps between the radial timbers, causing the distinctive arrangement of materials with reference to larger roundwood fragments. Anthropogenic indicators increase towards the top of the

unit, further supporting the hypothesis that trampling was the principal deposit formation process.

### 3.3.7.6 [011]

#### Macroplants

This organic deposit was composed mostly of waterlogged plants with only a single carbonised buttercup recorded. The assemblage was dominated by flooring material, specifically sedge and rush stems with a much smaller quantity of bracken and wood. The sedge and rush species were white sedge, glaucous sedge, hairy sedge, toad rush and jointed rush. Evidence for food was noted in the form of blackberry, but these finds could also have been weeds from plants growing nearby. The weeds were only a minor inclusion of the flooring.

The cleanliness of this flooring is surprising, with no evidence for any surviving hearth debris trampled into the surface. The presence of the yellow water-lily and cinquefoils coupled with the large quantities of small peat fragments perhaps indicates that this part of ST1 may have been continually damp or this material was accidentally introduced to the structure as a component of building material. This could help explain why layers of sedge and rush were rapidly built up in this area to keep it dry.

#### Insects

An assemblage of 120 beetles and bugs representing 74 taxa was recovered from a 4-l sample (concentration 30 MNI l<sup>-1</sup>). The composition of the assemblage was significantly different to those from floor layers elsewhere on the site. Diversity was high ( $\alpha = 82$ , SE = 14) with the fauna dominated by taxa from outdoor habitats (78% of the assemblage) and decomposers poorly represented (RT 15%). The composition of the assemblage suggests that the deposit included a significant amount of naturally formed sediment, probably peat, that may have been used to build up the mound and floor. There are many similarities with the assemblage from natural peat [15033] underlying ST3. An alternative explanation might be that the structure was open to the air and probably inundated at some stage, but the low numbers of decomposers are consistent with a largely natural deposit rather than typical occupation build-up.

Aquatic taxa accounted for a third of the assemblage. Damp ground/ waterside insects were common and included *Contacyphon* spp., representing a wet, well-vegetated environment with shallow pools of standing water, with wet waterside mud indicated by *Laccobius bipunctatus* and *Dryops*. *Euaesthetus ruficapillus*, a small rove beetle, occurs in permanently wet mire. *Limnobaris*, a weevil that feeds on sedges (*Carex*), may have been associated with the peat, but might also have been imported into the structure with collected wetland vegetation used as floor litter. Scarabaeoid

dung beetles were common (9% of the fauna). *Acrossus rufipes* is typically associated with herbivore dung deposited in the open (Jessop 1986: 20), but most of these remains were too fragmentary for close identification. There was no evidence in the rest of the insect assemblage to suggest that the abundance of dung beetles is linked to the stabling of animals. Hydrophilid beetles associated with dung and other foul organic matter and other beetles exploiting nutrient-rich open-textured decaying vegetable matter are more characteristic of stabling deposits than scarabaeoid beetles (Kenward & Hall 1997), and none were recorded here. It therefore seems most likely, given the composition of the rest of the assemblage, that the high proportion of dung beetles relates primarily to domestic animals living in the vicinity whilst the peat or other sediments used to build up the floor were forming.

Few synanthropes were recorded (3%), a single *Latridius minutus* group providing a slight hint of a house fauna. Sclerites of a single saw-toothed grain beetle (*Oryzaephilus surinamensis*) are at odds with the date of the deposit since it has not been previously recorded from deposits pre-dating Roman occupation in Britain (eg Buckland 1978; Smith & Kenward 2011). Laboratory contamination is a possibility for its presence here, however (see discussion).

### 3.3.7.7 [013]

#### Micromorphology

Deposit [013] comprises a highly organic, banded deposit. It was sampled in ST1/K1 and comprises three distinct sedimentary Type B units distinguishable by differences in porosity and preservation of organic matter (generally more decomposed upwards). Clasts of fine greyish micritic silt (possibly daub) were observed within Unit 2 and are rare examples of mineral material within a predominantly organic context. These silt clasts have sharp boundaries with the surrounding micromass and are anorthic (*cf* Stoops 2003), likely incorporated through trampling. Charcoal inclusions are present throughout the context and provide further clear evidence for anthropogenic activity. The charcoal was not associated with ash or other anthropogenic material and may thus also have been trampled into the deposit. It is possible that this is a Type H stabling deposit; the decomposed banded plant matter could represent the remnants of a banded stabling deposit where the finer boundaries have been blurred through decomposition of organic matter and shrink swell processes post-deposition, but the poor preservation of the unit makes it difficult to be certain.

### 3.3.7.8 [017A] & [017B]

#### Macroplants

The waterlogged assemblage from these two contexts was poor and the only finds were leaf fragments, wood and sedge

nutlets. The carbonised macroplant assemblage was equally small. In [017A] there were three cereal caryopses, two chaff and one hazelnut shell. The species were one six-row barley, one spelt, one emmer/ spelt caryopsis, one wheat and one cereal. The carbonised finds from [017B] consisted of one sedge, one fat hen, one buttercup achene and some peat fragments.

### 3.3.7.9 [018]

#### Macroplants

The waterlogged assemblage was relatively large and consisted of edible plants, floor material and weeds. The food remains were hazelnut shells and raspberry seeds. The floor material was composed of layers of sedge and rush stems, heath grass along with buds, leaves and wood. A small quantity of peat was observed.

The carbonised macroplant remains were dominated by food remains, particularly hazelnut shell that totalled 96 fragments and two whole shells. There were 46 cereal caryopses and five chaff fragments. The species were wheat (31%), emmer (27%) followed by bread/ club wheat (8%), six-row barley (4%), emmer/ spelt (4%), barley (2%) and cereal (24%). There was evidence that some of the bread/ club wheat had begun to germinate. Other charred plant remains include eight fragments of bracken, a single sedge nutlet, one fat hen, a fragment of moss and some charred peat.

Analysis of the macroplant assemblage confirms that this was a floor deposit built using rush, sedge, grass and wood. The inclusions of carbonised cereal and peat indicate that some domestic waste was trampled into this surface making it one of the dirtier floors associated with ST1.

#### Bone

There were 236 burnt fragments (22.4 g). An L/M tooth and M/M foot bone were identified.

### 3.3.7.10 [019]

#### Macroplants

The waterlogged assemblage was relatively small, the largest component of which was raspberry seeds. Other finds included rush, heath grass and leaf fragments that were part of a decayed floor that surrounded the hearth. The weeds and moss are accidental inclusions.

In contrast the carbonised assemblage was richer and contained 140 cereal remains and seven raspberry seeds. The cereal caryopses and chaff were identified as emmer (74%), bread/ club wheat (13%), six-row barley (4%), wheat (2%), barley (1%) and cereal (6%). The cereal represents clear-out from the hearth. The inclusions of chaff could be residual waste from small-scale processing that occurred within ST1, but it is also possible that this material was recycled for kindling. Fragments of charred peat and dung were recovered from this sample and

represent the remnants of fuel debris. Both the waterlogged and charred raspberry seeds could be food refuse but some could have been accidental inclusions within the burnt dung.

#### **Bone**

Of 129 burnt fragments (41.7 g) a single bone was identified as an M/M rib.

#### **3.3.7.11 [020]**

##### **Macroplants**

The waterlogged assemblage was very small but there was still some evidence of plants that may have been used as flooring and for food. The sedge and wood were part of a decomposed floor whereas the raspberry was a potential food source. The carbonised remains were equally sparse and totalled seven cereal caryopses, three chaff fragments and 13 fragments of hazelnut shell. The cereal species were three barley, one emmer and six cereal caryopses. The charred cereal and hazel are hearth refuse which was re-deposited within the material used for packing around the hearth.

#### **3.3.7.12 [025]**

##### **Macroplants**

The major component of the waterlogged assemblage was wild food resources such as hazelnut shell and, to a lesser degree, raspberry seeds. The building materials were limited to background traces of sedge, leaf fragments and buds which were probably part of the floor that bordered the hearth. The only weed species were a small number of annual nettles. The only other find was some moss leaves.

Wild food resources also dominated the carbonised assemblage, particularly hazelnut shells. Fragments and whole shells totalled 114. The nuts were probably first used for food and the shell recycled later as kindling. Other edible food resources included seven cereal caryopses and chaff fragments along with five raspberry seeds. The cereal was three emmer, two barley, one emmer/ spelt and one cereal. The charred raspberry seeds could represent cooking waste, but they could also have been inclusions within the dung. Carbonised fragments of peat and dung testify to their use as fuel.

#### **Bone**

Of 307 burnt fragments (29.2 g) one was identified as an M/M long bone shaft.

#### **3.3.7.13 [027]**

##### **Macroplants**

The waterlogged macroplants from this deposit were rare and there were a few raspberry seeds, leaf fragments, wood fragments, chickweed and moss stems. There were no carbonised plant remains. The finds were of little

interpretive value and the most that could be stated is that these macroplants were accidentally reworked into the packing material on this side of the hearth.

#### **3.3.7.14 [029]**

##### **Macroplants**

The waterlogged plant remains consisted of small quantities of building material, food and weed species. The flooring material was formed of sedge, rush, leaves and wood. Edible food items were hazelnuts shell and raspberry seeds.

The largest find within the carbonised assemblage was burnt peat, probably the remnants of fuel refuse. Other carbonised finds included five cereal caryopses, one glume, two hazelnut shell and some fragments of bracken. The cereal was one six-row barley, one barley, one emmer, one spelt and two cereal. The charcoal assemblage suggests that a wickerwork screen may have been burnt in this location so the burnt bracken may have formed part of this burning event.

#### **Bone**

Of the 13 fragments of bone (1.2 g), 12 were burnt. The only unburnt fragment was a rodent vertebra facet. As there were only trace amounts of burnt bone it is likely that food waste was only a minor component of this deposit and does not represent deliberate disposal of domestic debris. The rodent bone was probably *in situ* and reflects conditions in and around ST1.

#### **3.3.7.15 [030B]**

##### **Micromorphology**

Whilst the lower units of [030] ([030A]) are consistent with a naturally accumulated peat deposit, the surface of the context [030B] is identifiable as a separate deposit when viewed in thin section. Deposit [030B] contains quantities and distributions of minerals and compressed plant material not typical of natural peat. Of note are micro lenses with strong parallel orientation of coarse mineral and organic components which are characteristic of Type A active floors. Worked wood fragments were also observed but only rarely and not in comparable quantities to those observed at nearby Whitefield Loch where it was hypothesised that they were a deliberate addition to raise or level the floor (Cavers et al 2011). Deposit [030B] reflects the transition from peat to the occupation surface and is accordingly interpreted as a sub-floor over which the later timber sub-floor [009] was constructed. There is no micromorphological evidence for the deliberate deposition and preparation of [030B] as a clean surface for construction. However post-depositional changes, including water inundation, have blurred the distinction between these deposits and thus the premise that

a deliberate preparation of the ground surface occurred prior to construction cannot be discounted.

### 3.3.7.16 [032]

#### Macroplants

The waterlogged assemblage was small and was composed of building materials, wild food and weeds. The floor materials were rush, leaf fragments, wood and possibly heath grass. Food remains included hazelnut shell and raspberry. There were 11 carbonised cereal caryopses, 29 hazelnut shell and one whole nut. The cereal species were one emmer, one spelt, three wheat, one six-row hulled barley, three barley and two cereal. The waterlogged and carbonised macroplant represents flooring and food debris which has trickled down from the hearth and accumulated in the vacuous rubble mound below.

#### Bone

There were 156 burnt fragments (38.4 g). The identifiable skeletal elements were composed of one pig canine, two M/M ribs and an M/M metapodial. Whilst most of the fragments were completely calcified a small proportion had only been partially charred.

#### Insects

Remains of around 25 beetles were recorded by scanning. Preservation was moderate to poor. *Contacyphon*, the most common taxon, and *Dryops* are indicative of marshland with shallow pools and wet waterside mud. Very pale and considerably eroded *Cercyon* fragments could not be closely identified, but they may be a remnant of a fauna associated with an occupation deposit. Several sclerites from a single *Nebria brevicollis*, a common eurytopic ground beetle, were complete and excellently preserved in contrast to the rest of the assemblage, probably suggesting a very recent origin.

### 3.3.7.17 [033]

#### Macroplants

The waterlogged assemblage was relatively small but there was still some surviving evidence of floor material and food remains. Plants used for flooring include sedge, birch buds, leaves, bark, wood and heath grass. There were also infrequent inclusions of both hazelnut shell and raspberry seeds. A large quantity of moss leaves was noted which could have been accidental inclusions within the bark and wood fragments. These finds are a small mix of decayed floor and food residue which has been re-deposited within the hearth packing.

The carbonised assemblage included 21 cereal caryopses, two chaff fragments and three fragments of hazelnut shell. The species were emmer/ spelt (35%), wheat (13%), emmer (9%), six-row hulled barley (4%), barley (4%), spelt (4%) and

cereal (31%). The carbonised cereal, hazelnut shell and wood are domestic food and fuel refuse from the hearth re-deposited within the surrounding packing material.

### 3.3.7.18 [035]

#### Macroplants

Both the waterlogged and carbonised macroplant assemblage from this context was small and relatively insignificant. The waterlogged remains were raspberry seeds, bracken, moss leaves and peat fragments. The charred food remains were identified as seven cereal caryopses and eight hazelnut shells. The cereal species were one bread/ club wheat, one emmer, one emmer/ spelt and four cereal. The waterlogged and carbonised plant assemblage is consistent with domestic food debris being accidentally spilled and trampled into a decomposed floor.

#### Bone

There were 168 burnt fragments (30.8 g) of which one tibia and rib from a medium-sized mammal were identified.

### 3.3.7.19 [036]

#### Macroplants

Both the waterlogged and carbonised assemblages from this hearth fill were very small. The waterlogged plants were composed of some sedge, rush stems, buds, leaves, wood fragments, heath grass and moss. It is likely that some of these plants originally formed part of a floor which has subsequently decayed and was thrown onto the hearth. The waterlogged food remains were hazel and raspberry, alongside two carbonised cereal caryopses and hazelnut shell.

#### Bone

There were 252 burnt fragments (24.3 g). A tooth, metapodial and second phalanx from a pig were identified. There was also an M/M sized rib. The phalanx was unfused indicating the animal was younger than one year at time of death. A young pig or joints of pork may have been roasted in this hearth.

#### Insects

An estimated 40 beetles and bugs were recorded by scanning. The remains were variably preserved (good to very poor), with most sclerites/ fragments showing some degree of chemical erosion. *Cercyon* remains were particularly badly affected being very pale and surface-eroded; some were *C. analis* but the rest could not be confidently identified. It is possible that the most poorly preserved material, mainly of decomposer taxa, had originated within an occupation deposit, but the taxa identified are all generalists associated with many forms of decomposing plant litter.

The most common beetles were *Contacyphon* sp(p), typically found in well-vegetated marshy areas with shallow

pools of standing water, again perhaps indicating either the use of wetland sediments for building up the mound, or encroachment of the building by marshland. The *Contacyphon* remains were in a much better state of preservation than the rest of the assemblage, perhaps suggesting different origins, so their arrival as a result of inundation is very plausible. An alternative interpretation that the *Contacyphon* were introduced with rushes or reeds used as floor litter in the building seems less likely since there were few traces of such plant remains in this deposit (Robertson, plant report),

### 3.3.7.20 [037]

#### Macroplants

The waterlogged assemblage was minimal and consisted of a few raspberry seeds, wood fragments and goosefoot seeds. The carbonised remains numbered eight cereal caryopses and one hazelnut shell. The species were three barley, one emmer/spelt, one wheat and three cereal. The cereal, hazel and raspberry are food refuse reworked into the packing material.

### 3.3.7.21 [044]

#### Macroplants

The waterlogged assemblage consisted of a few leaves, wood and moss fragments. The most common find within this deposit was a large concentration of burnt peat recovered alongside one six-row hulled barley caryopsis, two fragments of emmer chaff, one sedge, one poorly preserved seed and a fragment of moss. The burnt peat and cereal have derived from fuel and food debris related to the use of this hearth. The other finds are of little interpretive value.

#### Bone

There were 281 burnt fragments (26.2 g). A pig canine along with four M/M ribs and one M/M phalanx were identified. Whilst only a single skeletal element was identifiable as pig it is possible these remains derived from the roasting of a single pig or of joints of pork.

### 3.3.7.22 [050]

#### Macroplants

This was a foundation layer created to form a stable and waterproof surface suitable for construction. The macroplant assemblage was preserved entirely through anaerobic conditions and was composed mostly of building materials along with smaller numbers of invasive weeds.

The flooring material was formed of discrete layers of plant stems, bracken, leaves, buds, twigs and wood fragments, some of which were worked offcuts. The plants stems were a mix of glaucous sedge, hairy sedge and jointed rush as nutlets and seeds from these species were intermixed within the stems. The weed assemblage was

dominated by fat hen and oraches. It is probable these plants grew in this location and the foundation deposit was dumped on top of them as it was either too labour intensive to remove them or they were purposely left *in situ* to add additional flooring material.

The only other finds were a few inclusions of moss leaves and peat fragments. The absence of any domestic debris indicates this foundation layer was deposited rapidly, preventing the opportunity for domestic refuse to become trapped within the deposit.

### 3.3.7.23 [051]

#### Macroplants

The plant assemblage from this foundation layer was generally waterlogged with only two carbonised finds. The plants were composed mostly of building material followed by weed contaminants and possible evidence of wild food.

The floor layer was dominated by layers of bracken, twigs, worked wood offcuts with smaller numbers of leaves and buds. The large concentration of bracken, twigs and wood was probably to provide a temporary working surface and is suggestive of bundles of different materials being dumped rapidly over the area. Wood was possibly prepared on the surface, hence the offcuts, or they may have been deliberately laid down as part of the floor. The leaves and buds were intrusive material that was stripped from the timber during its preparation. The only plant remains found to be carbonised were two tree buds. Sedge and rush stems were a more minor component of this floor formation.

A small quantity of hazelnut shells was observed. These are more likely to be the remains of discarded food rather than an accidental inclusion brought in with the hazel wood used in the structure.

The weeds were varied and some, including the heath grass, may have been used as flooring material alongside the other building resources, especially as sedge and rush were not used in the same quantities as they had been in deposit [050]. Other accidental inclusions were moss leaves and peat. The weeds are intrusive species found in a range of waste ground, woodland and damp habits which could easily have been transported along with the flooring materials or were already growing directly on the site or nearby.

The construction of deposit [051] is like [050] in that both bracken and wood were dominant and that the material was deposited rapidly. The most notable difference was that sedge and rush were present within [050] in much larger concentrations when compared to [051]. This discrepancy could be due to the unavailability of sedge and rush but as these deposits were probably laid down simultaneously it is more likely that it was instead easier to dump bundles of bracken and wood offcuts in this area.

## Insects

A 2-l sample from a deposit underlying the hearth complex produced a large assemblage of 340 beetles and bugs of 117 taxa (170 MNI l<sup>-1</sup>). Fragmentation was relatively low and preservation generally good, with only a minority of sclerites softened to some degree. Diversity was moderately high ( $\alpha = 63$ , SE = 5) and the assemblage consists of a combination of taxa exploiting damp plant litter within the building and from the natural peat.

Decomposers with a low diversity were the dominant ecological group (RT 58%,  $\alpha$ RT = 11, SE = 1). Most significantly, they included a sizeable house fauna (*Latridius minutus* group, *Atomaria*, *Cryptophagus* spp.; 16% of the assemblage) strongly suggesting that discarded litter from a pre-existing building had been incorporated into the foundation deposit. *L. minutus* group is particularly characteristic of a house fauna being commonly associated with dry, mouldering vegetation, frequently occurring in stables, hay/ straw, rotting provisions and other relatively dry decaying plant debris (Palm 1951; Horion 1961). An indeterminate flea (Siphonaptera) body segment almost certainly belongs with the house fauna. Other decomposers were mainly generalists found in damp plant debris, amongst which *Clambus pubescens* and *Orthoperus* were particularly abundant, and *Cercyon analis* and *Carpelimus bilineatus* group common, all probably living and breeding either within the damper parts of floor litter, either in its original location, or following its deposition onto marshland.

Insects from aquatic and terrestrial outdoor habitats made up just over a quarter of the assemblage. Some of these may have been contained within dumped floor litter but others more likely represent the pre-structure environment. Aquatic taxa (9% of the whole assemblage) included several *Anacaena globulus*, which most commonly occurs at the edges of slow running water in partial shade but can also be found by permanent still waters, in wet peat, and in marshy places (Foster et al 2014: 43; 2018: 146), and *Agabus sturmi* which generally lives in vegetated permanent waters (Foster & Friday 2011: 50). Other taxa typical of wet peat and marshy places included *Contacyphon* and the ground beetles *Elaphrus cupreus*, *Pterostichus minor*, and *P. ?diligens*. Other beetles are suggestive of disturbed or cultivated ground: *Meligethes* larvae and *Phyllotreta nemorum* group are associated with a variety of wild and cultivated brassicas, and *Chaetocnema concinnum* or *picipes* chiefly with knotweeds (*Polygonum*). There were indications of local trees or shrubs from a *Crepidodera* species found on willows or poplars (*Salix* or *Populus*), and *Salpingus planirostris*, found under bark or in the passages of bark beetles (Scolytinae). Grassland habitats were suggested by beetles such as *Mecinus pyrae* found on ribwort plantain (*Plantago lanceolata*), *Longitarsus* (at least seven individuals), and *Phyllopertha horticola* and *Dascillus cervinus*, both of which have turf-feeding larvae. In archaeological contexts, *P. horticola*, a small chafer represented by at least five individuals, is sometimes suspected of having been imported in turf or

cut vegetation such as hay (Kenward 2009: 292) but no plant macrofossils suggestive of the use of turf were identified from this deposit (Robertson, plant report).

Scarabaeoid dung beetles (*Geotrupes* s.l. and several Aphodiinae spp.) accounted for 2% of the assemblage and at least some of these may indicate a low-level presence of grazing animals nearby; *Teuchestes ?fossor* and *Acrossus depressus* are typical of dung deposited in the open, the former most often associated with cattle dung. *Melinopterus prodromus/ sphacelatus* and *Agrilinus ater* will also exploit other foul matter including foul habitation waste, and some species hibernate in flood refuse (Jessop 1986: 20–25).

## 3.4 Structure 5 (ST5)

### 3.4.1 introduction

ST5 is one of the more prominent mounds on the site, standing to a height of 0.45 m above the surrounding ground surface. Probably as a result of its height the mound is relatively well-drained and therefore supports a number of large multi-stemmed sycamore trees (Chapter 1, Figure 1.7). Consequently, the mound was never considered for excavation because the roots are likely to have already caused considerable damage to the archaeological deposits. However, the SW extension of Trench 2 inadvertently clipped an arc of its perimeter and it was thus possible to establish that the mound was indeed a roundhouse, like its neighbours.

### 3.4.2 Chronology

Dendro analysis of the two oak plank fragments from the wall produced a *tpq* of 573 BCE for the construction of ST5. However, correlations between two of the hazel stakes in stakeline [289] and the ST2 hazel master chronology *ST2x16HAZ* indicate that they were all felled at the same time. Furthermore, strong correlations between the ST5 oak and some of the ST2 oak sequences also suggest that they were contemporary. Therefore, it is argued that ST5 was probably also built in 435 BCE at the same time as ST1 and ST2, and that some 138 growth rings had been trimmed or decayed off the fragmentary planks.

### 3.4.3 Structural evidence

The outer wall of the structure was defined by an arc of seven hazel stakes, [289], of which only a 2.2 m length was exposed in the corner of the trench (Figure 3.69).

The stakes survived to depths varying from 0.10 m to 0.071 m and were irregularly spaced between 0.3 m and 0.5 m apart. A bundle of hazel withies [298] could be all that remains of the wickerwork construction of the outer wall (Figure 3.70).

The evidence for the inner wall consisted of two vertical oak planks [288] set some 0.3 m inside the outer wall (Figure 3.71). The planks were in poor and fragmentary



Figure 3.69. ST5 plan and section.

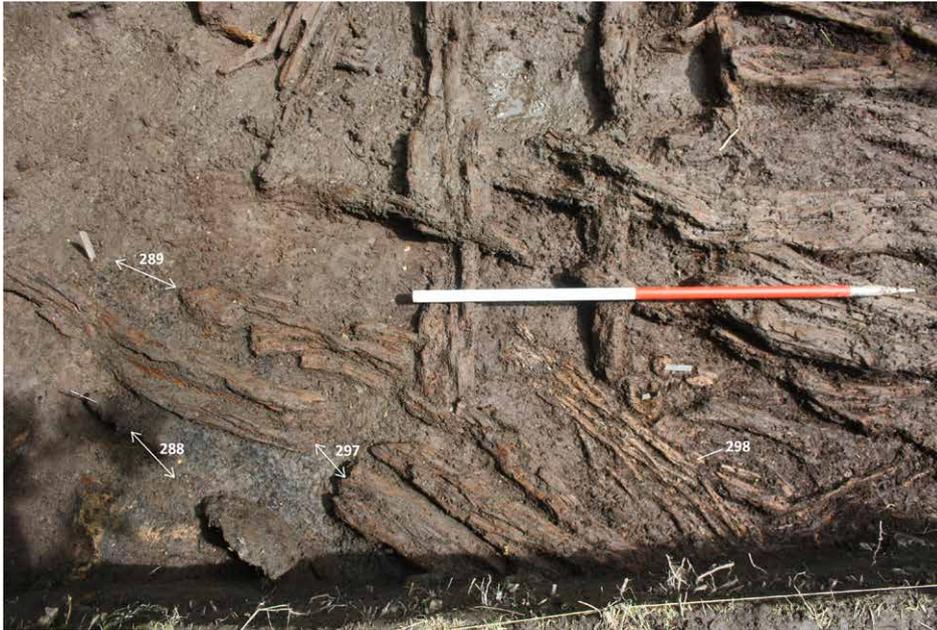


Figure 3.70. The oak planks of the inner wall [288] can be seen just in front of the baulk, whilst the outer wall is represented by stakes, one of which is marked by a garden tag, and the bundle of withies just below the ranging rod. The timbers [297] lie between the two walls but probably represent post-abandonment tumble.



Figure 3.71. The oak planks of the inner wall [288]. The planks appear to sit within a shallow groove. Just in front of the plank are withies which may be the remains of a wickerwork wall.

condition. It appeared that [288/1] was sitting in a shallow groove but it was not clear whether it had been deliberately cut or whether it had been created simply by ramming the plank into the peat. Within the groove were some poorly preserved withies aligned along the width of the planks (Figure 3.71). These may be all that remains of a wickerwork wall which continued in front of the planks; a single alder stake [299] had been inserted just in front of plank [288/1] and may represent an upright of that wall. A shard of oak plank was also found in the N baulk suggesting that the oak plank construction may have been continuous along this stretch of the inner wall.

A group of poorly preserved timbers [297] aligned along the arc of the house appeared to lie between the inner and outer walls of ST5 (Figure 3.70), and it was initially thought that they formed an infill for the void between the walls. However, it became clear that they in turn lay over one of the transverse supports of the trackway and therefore it seems more likely that they represent movement or tumble from the trackway after both the trackway and house fell out of use. MM shows that the matrix of the timbers was very heterogenous, incorporating charred organics and mineral deposits, and thus consistent with a tumbled deposit.

The inner and outer walls were sealed by a series of charcoal-rich deposits. The lowermost deposits [293] and [294] lay directly over the natural peat and over timbers [297]. They merge together and probably represent the same event, although [293] was also distinguished by patches of yellow clay and a crumbly orange-red soil. Deposit [293] contained both hearth waste and stabling waste which may have been deliberately deposited in the wall cavity as insulating material (MM). They are both sealed by a more extensive deposit, [287], a grey clayey soil which was also charcoal-rich and contained large fragments of carbonised oak timbers. MM suggests that [287] may have been a dumped or swept deposit incorporating a mixture of food and fuel debris. It covered the NW corner of the trench and extended just beyond the arc of stakes [289].

Deposits [287], [293] and [294] contained varying mixtures of alder, hazel and oak charcoal, and carbonised food residues including hazel nutshell, cereal grain and bone (MA). MM has also identified the presence of ash and possibly stabling waste in [293]. These contents are indicative of domestic debris including hearth waste. It is possible that the lower deposits [293] and [294] represent packing in the cavity between the inner and outer walls, as was seen in ST2 but the upper deposit [287] more likely accumulated after abandonment, the large fragments of oak charcoal possibly representing the destroyed remnants of the plank walls.

### 3.4.4 Interpretation

Despite the very small area of ST5 that was exposed it is possible to suggest that the roundhouse was of similar construction to that of its neighbour, ST2. The exposed arc was only some 2.2 m long but if projected it would have lain along a circuit roughly 13 m in diameter. The outer wall of ST2 is flattened at points around its circuit so it is possible that the exposed arc of ST5 is also a flattened stretch and that the estimated diameter is an overestimate. Nonetheless, the mound itself is significantly larger than those of ST1 and ST2 so the estimated diameter might not be too far out.

ST5 displays a double outer wall, like both ST1 and ST2. Both the inner and outer wall lines of ST2 were mainly built other than on either side of the entrance where they were plank-built, and at the junction with the trackway, where the outer wall line appears to have been reinforced with planks. A plank-built construction was only observed along the inner wall line of ST5 but it is likely that, as in ST2, the oak planks signify the approach to the entrance. If the entrance faced towards the trackway, as it does in ST2, then it would have lain in the SE quadrant of the structure. ST5 lies tightly up against the trackway, the transverse timbers of the trackway butting against its E wall, so that as both structures decayed after abandonment trackway timbers [297] tumbled over into the wall cavity.

CONTEXT	MM	LB	MA	BO	INS
[287]	*		*	x	
[293]	*			x	
[294]			*	x	
[297]	*				

Table 3.4. Summary of ecofact analyses for ST5 contexts . x = present but too small for entry (see summary in Chapter 12.1).

MM suggests that [297] also contained general occupation debris which may have built up on the trackway.

The contents of the only deposits associated with ST5 suggest that activities such as food preparation and cooking took place within the structure. In all, the admittedly limited evidence from ST5 suggests that structurally it was probably the mirror image of its neighbour across the trackway and used for similar activities.

### 3.4.5 ST5 ecofact summaries

Table 3.4 summarises the type of ecofact analysis undertaken for each of the contexts described below.

#### 3.4.5.1. [287]

##### Micromorphology

Deposit [287] is a Type G deposit comprised of a complex juxtaposition of mixed organic and mineral microfacies which form sharp boundaries with one another. The complex juxtaposition of microfacies observed within [287] and the sharp boundaries between them are consistent with a deposit that has been dumped or perhaps swept/ raked out. The mix of hearth and occupation debris probably represents the debris from the cleaning of a floor surface hearth or activity area. Observed clasts of soil material possibly represent trampling or sweeping of material from outside the structure. The observed orthic iron and phosphorous nodules can be attributed to numerous origins: animal husbandry or the general weathering of occupation deposits, including animal dung, ashes and bones.

##### Macroplant

There were 123 cereal caryopses and four fragments of hazelnut shell. The crops were wheat (40%), emmer/ spelt (19%), barley (7%), bread/ club wheat (5%), six-row hulled barley (1%), emmer (1%) and cereal (27%).

#### 3.4.5.2 [293]

##### Micromorphology

Anthropogenic material within [293] is composed of amorphous and charred fine organic matter, rich in silt and

phytoliths. The lower layer comprises a heterogeneous mix of charred and uncharred material and mineral materials characteristic of Type A deposits with identified phosphatic features and layers of dominant organic material characteristic of Type H deposits and indicative of incorporation of stabling waste. The charred remains frequently occur associated with patches of phytoliths in both units (units 1–2 of ST5/K1). Rare patches of vesicular melted material were also observed. The sharp boundary between the upper and lower layers of the deposit is indicative of the rapid deposition of unit 2 onto the underlying unit 1. The dominance of siliceous and vesicular ash material and yellow amorphous clay within unit 2 shares many characteristics with a Type G ash deposit and it is therefore likely that the upper part of [293] as sampled within ST5/K1 represents hearth waste deliberately deposited into the wall cavity either as a means of waste disposal or as insulation. The incorporation of stabling remains was observed micromorphologically in the wattle wall fill at the London Guildhall (Macphail & Goldberg 2006: 365) demonstrating the use of stabling waste as a building/insulating material.

#### 3.4.5.3 [294]

##### **Macroplant**

A total of 47 charred plant remains were present in [294] and these were 34 cereal caryopses, 12 fragments of hazelnut shell and one weed. The cereal species were emmer/ spelt (20%), emmer (18%), wheat (15%), barley (12%), bread/ club wheat (6%) and cereal (29%).

Deposits [293] and [294] are believed to represent the same event which was subsequently sealed by [287]. The carbonised domestic food waste probably originated from a nearby hearth or oven and may have ended up over the outer walls during the destruction and abandonment of the house.

#### 3.4.5.4 [297]

##### **Micromorphology**

Deposit [297] is represented by unit 3 of sample ST5/K1 and comprises a compacted mixed deposit of charred and reddened organic matter and contains a complex juxtaposition of mixed organic and mineral deposits. Cracks and fissures dissect much of the material and channel voids were also observed. Coatings of organic yellow clay on channel voids were also observed and are indicative of translocation of clay through the sediment profile. The complex juxtaposition of heterogeneous deposits of compacted mineral and organic material including relatively high proportions of charred material are indicative of the dumping and/ or slumping of general occupation debris which has subsequently been mixed by soil fauna and flora and chemical weathering processes. The micromorphological evidence is thus consistent with a deposit formed from the tumble of compacted track material after it fell from use.

## Episode 2



Figure 4.1. Reconstruction of what the settlement may have looked like in Episode 2.

In this episode the settlement expanded out over and beyond the Episode 1 palisade into the S half of the island (Figure 4.1). It consisted of at least three roundhouses, ST3, ST4 and ST6. The trackway continued in use, although it may have shifted to the W of its original alignment a little. It was resurfaced multiple times throughout this episode, particularly in the entrance area, where efforts were made to constrain movement on and off the site with the construction of a perimeter bank and fences lining the trackway. The evidence for a defensive perimeter during this episode comes from small exposures in Trenches 6 and 7 and, consequently, we cannot say how substantial this enclosing work was. In Trench 6 a turf rampart retained by a palisade of alder posts was built but was later superseded by the construction of ST6, suggesting that within this episode there were at least two construction events: the building of the rampart and palisade in Episode 2.1 and the construction of ST6 over the rampart in Episode 2.2. This sequence of events was not exposed elsewhere; in Trench 7 the defences consisted of a low earthen bank retained by a wickerwork fence found to one side of the trackway in the entrance area.

## 4.1 The trackway, entrance and defensive structures

### 4.1.1 Chronological evidence

Fragments of two heavily decayed planks testify to the probable re-use of timbers in the entrance area. Planks [727] and [729] produced dendro dates of *tpq* 427 BCE and *tpq* 410 BCE, respectively (Chapter 7.2.3.3) so were probably felled in the early 4th century BCE and are therefore part of the Episode 2 activity. However, they were found in Episode 3 deposits, presumably re-used during the Episode 3 rebuilding of the entrance (Chapter 6.1.1).

It was not possible to successfully dendro-date the alder posts of the Episode 2 palisade but post [609/2] produced a radiocarbon date of 387–204 cal BCE (SUERC-70483) (Table 2.2).

### 4.1.2 Trackway resurfacing

A variety of surfaces were recorded over the trackway logs in the interior (see Chapter 3.1.2.2). The surfaces were probably frequently replaced, particularly in the area of the

site entrance and, as it is clear that the trackway continued as the main access route throughout the occupation of the site, it is likely that some of these surfaces relate to activity during Episode 2. However, the alignment of the trackway may have shifted slightly to the W of its Episode 1 alignment as one of the Episode 2 houses, ST3, lies over the E edge of the logs (see below). There is no evidence of other modifications or structures such as fencelines that can be associated with the use of the trackway during this episode.

In the entrance area significant refurbishments to the trackway were made (Figure 4.2).

The latest surfaces in the Episode 1 trackway [787] and [760] were covered by an extensive deposit of hazel brushwood [782] and [759], consisting of bundles up to 0.3 m deep (Figure 3.12). Bracken, sedges and rushes had also been incorporated. The hazel brushwood [782] and [759] was laid down as part of a major resurfacing of the trackway in the entrance which also included parallel pairs of longitudinal alder logs [794] and [776] defining the outer edges of the new trackline. The oak threshold beam [775] was laid over the brushwood surface just to the N of

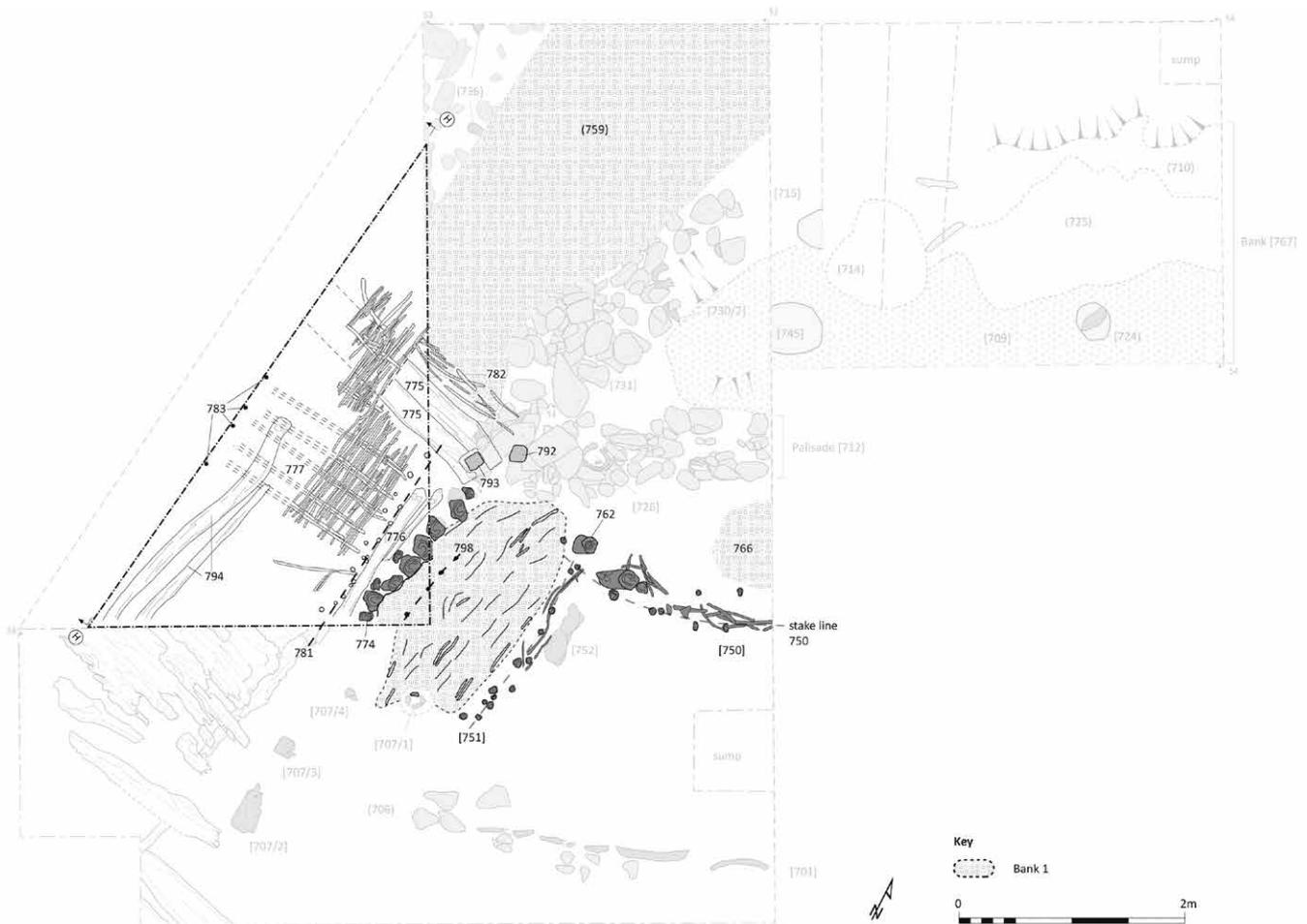


Figure 4.2. The Episode 2 entrance.

the longitudinal logs and pinned in place at its E end by an oak post [793/1] (Figure 4.3).

The similarity in design between [775] and the other Episode 1 thresholds has already been noted (Chapter 3.1.2.1) so it is likely that it was an Episode 1 threshold timber which was re-used in Episode 2. To the S of the threshold the brushwood was covered by a thin deposit of heavily trampled plant matter [786] consisting of bracken and wood debris (MA) and then by a layer of cobbles [780]. These cobbles may have been intended as a rubble drain across the trackway.

A hurdle panel [777] was laid down immediately to the S of the threshold beam (Figure 4.3), covering the cobbles [780] and the brushwood [782]. It was at least 2 m wide and some 2.7 m long and consisted of paired sails aligned tangentially across the trackway (Table 14.2). It had been pinned in place by alder and willow stakes [781] along its E side and hazel stakes [783] along its W side. At a later date the hurdle panel had been roughly extended out over the W half of the threshold timber by lying bundles of withies longitudinally over the threshold, inserting sails at intervals and weaving the ends into the main hurdle panel. This may have been a refurbishment of a previous surface but it only covered half of the threshold timber (Figure 4.3). Small patches of compacted plant litter were found surviving amongst the withies of the hurdle panel,

and thin deposits of grey clayey sand [779] were also observed. The compacted plant litter was presumably the remnants of the original working surface whilst the latter may represent a flooding event. MM of the brushwood trackway [759] identified four distinct bands distinguished by relative proportions of coarse mineral content and plant matter. These bands may reflect episodes of resurfacing of the trackway N of the threshold which correspond to the evidence for resurfacing described above. The uppermost of these bands also displayed characteristics which suggest it might have been laid down during a localised flooding event. Herbivore dung was also detected in this deposit (MM).

During this episode the area to the E of the trackway was covered by a distinctive greenish compacted organic deposit [758]. It extended over the E edge of the trackway over the brushwood surface [759] but it did not extend over to the W edge (Figure 4.4).

On site it was not possible to distinguish plant components but in thin section it comprised roundwood and fibrous plant tissues which were not identifiable, as well silt and sand, the latter possibly representing localised flooding events. Deposit [758] did not contain any anthropic debris, which is surprising given its location on the main thoroughfare into the settlement; perhaps it was covered by a surface such as planks that were later removed, which



Figure 4.3. Multiple resurfacing of the track in the entranceway. To the left the threshold beam [775] is partially exposed, pinned in position at one end by post [793/1]. The trackway is defined by the longitudinal alder logs [794] and [776] and behind them lie the posts of wall [774]. The remains of the yellow clay Bank 1 can be seen immediately behind the posts. In front of the longitudinals is the hurdle screen [777], pinned along that edge by stakes [781]. In the very foreground are bundles of withies representing a later refurbishment of the trackway which extended over the threshold beam.



Figure 4.4. Deposit [758] overlying the E edge of the trackway; its E edge lies under the left end of the ranging rod. It lies over brushwood surface [759] and is itself overlain by brushwood surface [738].



Figure 4.5. Brushwood surface [738] in which bundles of brushwood have been laid down at right angles to each other.

would explain the sharp boundary with the overlying brushwood surface [738].

Further to the E [744] is likely to be the same deposit as [758]. This was a thick deposit of compacted organic litter which extended E for at least 4 m but did not reach as far as the walls of ST3. MM shows that it was very like other active floors on the settlement, ie constructed using bracken, sedge, rush and roundwood and, unlike [758], it contained small amounts of food and fuel debris particularly in the upper units. It was a very thick deposit, up to 0.13 m thick in places so it is possible that it represents multiple resurfacing events, laid down between the trackway and

ST3. At its easternmost extent it sealed the hazelnut deposit [743] so the lower layers are likely to be part of the same resurfacing event which saw the deposition of the withy surface [1138] which also sealed [743] and abutted the outer wall of ST3, possibly in Phase 7 of its occupation (Chapter 4.2.10).

A brushwood surface [738] lay over [758]. It had been constructed by lying down small tangential branches over which bundles of brushwood and hurdle panels have been laid longitudinally and tangentially (Figure 4.5).

Layers of bracken had also been incorporated. The uppermost levels were poorly preserved and it is

likely that they incorporate layers of brushwood which represent later episodes of refurbishment. MM suggests that the microstructure of [738] was created by persistent trampling activity which pushed the brushwood below the water table, thus requiring constant replenishing. Possible herbivore dung was observed in [738]. The brushwood surface [738] covered the hurdle panel [777], the threshold timber [775] and extended into the N baulk of Trench 7. The alignment of the trackway appears to change at this point, veering off towards the E. The brushwood surface [738] is sealed by sterile deposit [741], possibly the remains of an Episode 3 rampart (Chapter 6.1.2).

#### 4.1.3 The rampart, palisade and associated fencelines

In Trench 6, the Episode 2 defences consisted of an earthen rampart with an external timber palisade. Rampart 1 forms a low bank of sterile grey/ brown clayey soil *circa* 2.5 m wide and surviving to a height of 0.45 m. It was ramped up behind Palisade 2, an alignment of closely-set alder roundwood posts (Figure 4.6).

The posts had been set into a narrow slot, cut into the natural peat but barely discernible apart from the fill, which consisted of re-deposited peat with small stones. MM has demonstrated that the bank was constructed using peaty turves from a variety of sources. In the interior of the bank the turves had been inverted, the grassy surface underneath, but at the outer edges of the bank the grassy surface was uppermost, presumably to create a firm surface to the bank. Alluvial silt [631] underneath the bank may have been laid down as a core foundation for the bank as it did not extend the full width of the bank. Alternatively, the deposit may represent localised flooding; the bank was built on the very edge of the island and was subject to small flooding events, as MM shows. It was built directly over the natural peat surface, suggesting that this area had not been occupied during the earlier episodes. ST6 was subsequently built over Rampart 1 but Palisade 2 probably continued in use as the defensive perimeter during the remainder of Episode 2.

The track, on its approach to the threshold beam, was flanked by wall [774], a line of 11 closely set birch posts along the E edge of the track, flanking the full length of the hurdle screen, the northernmost post lying adjacent to the corner of the threshold (Figure 4.2). Ash post [792] may be a continuation of the wall line to the N of the threshold. The southernmost post [774/8] was a pencil-tipped post driven deep into the substrate around which a further two pencil-tipped posts, [774/10] and [774/11], had been driven. This contrasts with the shallower, chisel-tipped posts in the line and suggests that [774/8] may have had a load-bearing or anchoring function, whilst the other posts were placed in a slot.



Figure 4.6. Palisade 2.

Behind the wall line and running parallel with it was Bank 1, a bank of light yellow clay (Figure 4.2) built over a thin spread of alder, hazel and willow brushwood [740]/[790], the upper surface of which had been charred. It extended N–S for 2.1 m and had survived to a height of 0.2 m. It was revetted on its W edge by a short stakeline [798] and on its E side by fenceline [751], both built with a mixture of alder, hazel, ash and willow. The upper levels were rich in orange sand, charcoal and some food waste (MA) and may represent another phase of refurbishment (see Chapter 6.1.1).

Bank 1 probably turned E when it was level with the threshold timber and continued as a perimeter around the S shore of the settlement. The northern end of fenceline [751] terminates at a cluster of three willow, alder and ash posts [762] as does fenceline [750], a W–E alignment of paired stakes around which 10 courses of withies had survived (Figure 4.7).

Like all the stakelines in this refurbishment [750] was built with a mixture of ash, willow, hazel, alder and birch. Behind and inside [750] was a mound of yellow/ brown sand [766] which may be the remains of the same bank as



Figure 4.7. Fenceline [750] terminating at the cluster of posts [762] on the left. The remains of the yellow/brown sand bank [766] can be seen in the baulk in the top right-hand corner of the photo.

CONTEXT	MM	LP	MA	BO	INS
621	*		*		
631	*				
738	*				
744	*				
758	*				
759	*				
766	*				

Table 4.1. Summary of ecofact analyses for contexts from the Episode 2 trackway, entrance and defensive structures.

Bank 1 (a drainage channel had destroyed any evidence for the relationship between these features). The bank had collapsed outwards over the fence into the littoral zone around the shores of the settlement, where the sediments had become very mixed because of water movement. This has been demonstrated clearly by MM of this deposit which shows that it has been subject to a series of in-wash events which have led to the incorporation of lenses of diatom-rich silt and sand.

The two perimeter constructions are very different: a turf rampart and post palisade on the SW which was later built over by a house, and an earthen bank and wickerwork fence, probably on either side of the entrance. It is possible that in trying to make sense of deposits seen only in small exposures we are joining the dots between two unrelated structures, but it is also possible that the outer enclosure was added to and strengthened almost continuously, and that construction techniques varied along its course.

#### 4.1.4 Trackway, entrance and defensive structures ecofact summaries

Table 4.1 summarises the type of ecofact analysis undertaken for each of the contexts described below.

##### 4.1.4.1 [621]

##### Micromorphology

The remains of a turf bank [621] was sampled to elucidate the processes responsible for its formation. Anthropogenic indicators from across [621] are limited to fragmentary silt-sized and smaller charcoal except at the very top of the context where cellular charcoal is common. The occurrence of charcoal most frequently within or in close association with channel voids supports an interpretation of post-depositional mixing of charcoal into this layer. Few to common phytoliths are proxy indicators of nearby human activity. All are disarticulated and evidence relatively advanced decomposition of plant materials. Rare diatoms are also indicative of wetland influences.

The complex juxtaposition of sediment microfabric types within the bank is indicative of a rapid build-up of sediment from variable sources. Of note is the 45° dipping sharp boundary between Units 2 and 3 within BA/K6 indicative of direct dumping of one material on top of another as organic building materials were piled up to create the bank. Differences in the microstructure and incidence of pedofeatures are indicative of different sediment sources for these materials, with some having apparently been subject to clay translocation whereas others appear not to have been so influenced by water. Post-depositional alteration of the sediments is evident in the form of faecal pellets and large channel voids (probable

roots) which dissect the units and, in some cases, blur the boundaries between them. The broad difference between Units 1 and 2 and between Units 3 and 4 within sample BA/K6 derive predominantly from a difference in proportions of organic matter, with higher proportions of organic material being observed within Units 1 and 3. This is indicative of the use of turf for the construction of the bank with the more organic sediments reflecting the upper vegetated peaty topsoil surface. The decrease in organic matter upward is indicative that turves were inverted and placed upside down with the vegetated reworked upper soil surface placed at the bottom. Broad repetition of this sequence was noted in Units 3 and 4 within BA/K6 and also within Units 1 and 2 of BA/K7, thus documents stacking of inverted turves directly above one another.

The sedimentary units observed within samples BA/K7 and BA/K8 have evidently been subject to a greater degree of post-depositional alteration than those further down the profile. Mobilisation of iron within Unit 2 of BA/K7 prior to its later reworking by soil fauna is indicated by dissection of iron/ manganese features by the voids and suggests that the turves were derived from sediments/ topsoil undergoing podsol formation which would be consistent with the surrounding natural soil type. Differences in colour within Unit 2 of BA/K7 reflect iron/ manganese formation and the bleaching of the surrounding sediment indicative of iron mobilisation through the bank profile. Reworking by soil biota is also evident within sample BA/K8 which was found to have a porous crumb structure towards the centre of the sample within the lower part of Unit 2 and across the boundary with Unit 1. Patches of rugose material are likely welded faecal pellets and infilled burrow indicative of a high degree of biological reworking.

The outer part of the bank appears to have been constructed directly on top of the peat [620] with no evidence for the alluvial silt [631] observed within the inner part of the sequence. The sharp boundary between [620] and [621] observed in sample BA/K10 is indicative of the rapid deposition of [621] consistent with its interpretation as an imported turf material. The increase in plant material and charred material upwards within this sample is indicative that, unlike the interior of the bank, the turf in this part of the bank has been deposited the 'right way up' ie with the upper vegetated surface towards the top. The presence of a greater proportion of charred material and rounded gravel-sized pebbles is indicative of a slightly different source of material for the outer part of the bank when compared to the inner part of the bank, although this could reflect very localised differences in the source of the turf.

The evidence observed in thin section from sample BA/K5 suggests that the base of the bank was subject to at least one water inundation event. This inundation resulted in the accumulation of fine sand and silt within the channel voids of the lower sediment, specifically the upper part of the

natural peat [620], the (presumed) re-deposited alluvial silt and lower parts of [631]. The reason for this inundation is not clear but it is likely that vegetation clearance associated with the construction of the bank and associated settlement may have destabilised the adjacent local ground surface, leading to low energy erosion events and subsequent in-washing of silt and fine sand into the sediment at the base of the bank. The flooding of the sediments within BA/K5 also likely resulted in the observed diffuse boundary between units and perhaps erased more subtle indicators regarding the formation of these deposits.

Turf as construction material is readily documented in archaeological contexts (see Walker 2006). Apart from the remnants of above ground vegetation, the properties of turf structures depend largely upon the properties of the parent soil (Huisman & Milek 2017) which at BLoM is saturated peat. Non-woody wetland areas such as marshes and peat bogs, as found around BLoM, are especially suitable environments from which to extract turves for construction because the dense root mat and the high organic content relative to mineral content give it more coherence, make it more water absorbent and give it better insulating properties than dry turf (Milek 2017). Organic material towards the base of the bank is generally better preserved, presumably as a result of reducing burial conditions that have allowed for maintained wetness. Localised reduction of the groundmass is a common occurrence within turf structures where oxygen is consumed by decaying organic matter. This process can result in the precipitation of iron oxides on the oxidation-reduction boundaries, sometimes resulting in iron pan formation (Huisman & Milek 2017: 117).

Sloping turves at a 45° angle, as observed within sample BA/K6, probably result from minor slumping and partial collapse of the bank or settling of turves after having been laid down. However, there does not appear to be any evidence of soil structural collapse and the construction of the bank appears to have prevailed. For example, fine soil/ clay movement, which might be expected from soil disturbance such as digging, transportation, construction and collapse of the turf bank, is not present. In addition, although compaction is certainly an effect of burial (Crowther et al 1996), it seems likely that the clay-depleted sediments observed within the turf bank were already relatively compact. The soft organic tissues present within the bank show little evidence of having been totally compacted. It seems more likely that the major post-burial modification was through activity, mobilisation and deposition of iron and manganese. Study of the taphonomy of turf bank material constructed at Overton Down, Wiltshire (Bell et al 1996; Crowther et al 1996) and Folly's Lane (Macphail et al 1998) suggest that buried soil fauna can survive for some time after burial and that post-burial biological mixing of turves can occur, as demonstrated within the upper parts of the turf bank within sample BA/K8. At Overton Down

(excavated 1992) moderately broad mamillated earthworm excrements were replaced by aggregated excrements and a spongy microfabric composed of thin cylindrical organo-mineral excrements similar to that observed within samples BA/K7 and BA/K8 within the turf bank.

### Macroplant

A total of 51 charred cereal caryopses were recovered from this context. These were emmer/ spelt (37%), wheat (16%), barley (14%), six-row hulled barley (2%) and cereal (31%). The bank was probably built rapidly and the ecofactual evidence supports this as there appears to have been little opportunity for the long-term disposal of domestic refuse to collect. Instead, this small accumulation of food residue has probably derived from a single disposal event.

#### 4.1.4.2 [631]

### Micromorphology

Deposit [631] comprises a moderately to poorly sorted silt overlying the natural peat and underlying the bank [621]. The context is predominantly comprised of silt-sized organic fragmentary material commonly identifiable as single cells or tissue residues. Anthropogenic indicators are limited to few microcharcoal fragments which may have been washed or blown into the deposit.

Deposit [631] exhibits several characteristics that indicate that it originated in an alluvial environment: the dominance of silt-sized particles (indicative of water sorting) and 'flood couplets' consisting of thin alternating bands of fine sand or silt, and silty clay. Waterlogging has caused the iron in the sediment to be reduced to its more mobile form which leads to the observed grey colour with reddish mottling around plant remains, roots and channel voids where oxygen has been able to penetrate and the iron has been oxidised. Cracks and fissures are indicative of shrink swell, suggesting that the sediment has been subjected to wetting and drying. Channel voids part infilled with fine sand material are indicative of in-washing of sediment following deposition and are consistent with the evidence for water inundation as noted in the underlying natural peat [620]. It is likely that this deposit formed *in situ* following a small-scale flooding event. However, [631] is not present below the outer bank (sample BA/K10), indicating that it is not widespread across the site. This may indicate very localised flooding within the site or deliberate removal of the silt from above the peat prior to the construction of the outer bank. Thus it remains possible that [631] was intentionally re-deposited from an alluvial environment and deposited on top of the peat as a foundation layer prior to the construction of the overlying turf bank [621].

#### 4.1.4.3 [738]

### Micromorphology

It was found that [738] forms the upper part of a brushwood track consisting of bundles of brushwood laid at right angles to each other over an intermittent framework of small transverse poles. The context is rich in organic material which comprises a mix of elongate plant tissues and roundwood material. Preservation of the plant material is variable, with some highly birefringent fragments intermixed with heavily decayed and humified material. The unit has a moderately developed lenticular microstructure with moderately separated peds. Observed anthropic indicators are rare in sample TR/K3 but common in sample TR/K4.

Coarse organic material including roundwood and elongate plant tissues display a strong horizontal orientation which is consistent with trampling. Other indicators of trampling, such as layers of heterogenous laminated material, were not observed. However, it is not uncommon for such features to be absent from trampled layers located outwith structures where soil moisture and intense trampling can lead to greater homogeneity of the deposit (Rentzell et al 2017). The slightly spongy nature of the context and excellent preservation of plant remains also suggests that persistent trampling activity pushed the brushwood surface below the water table causing the sediment to absorb water and swell and thus lose some of its structural integrity. Ten percent of Units 2-3 of Sample TR/K3 comprises chopped and part disaggregated plant issues in clusters which are characteristic of Type H stabling deposits and may be indicative of herbivore dung, reflecting that the track may have been used to move animals around the settlement.

#### 4.1.4.4 [744]

### Micromorphology

It was hypothesised that [744] was probably the same as [758]: [744] extended from the outer walls of ST3 towards the trackway whilst [758] lay over the trackway. The thin section evidence indicates similarity in terms of organic compositions of the units and sediment structure, with both contexts displaying lenticular microstructures and dominance of organic matter. However, whilst the plant formation of both contexts is similar, the occurrence of anthropic indicators including charred hazelnut, bone, charcoal and anorthic sediment fragments (albeit in small quantities) within the upper layers of [744] indicates a higher level of human influence on the upper layers of this context in comparison with [758]. The reasons for this change could be numerous. It is possible for example that the lower units comprising plant litter were laid down as a foundation floor covering and immediately covered over, preventing their contamination with charcoal and

food refuse, whilst the upper units reflect a more active floor surface. Alternatively, it is possible that the slight contamination of the upper unit reflects a period of less intensive cleaning, ie a period when the upper dirty layer of the surface was not so thoroughly removed, thus leaving behind a stronger anthropic signature. The observed structural plant remains are consistent with organic floors observed elsewhere across this site and have been constructed from stems and leaves of elongated plant which, where identifiable, comprise bracken, sedge, rush and roundwood fragments. The charcoal, hazelnut fragments and bone constitute a very small proportion of the overall unit and represent a mix of domestic food, fuel and food debris which has been trampled and reworked into the sediment, possibly because of its proximity to ST3. The hazelnut occurs only in the lower layers of [744] where it directly overlies [743], a deposit particularly rich in hazelnut shell, and therefore it is possible that the hazelnut in the lower layers of [744] has been reworked from the underlying layer.

#### 4.1.4.5 [758]

##### Micromorphology

Deposit [758] overlies the trackway surface [759]. Samples were removed from across its section in an attempt to identify any surfaces within this deposit. The boundary between the units is diffuse and the units are distinguished from one another by slight variations in overall proportions of coarse mineral material and proportions and preservation of organic plant tissue fragments. Coarse mineral material accounts for 15–20% of each unit and is dominated by silt to fine sand-sized quartz material distributed evenly throughout the matrix. The composition of the organic matter varies across the units but in general comprises distorted and compressed roundwood fragments, elongated compressed fibrous brown tissue, sand-sized angular black fragments and phytoliths. The microstructure of each unit is complex but is generally lenticular to platy. Preservation of plant tissues generally decreases upwards and is possibly also affected by decreasing porosity upwards, most likely as a result of trampling of the upper layers. It is possible that the upper part of [758] surface was exposed for a relatively extended period, allowing for its trampling and partial decomposition before it was sealed by [738] which was noticeably more organic and better preserved (see above). The lower layers of this deposit appear to have been less affected by trampling and by reworking and thus may have accumulated through dumping of waste plant material. There is minimal evidence for human activity associated with this deposit and thus it possibly represents a deposit located outwith the main activity areas of the site or perhaps a period of less intensive use of the site.

#### 4.1.4.6 [759]

##### Micromorphology

Brushwood trackway [759] is constructed using a variety of plants (wood, sedge, rush and bracken) which form four layers distinguished by differences in sorting, coarse proportions of plant material used and proportions of coarse mineral material. The distorted cellular structure of the roundwood fragments and their lath shape is indicative that the roundwood has been squashed. Anthropoc indicators include charcoal which is present in roughly equal amounts in both units and rare fragments of burnt peat. A small patch of short segments of plant material embedded in yellow amorphous organic is likely decomposed herbivore dung.

The uppermost unit of [759] (Unit 2 of TR/K2) preserves several characteristics that indicate that it originated in an alluvial environment. The dominance of sand-sized particles is indicative of a degree of water sorting. The sediment also exhibits some evidence of bedding with very fine internal laminae or 'flood couplets' consisting of thin alternating layers of fine sand or silt, and silty clay. Additionally, waterlogging has caused the iron in the sediment to be reduced to its ferrous, more mobile, form. As with the overlying [758], the cracks and fissures are indicative of shrink swell, suggesting that the sediment has been subjected to wetting and drying. It is unclear, however, whether the upper layer of [759] was a deposit formed *in situ* following a low energy flood or water inundation event across the site or if it has been sourced from an area outwith the site and intentionally re-deposited on top of the underlying peaty [760]. However, given its thin nature (maximum 9 mm) and the incorporation of plant tissue remains similar to [758], it is most likely that it represents a low scale water inundation event.

#### 4.1.4.7 [766]

##### Micromorphology

Bank [766] is located within the lower part of BA/K17 and contains evidence for incorporation of in-washed mineral material in the form of lenses of diatom-rich silt and sand. The unit has a complex microstructure exhibiting a juxtaposition of peat material rich in plant matter, with evidence for human influence in the form of loam clods and charcoal intermixed/ juxtaposed with lenses of silt and sand. Boundaries between these elements are diffuse and the presence of excrements derived from earthworms and mites suggest that the deposit has been reworked. The channel and chamber microstructure also testifies to a moderate degree of post-depositional reworking. Although reworking has altered the sedimentary signature of this deposit, it remains clear that it has been subject to influx of a series of low to moderate energy in-wash events, possibly during higher water levels.

## 4.2 Structure 3 (ST3)

### 4.2.1 Introduction

ST3 was investigated over two seasons and in three trenches, 11, 15 and 17. Its W edge was also uncovered in Trench 18, where a chord of the outer wall was recorded. In all some 49 m<sup>2</sup> were uncovered, amounting to 75% of the total area of the structure. Perhaps inevitably, the baulks lay over critical relationships and features, particularly Baulk W/E between Trenches 11 and 15 which obscured the hearth stack at the centre of the structure. Consequently, the hearths were never fully exposed.

The main structural features of the building are an outer stake wall, an inner post-ring and a central hearth stack. At least eight phases of building activity were recorded within the structure, all associated with changes to the central area, where a stack of hearths and work surfaces had been built up (Figure 4.8).

Our understanding of the deposits in ST3 relies heavily on the ecofact analyses; Figure 4.9 shows the location of the monoliths and kubienas referred to in the text and their positions in the sections are shown in Figures 4.10–4.15.

### 4.2.2 Chronological evidence

Twenty-eight radiocarbon dates were obtained from a stratified sequence of occupation debris through the hearth stack, WMD dates were obtained on two structural timbers and an artefact, SF237, was also dated. There are no calendrical dendro dates for ST3 but the dendro date of 436/5 BCE for the Episode 1 palisade provides a *tpq* for its construction. Allowing for an interval of  $15 \pm 2.5$  years for the use of the palisade, ST3 was probably constructed between 425–420 cal BCE. Modelling of the chronological evidence estimates that ST3 fell out of use in 375–310 cal BCE (95% probability), or 370–340 cal BCE (68% probability), giving it a duration of 45–110 years (95% probability) or 55–80 years (68% probability).

A large ash post [15035] in ST3 which replaced the Phase 1 post [15036] (but cannot be tied into a specific phase), correlates well with [792/1], one of the large posts alongside the trackway in the entrance area, which is likely to be an Episode 1 construction (Chapter 7.5.3). The correlation suggests that the phase of refurbishment in ST3 represented by [15035] took place some 66 years after trackway construction. As the trackway was constructed between 437 BCE and 435 BCE (Chapter 2) then the refurbishment phase took place between 371 BCE and 369 BCE. This is in agreement with and further refines the modelled radiocarbon evidence presented above, suggesting that the post might have been inserted in the final phases of occupation in the house.

The Phase 1 *in situ* concave-based posts [15036] and [1760/26] in the post-ring and the Phase 2 floor supports

[1755] all display the same end-date (Chapter 7.3.3.1). This means that either there was a stockpile of alder timbers which had been felled at the same time and was drawn from during construction of Phases 1 and 2, or that Phases 1 and 2 were completed within the same year.

Hazel stakes used in stakelines [1133], [1135], [1167], [1710], [1711] and [18012] were cut down within a felling band of eight years. This implies that, between the construction of the outer wall line in Phase 1 [1135] and that of stakeline [1133] in Phase 7 there may have been as little as 12 years (see Chapter 7.4.2.1 for calculation). Even allowing for another two years for Phase 8 and two years for occupation after that, this estimate of *circa* 16 years for the duration of the building is in apparent conflict with the minimum duration of 45 years estimated by the radiocarbon dating. This is discussed further below.

### 4.2.3 Phase 1 (Figure 4.16)

The house was built directly over the old ground surface [15037] and [15049]. IN indicates the existence of damp shaded ground and woodland on the site prior to the construction of ST3. The root masses of hazel scrub [15044] were found under ST3, thrown there either during primary clearing of the island or deliberately as a foundation for ST3. It was found that [15037] also contained strong IN evidence for the deposition of dirty floor litter along with other occupation debris, whilst MA also found cereal bran fragments and blackberry seeds which could suggest faecal matter. Food waste and flooring materials were also found in [15049] (MA). ST3 lay just over the edge of the Episode 1 ditch with its midden-rich fill so this debris may relate to spillage and trample during the earlier episode.

#### 4.2.3.1 The superstructure

The primary structure of the house consisted of an inner post-ring and an outer wall. The outer wall line ([1747]/[1135]/[15007]/[18012]) comprised a line of slender stakes, between 0.033 m and 0.067 m in diameter ( $av = 0.047$  m) (Figures 4.17 & 4.18).

Although composed primarily of hazel (65%) willow, birch, ash and alder stakes were also used. In the SW quadrant stakelines [1167] and [18005] lie some 0.4–0.5 m inside [1135] and [18012] along the very edge of the sub-floor and thus appear to form a double outer wall, but this arrangement is not replicated around the entire circuit of the house. The wickerwork around the stakes had survived up to three courses high around the stakes of [18005]; hazel and ash withies had been used. This circuit of this outer wall has survived as more of an egg-shape than a circle, possibly because it slumped as it decayed. A best guess at its original dimensions suggests that it would have enclosed a house *circa* 9.6 m in diameter, giving a floor area of *circa* 72 m<sup>2</sup>.

	Hearth	Sub-floor		Active floor		
		SW	SE	SW	SE	N
Phase 8	Hearth 7			1119/1120		15005
Phase 7	Hearth 6	1127/1128	1707	1116	1708	
Phase 6	Hearth 5			1144S	1144S	15015
Phase 5	Hearth 4			1148	1728	15018B
Phase 4	Hearth 3	1154	1729	1148	1728	15018B
Phase 3	Hearth 8			1153	1743	15018A
Phase 2	Hearth 2		1755 + hurdles	1153	1743	15018A
Phase 1	Hearth 1	1166/1749/15029/15030			1761	

Figure 4.8. Schematic summary of the phases in ST3, showing hearths and associated sub-floors and active floors.

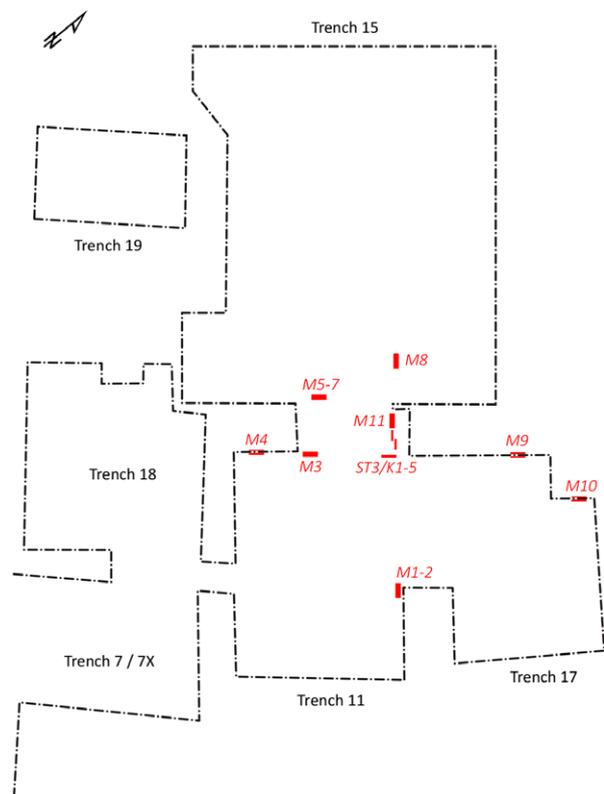
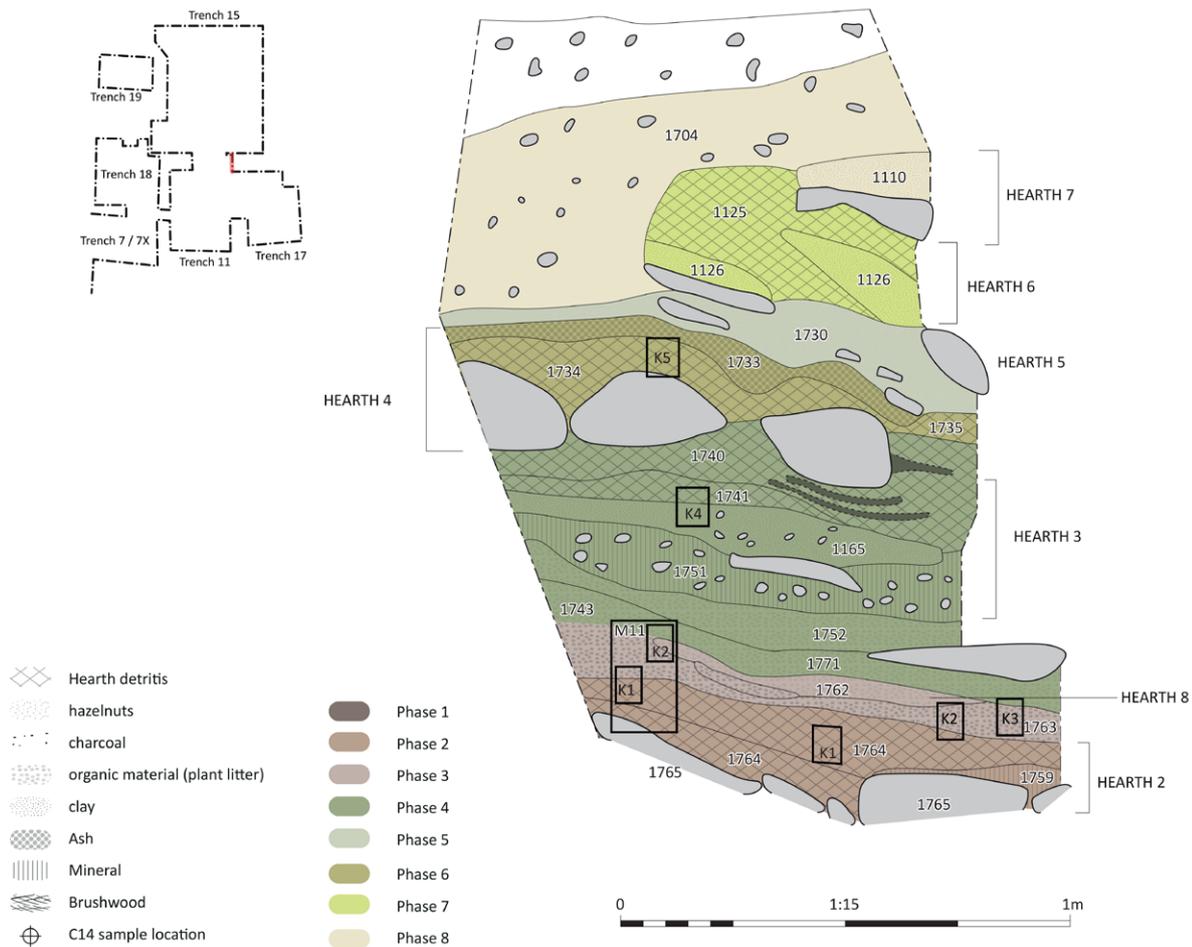


Figure 4.9. ST3: positions of monoliths and kubienas.

Only three of the load-bearing posts of the post-ring had survived (although it is possible that other posts survive in the unexcavated areas). Posts [15036] in the NE quadrant and [1760/26] in the SE quadrant were both alder posts with concave bases, both 0.16 m in diameter; [1760/26] lay over one of the radials in the sub-floor. In the NW quadrant [15051] was a pencil-tipped ash post 0.15 m in diameter. This post lay just behind the right-hand side of the entrance and the pencil tip may relate to its position there, providing resistance to the lateral thrust of the ring-beam where it spans the entrance space (as in ST2). At some point post [15036] was chopped off, leaving the base *in situ* and a flat-based ash post [15035] some 0.14 m diameter was inserted to one side of [15036] (Figure 4.18) suggesting refurbishment of the post-ring; the chronological evidence (see above) suggests that this

may have happened in the last phases of occupation. In the SE quadrant an arc of small hazel stakes [1760/A] lies along the projected line of the post-ring and may have formed screens between the posts. The post-ring lay some 2.3 m inside the outermost wall and would have formed a ring roughly 5 m in diameter.

Although ST3 was built over the edge of the Phase 1 log trackway the track still provided the main axis into the settlement and unsurprisingly, the entrance into ST3 opened onto the track on the W side of the house. The entrance threshold was only well-defined later in Phase 4, when alder logs were laid down to form a threshold (see below). However, a gritty, compact peaty deposit [15045] containing grey clay may represent trampling caused by footfall through the primary entrance and out onto the trackway.



Trench 17, Section 1 through hearth sequence.

Figure 4.10. ST3 Section 1.

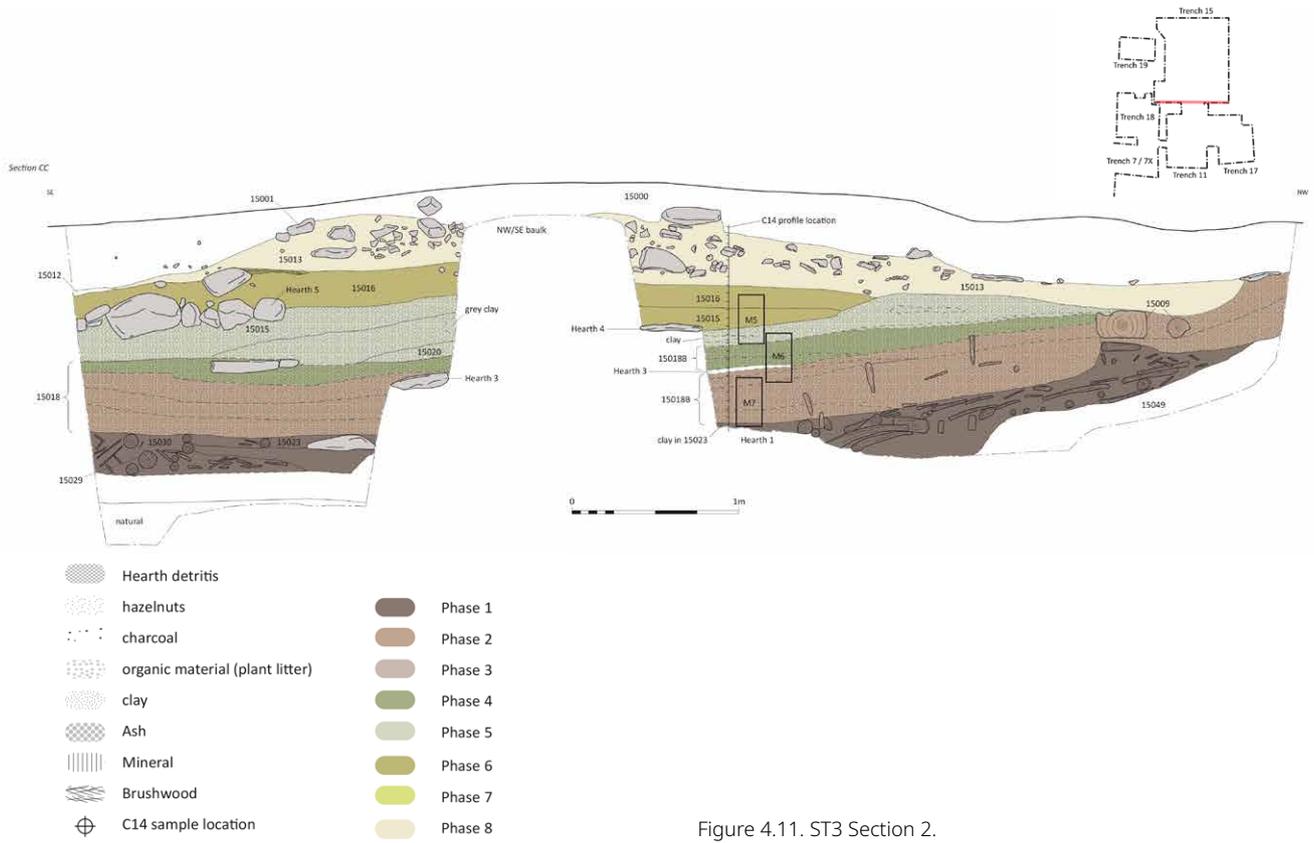


Figure 4.11. ST3 Section 2.

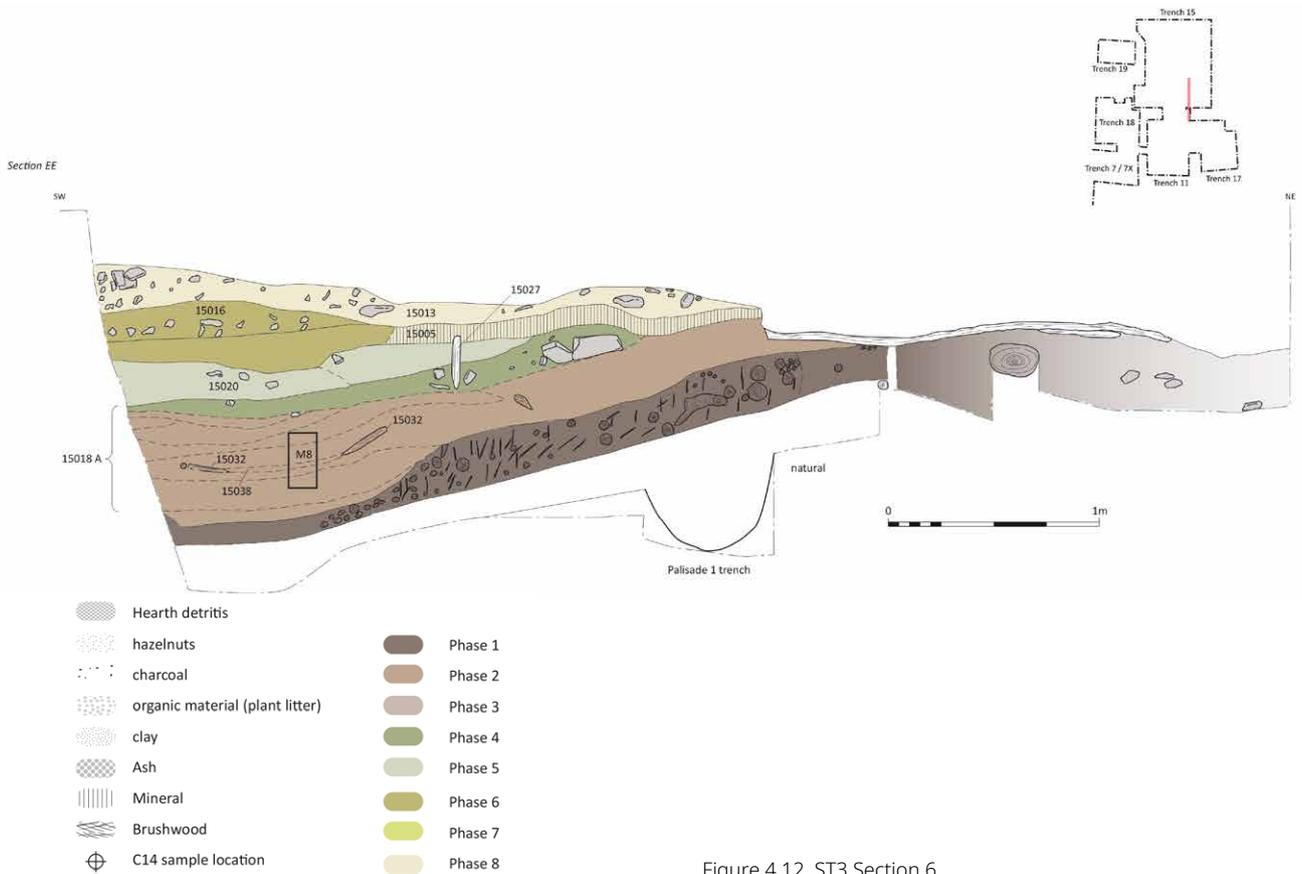


Figure 4.12. ST3 Section 6.

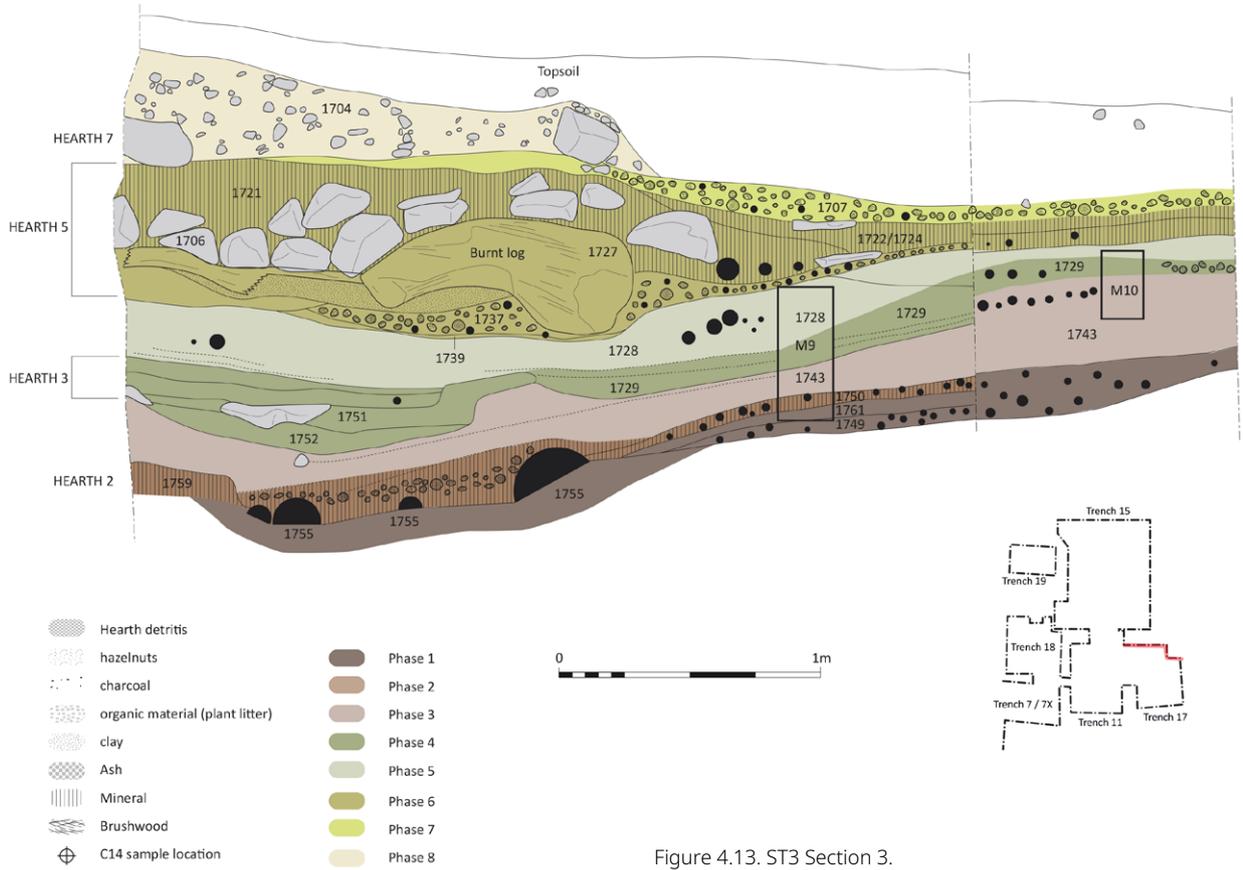


Figure 4.13. ST3 Section 3.

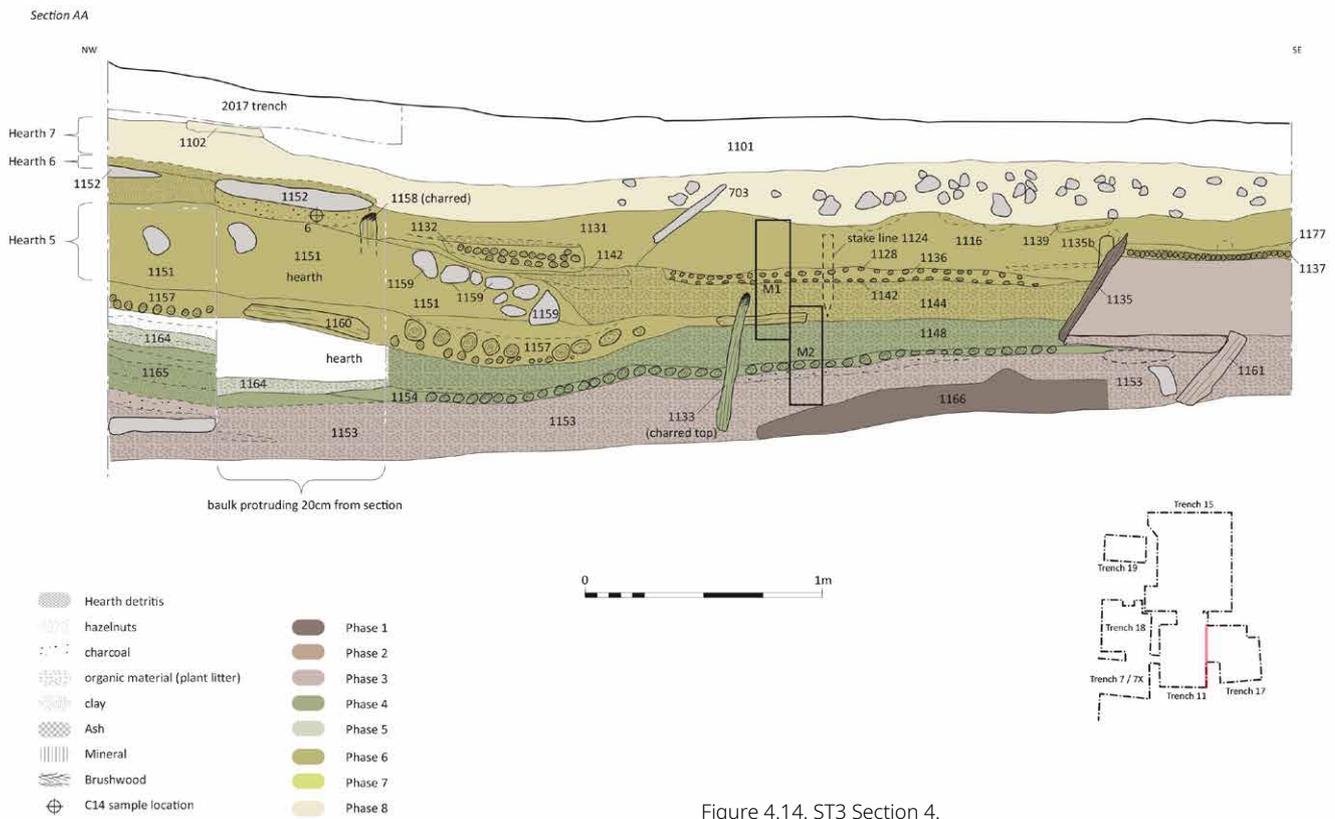


Figure 4.14. ST3 Section 4.



Figure 4.15. ST3 Section 5.

#### 4.2.4 Phase 1

##### 4.2.4.1 The sub-floor

Micromorphological analysis of [1166], one of the components of the sub-floor laid immediately over the peat surface, shows a sequence in which the peat was churned up, hearth debris spilled and trampled into it, then turf-like material spread over that. This must reflect the activities of the builders and preparation of the surface prior to laying down a sub-floor within the house.

The sub-floor ([1166]/[1749]/[15029]/[15030]/[18018]) was constructed by laying down bundles of brushwood in a roughly concentric pattern, over which radially-aligned roundwood timbers of alder, 0.1–0.2 m in diameter were placed (Figures 4.17 & 4.18). Small branches of hazel and alder were then laid over and across the radials, occasionally being roughly woven under the radials in places. A large number of cereal chaff fragments in [15030] suggests that the builders may have been processing their cereals on the newly-built sub-floor or dumping their processing residues there (MA). A large fragment of a cattle scapula was also found amongst the brushwood [1749]; it may relate to food consumption during the building but its size suggests that it may have been deliberately deposited in the sub-floor (BO).

##### 4.2.4.2 The active floor?

A thin deposit of plant litter [1761] was found between the sub-structure [1749] and the hurdle screens of Phase 2 (see below) so this may represent the only surviving, or at least distinguishable remnant of flooring associated with the use of this hearth. It was composed of bracken, sedges and rushes and did not contain any domestic debris (MM; MA).

##### 4.2.4.3 Hearth 1

Hearth 1 was built directly over the sub-floor. It was 2 m across from N to S but was not fully exposed from W to E because the hearth dipped steeply to the SE and under Hearth 2 (Figure 4.19).

Small slab-like stones [1766] were laid down first and then covered by large greywacke slabs [15025] some 0.3–0.4 m across. A grey-yellow clay ([1770]/[1168]/[15023]) had been packed amongst the stones. Hearth 1 lay to the NW of the later stack of hearths. As the chronological evidence suggests, the floor and the hearth of Phase 1 were probably in use for a few months at most, a temporary arrangement as the house was being constructed, and this might explain the off-centre position of Hearth 1. Hearth debris [15026] was probably associated with the use of this hearth; it contained quantities of unburnt hazelnut shells, charred cereal grains and burnt and unburnt bones, representing both cooking and butchery waste (BO).

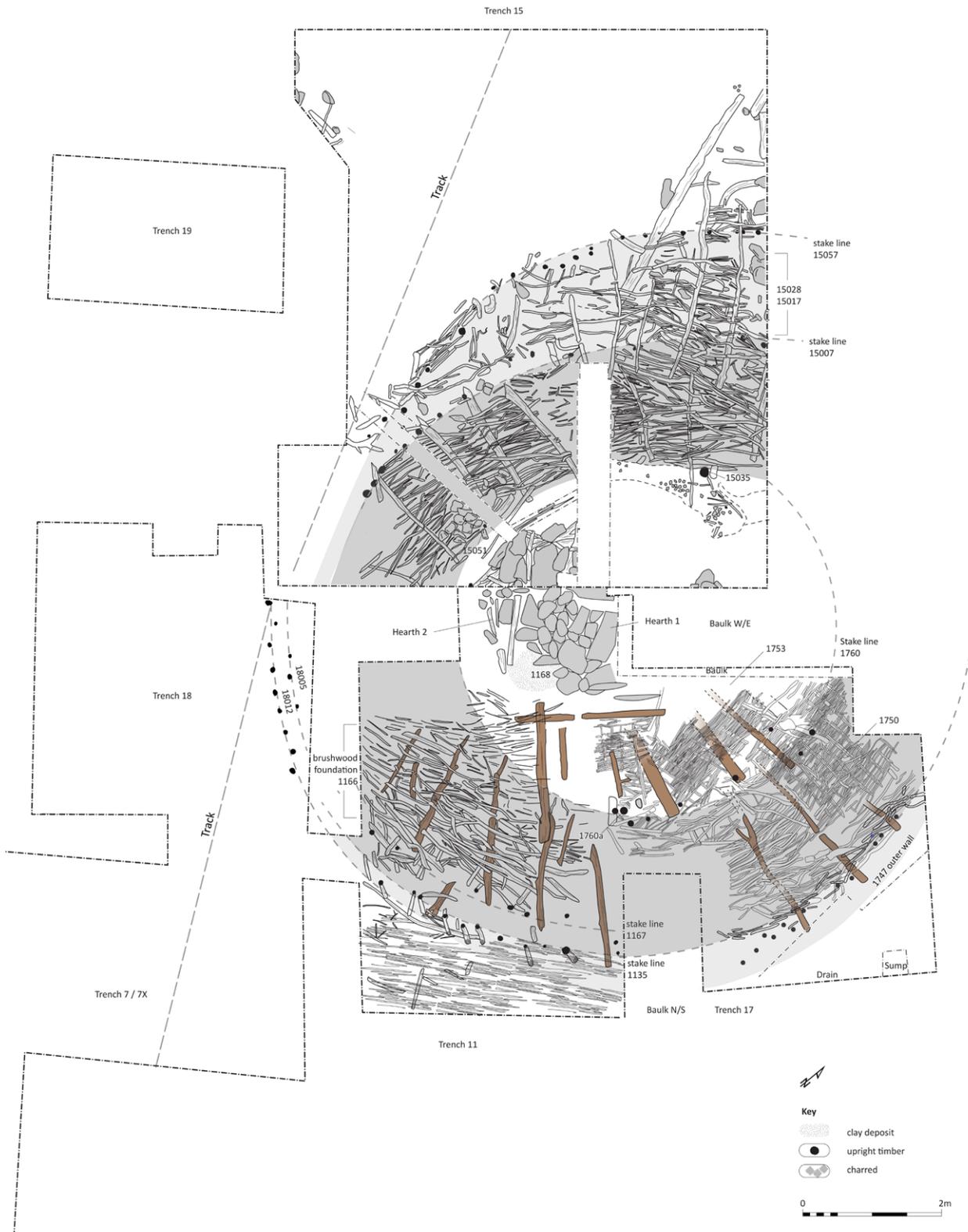


Figure 4.16. ST3 Phases 1 & 2.

Figure 4.17. The SW quadrant of ST3 showing the Phase 1 sub-floor [1166]. The outer wall stakes [1135] lie sloping outwards at the back. The gap between the edge of the sub-floor and the outer wall line suggests that there may have been a double wall.

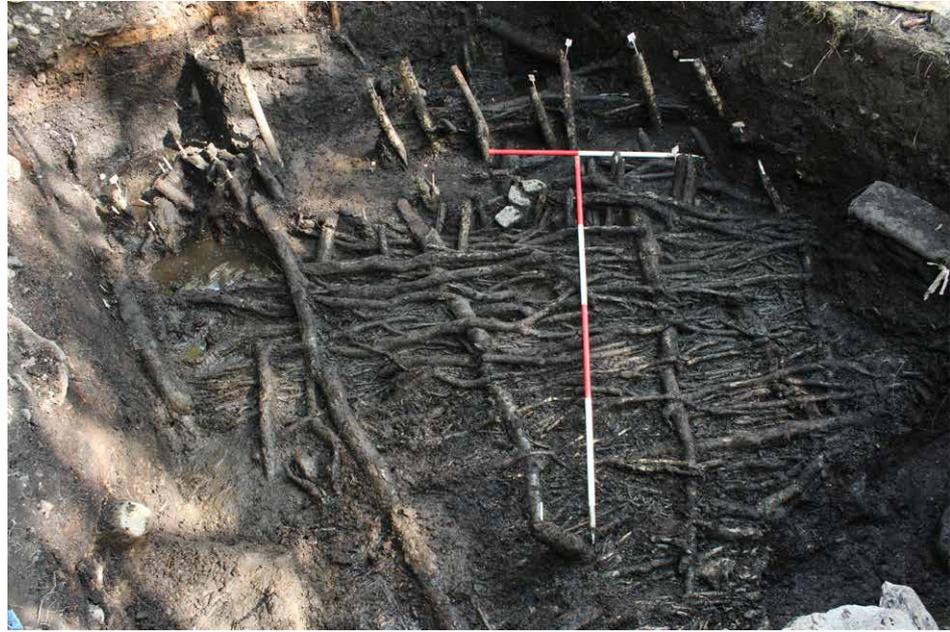


Figure 4.18. The N half of ST3 showing the Phase 1 sub-floor [15029/15030]. One of the surviving post-ring posts [15035] is *in situ* on the right of the photograph and in the foreground the stakelined Phase 3 feature [15032] is visible. The external surface [15017/15028] is visible at the top of the photograph, the radials lying at a different angle to those in the sub-floor, the stakes of the outer wall line lying along the junction between the two surfaces.



## 4.2.5 Phase 2

### 4.2.5.1 Embellishments to the sub-floor

During this phase, the sub-floor in the SE quadrant was embellished with an unusual arrangement of radially-aligned logs and hurdle screens (Figure 4.16). Four large alder half-logs [1755] had been laid directly over the sub-floor, fanning out from the edge of Hearth 2. The inner end of the westernmost log lies over the edge of Hearth 2 which might suggest that this feature was constructed after the abandonment of the hearth, but it is more likely that it has slipped down into the hollow created by the combined weight

of the stone hearths. Lying directly over the half-logs were two hurdle screens, [1753] to the E and [1754] to the W (Table 14.2) (Figure 4.20).

Hurdle screen [1753] had been laid down first and then [1754] was laid down over its edge, at a slightly different alignment. The sillbeam of [1754] was still *in situ* and lay along the S edge of Hearth 2, as though the screen had been pushed over backwards, away from the hearth. A third hurdle screen, [1750], lay beyond [1753] (Figure 4.21); it did not lie over the logs but lay on the same alignment as [1753].



Figure 4.19. Hearths 1 and 2 were only partially exposed, mainly under baulk WE. The stones of Hearth 1 lie to the left, the brushwood of the sub-structure poking through them. Some of the Hearth 2 stones have been removed to reveal the Hearth 1 stones dipping down steeply under Hearth 2. In the section below the ranging rod the sequence of clay [1770] capping Hearth 1, the (dark) plant litter [1767] which covered the mound and the grey clay [1769] which formed the foundation for Hearth 2 can be seen. The thick band of yellow-brown gritty clay [1759] is the capping of Hearth 2.



Figure 4.20. Hurdle screens [1753] to the back and [1754] to the fore. The sillbeam of [1754] lies to the left, along the edge of [1759], the clay capping of Hearth 2. One of the radial logs [755] is visible under the hurdle screens.

Screens [1753] and [1754] would have provided a robust surface which would have been raised above the sub-floor by the radial half-logs. The purpose of this construction is not obvious; as the hurdle screens were fully covered by the active floor surface [1743] (below) it must have been for a purpose related to the primary construction of the house.

#### 4.2.5.2 The active floor

Throughout the house the sub-floor and the hurdle screens were covered with a thick deposit of compacted plant litter, [1153] in the SW quadrant, [1743] in the SE quadrant and [15018A] in the N half. The thin layer of plant litter ([1169]/[1767]/[15031]) which sealed Hearth 1 was probably

part of the same deposit (see below). This deposit was up to 0.60 m deep in places but within this thick deposit it was not possible to distinguish individual surfaces by eye, either in plan or section. When [1153] was removed in the SW quadrant pockets of fly pupae, thin lens of charcoal and grey ashy layers were all noted but the surfaces on which these deposits must have lain could not be distinguished from the surfaces above and below them. Yet stratigraphically this deposit must contain the active floor surfaces associated with the use of both the Phase 2 Hearth 2 and the subsequent Phase 3 Hearth 8. In the section through the hearth stack (Figure 4.10) there was an organic layer [1763] between Hearth 2 and Hearth 8 and this must surely represent

Figure 4.21. Hurdle screen [1750] with its paired sails visible. The outer wall stakes [1747] are visible in the background.



Figure 4.22. Radial division 1 (RD1), the radially-aligned 'fault line' in active floor [1153]; it is visible as a gap just to the left of the ranging rod. The surface overlying [1153] is the Phase 4 sub-floor [1154] which consists of bundles of brushwood.



the Phase 3 floor surface, but beyond the hearth stack where the inorganic deposits helped to define them these layers could not be distinguished from each other in the field. Consequently, this means that we cannot distinguish between Phases 2 and 3 in the contents of these deposits.

The ecofact analyses of the floor deposits have distinguished differences in content and composition throughout the house, thus identifying clear activity areas.

#### **N half = [15018A]**

In the N half of the house [15018A] was up 0.3 m thick. MM has shown that [15018A] consists of the build-up of

Type B floors represented by large quantities of bracken interleaved with Type A floors rich in food and fuel residues and trampled sediments. As the monoliths were taken just to one side of the hearth stack (Figure 4.11) this presumably represents trample around the hearths followed by rapid covering with fresh flooring. The number of floor surfaces seen in MM indicates the frequency with which they were cleaned and refreshed.

The other ecofact assemblages were retrieved from bulk samples further away from the hearth stack and probably more accurately reflect conditions in the N half of the house. These suggest that this area of the house

was kept remarkably clean. Food remains were a minor inclusion and there was no burnt bone or charcoal (MA). Faecal matter was not detected in the monoliths furthest from the hearth (M8; Figure 4.12) but a human/horse signal was detected near the hearth in the uppermost levels of this floor (LB).

#### SE quadrant = [1743]

This was also identified as a Type B floor. MM to the E of the hearth stack (Figure 4.13) was able to distinguish a sharp discontinuity boundary within [1743] which is consistent with the removal of old floor deposits and replacement with fresh plant matter. The lower unit was characterised by roundwood interleaved with different plant types, whereas this distinct interleaving was absent in the upper unit.

MA has distinguished the components of [1743] as bracken and wood with smaller quantities of rushes and sedges. The components of turves were also present, possibly as flooring material and there was a lot of food debris, emmer chaff, bran, raspberry seeds, burnt and unburnt animal bone including butchery waste, suggesting that the SE quadrant during Phases 2/3 was not kept very clean. However, LB detected no faecal matter in this quadrant and no anthropogenic indicators, other than fragmentary charcoal in the lower units, were observed in MM.

#### SW quadrant = [1153]

This was some 0.25 m thick in places and covered the SW quadrant. A radially-aligned 'fault line' was observed in [1153], manifesting as a distinct gap 0.02–0.03 m wide, in the fibrous plant litter (Figure 4.22).

There were no stakes *in situ* within the gap but its line was continued out to the outer wall by an irregular line of small stakes [1175]. It seems most likely that this was a radial division (now called RD1) which continued in use throughout the occupation of the house (see below). Deposit [1153] was sampled in thin section in two positions, to the W of the hearth stack (Figure 4.15 [1153W]) and to the S of the hearth stack (Figure 4.14 [1153S]). Each section shows a quite different depositional history, probably because the floor deposits lie on either side of RD1 and were therefore subjected to differing activity regimes.

The deposit to the west of the hearth stack [1153W] consists of peaty material, possibly turves, with very little anthropic content, a Type E floor which looks like a single depositional event but must incorporate at least two events, ie Phases 2 & 3. This area lay in front of the entrance into the house so it is possible that dirty flooring was scrupulously removed leaving little to no trace of domestic debris or resurfacing events. The other possibility is that hurdle screens were used as matting in front of the entrance area and they were regularly replaced, thus removing all evidence of trampled debris. Faecal matter was not identified in this area (LB).

The deposit to the south of the hearth stack [1153S] is a Type B floor in which four depositional events could be distinguished, suggesting that the surfaces were more frequently replaced in this area of the house. It seems probable that the lower two events represent Phase 2 whilst the upper two represent Phase 3 but this cannot be conclusively demonstrated. Coprolitic material was identified and this is supported by LB which identified the presence of human/horse and ruminant faecal matter. However, foul decomposers were not present in sufficient numbers to indicate that animals were being stabled in this part of the building (IN). House fauna associated with damp mouldering organic conditions were present, as were human fleas (IN).

MM of [1153] identified only limited amounts of occupation debris but MA identified food debris, including hazelnut, emmer and raspberry seeds, and relatively large amounts of unburnt animal bone, some of which had been butchered (BO). The plant litter used in the floors was mostly bracken and roundwood and large quantities of sphagnum moss were present. IN identified terrestrial outdoor taxa which were probably brought in with flooring materials such as rushes, mosses and brushwood.

#### Artefact distribution

There is a clear distinction between the N and S halves of the house during Phases 2/3, with only trace quantities of food and fuel debris found in the N half, suggesting that this part of the house was not a working area. This division is all the more pronounced when the distribution of artefacts is considered (Figure 4.23).

In terms of artefacts, [1743] and [1153] are the richest deposits throughout the use of the house. Deposit [1743] produced 13 objects including wooden vessel fragments SF293, turning waste SF298, a roll of birchbark SF299, a thin perforated stone SF301, a trenail SF302 and a woven withy ring SF308, as well as many coarse stone tools and puffballs. Deposit [1153] also produced puffballs (SF242, SF243, SF246 & SF247), a notched bone artefact (SF230 & SF231) and, most significantly, the turned baton-like object SF237. Whilst most of the other finds could represent accidental losses, SF237 was too big to have been accidentally dropped so it must have been deposited when new flooring was being laid down. Nonetheless, during excavation we could not distinguish the floor surface on which it was laid from the floor surface that covered it. The artefact distribution, together with the greater quantities of food debris encountered, suggests that the S half was the primary working area in the house. As will be seen this distinction continued throughout the use of the house.

#### 4.2.5.3 Hearth 2

A thin layer of plant litter ([1169]/[1767]/[15031]) was also laid over Hearth 1 to seal it; it consisted mainly of bracken,

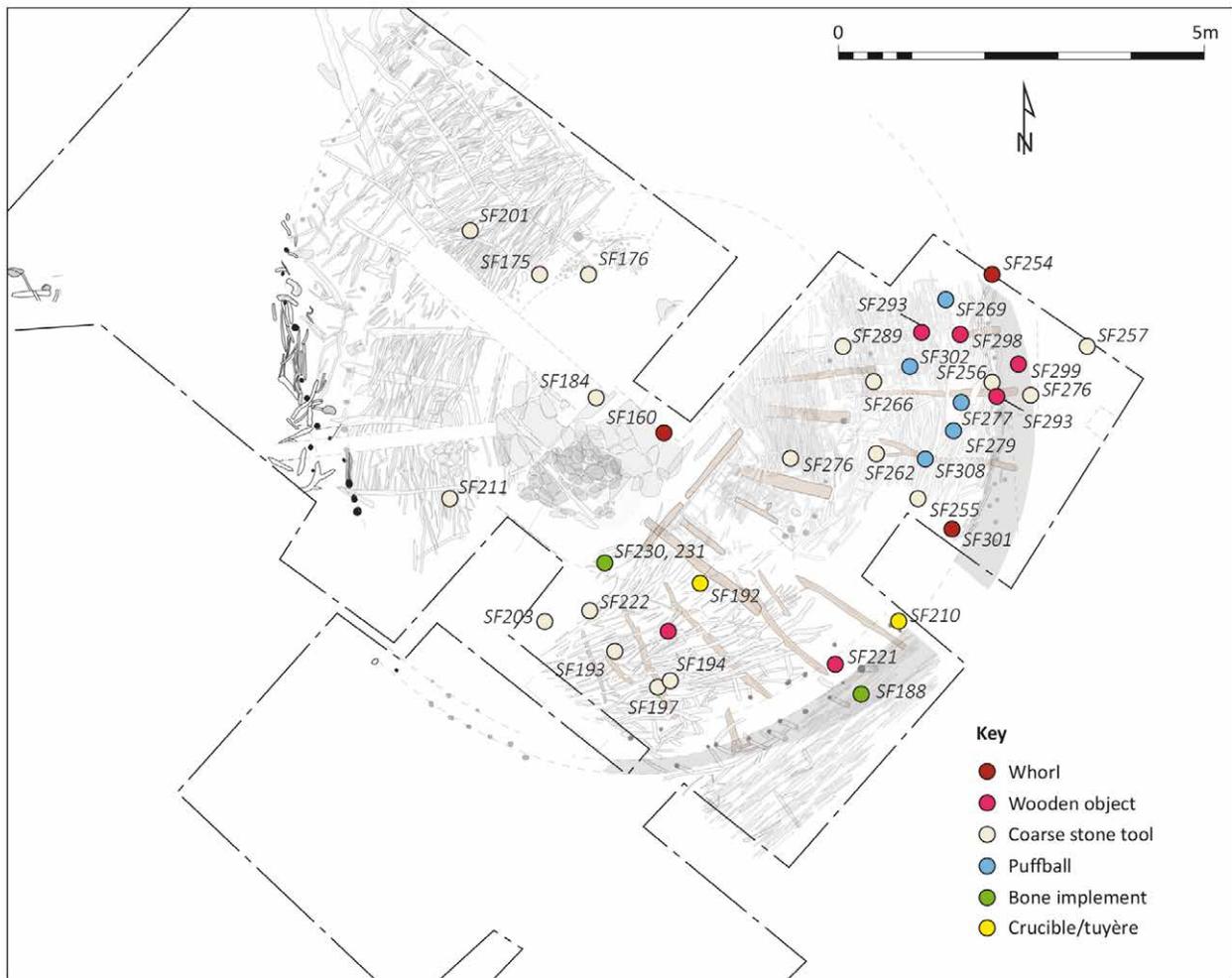


Figure 4.23. ST3 artefact distribution.

with some sedge and rush which had been burnt, and also contained carbonised and waterlogged cereal grains and chaff (MA). Quantities of moss and some heather were also contained in [15031] whilst [1767] contained burnt bone which may be the remains of a pig that had been roasted on Hearth 1 (BO).

A surface of grey clay [1769] was laid down as a foundation for Hearth 2. Hearth 2 consists of large flat slabs [1765] packed around with a gritty yellow-brown sandy clay ([1143]/[1170]/[1759]) which extends beyond the edges of the stone surface (Figure 4.24).

The structure of this hearth was not fully exposed but [1759] appears to have been contained within a slight framework of roundwood timbers, at least on its S side. It was at least 2 m across. A thick deposit of hearth debris [1764] consisting of thin bands of charcoal, ash, and clay lay over the centre of the hearth. In MM six episodes of rakeout were identified in [1764], characterised by fluctuating proportions of burnt bone and calcitic ash, and the presence/ absence of unburnt organics alongside burnt

debris. The changing proportions of components may signal slight changes in the use of the hearth. Vesicular ashy slag identified on the edges of the hearth may be evidence of iron working. Burnt flooring materials, trace amounts of food debris including limpet shell, and burnt peat were present (MA).

#### 4.2.6 Phase 3 (Figure 4.25)

As described above, it was not possible to distinguish between the floor levels of Phases 2 and 3 so the descriptions of the Phase 2 floors, their contents and composition also applies here. The hearth debris over Hearth 2 was sealed by a layer of plant litter [1763] over which Hearth 8 was constructed. On the S edge of the hearth stack [1763] was a Type B floor in which clear horizontal boundaries reflect distinct episodes of resurfacing whilst on the N edge of the hearth stack food and fuel debris have become trampled into the organic matrix of the floor (MM), possibly from the hearth debris over which it was lain.



Figure 4.24. The W edge of Hearth 2 revealed after the removal of the clay capping [1759]. In the background one of the [1755] logs can be seen lying over [1759]. The deposits of the later Hearths 3 and 4 can be seen in section.

#### 4.2.6.1 Hearth 8

Hearth 8 was labelled as such because it lay within the stratified sequence of hearths but it is a strange construction and may not have functioned as a hearth at all. It consists of [1762], which was described in the field as a hard white-grey clay, rich in burnt bone (BO) and limpet shells (Figure 4.26).

However, MM shows that towards the edges it also incorporated much of the organic surfaces above and below it. The surface of [1763] immediately under it is carbonised so this hearth debris may have been spread over it whilst still hot. It is thinly spread, no more than 0.12 m at its deepest and thins out to E and S. It measures at least 2 m W to E and appears to be retained on its W edge by small stones. Small, short cleft oak staves [1758] have been inserted into this layer to form a semi-circle some 1.2 m across. A thin layer of charcoal fragments and marine shell [1757] was spread over the surface of [1762] and lying over this, and within the semi-circle formed by the oak staves, is a circular patch of white ashy clay [1756]. It is difficult to see how this functioned because there is no hearth structure as such. The deposits are simply dumps of hearth debris and the purpose of the oak stave construction is unclear, except perhaps to contain later dumps. It may be significant that Hearth 8 contained 59% of all the marine shell found on the settlement, 7.4 g of mixed limpet and periwinkle from [1757] and 5.7 g of limpet from

[1762]. It was found that [1762] also contained 160 g of burnt bone including a cattle horn (BO). The feature was sealed by a layer of plant litter [1771] which must represent the Phase 4 resurfacing (see MM below), although in the field it was not possible to distinguish between the Phase 3 plant litter layer [1763] under Hearth 8 and [1771] over it.

#### 4.2.6.2 Other features

It is possible that [15032], another enigmatic feature which lies some 0.75 m to the NE of Hearth 8, belongs in this phase (Figure 4.27).

Feature [15032] consists of a shallow hollow *circa* 1 m across and 0.25 m deep, lined with small hazel stakes, *circa* 0.03 m diameter, which radiate out from the centre. It lay within [15018] and its 'fill' [15038] could not be distinguished from [15018] in the field. However, MA identified differences in their composition, with [15038] containing quantities of barley and emmer caryopses, chaff and straw fragments, suggesting that it may have been used for cereal processing or storage. There was also evidence for decomposed turves in [15038]. IN also hinted at the presence of turves and suggests that the hollow might have been slightly drier than the surrounding floors. LB also identified faecal input in [15038], distinguishing it from [15018] below it which did not show any evidence for faecal matter. Hollow [15032] cannot be stratigraphically linked to Hearth 8 because

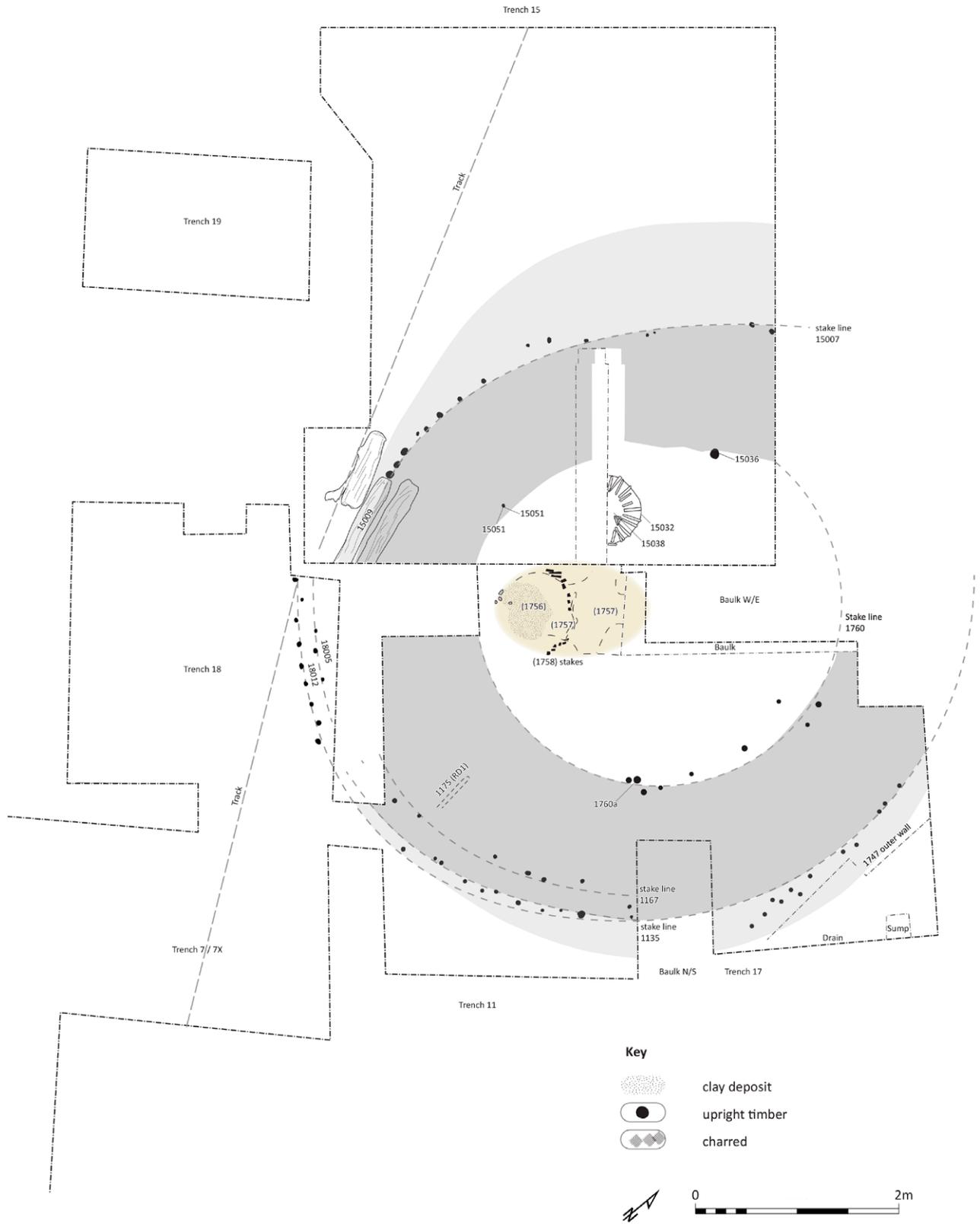


Figure 4.25. ST3 Phase 3.



Figure 4.26. Hearth 8 half-sectioned. The section shows the spread of white clay [1762] lying in the hollow, the charred surface of the plant litter floor [1763] visible below. The arc of oak staves [1758] has been inserted into this deposit and the deposit of ashy clay [1756] lies within it.



Figure 4.27. Feature [15032] after removal of fill [15038]. The surface within which it lay [15018] has been removed around it, exposing the peat and the primary sub-floor.

of the homogeneity of [15018] within which it lay, but it would have been overlain on its SW edge by the projected spread of the later Phase 4 Hearth 3 so must relate to earlier activity.

#### 4.2.7 Phase 4 (Figure 4.28)

##### 4.2.7.1 The sub-floor and structural refurbishments

In Phase 4 a new sub-floor surface ([1729]/[1154]) was laid down over the old Phase 3 active floor surface (Figure 4.29). It consisted of tightly packed bundles of brushwood and small branchwood laid tangentially to form a wide annulus around the S edge of Hearth 3. It had a distinct outer edge which left a gap between it and the outer wall ([1747]/[1135]), suggesting that there may have been a double outer wall, the evidence for the inner face of which has gone. [1154] was generally clean, with little evidence for domestic debris (MA) but the faecal signal for human (horse) was detected (LB).

In the SE quadrant, some 1.7 m in from the outer wall and lying concentric with it there was a gap 0.3 m wide in the sub-floor surface and within this gap was an arc of stakes (Arc line 1 = [1742] & [1760]) which had subsequently been sealed by the later Phase 5 floor [1728b]. Arc line 1 did not continue into the SW quadrant; in this quadrant the sub-floor surface continues without a break from the outer wall to the edge of the hearth. This suggests that there may have been another radial division running N-S which lay under the baulk, hitherto referred to as RD2. The sub-floor surface did not extend W beyond RD1 nor were they found in the N half of the house. A short line of small alder stakes [15027] may have been inserted in between the posts of the

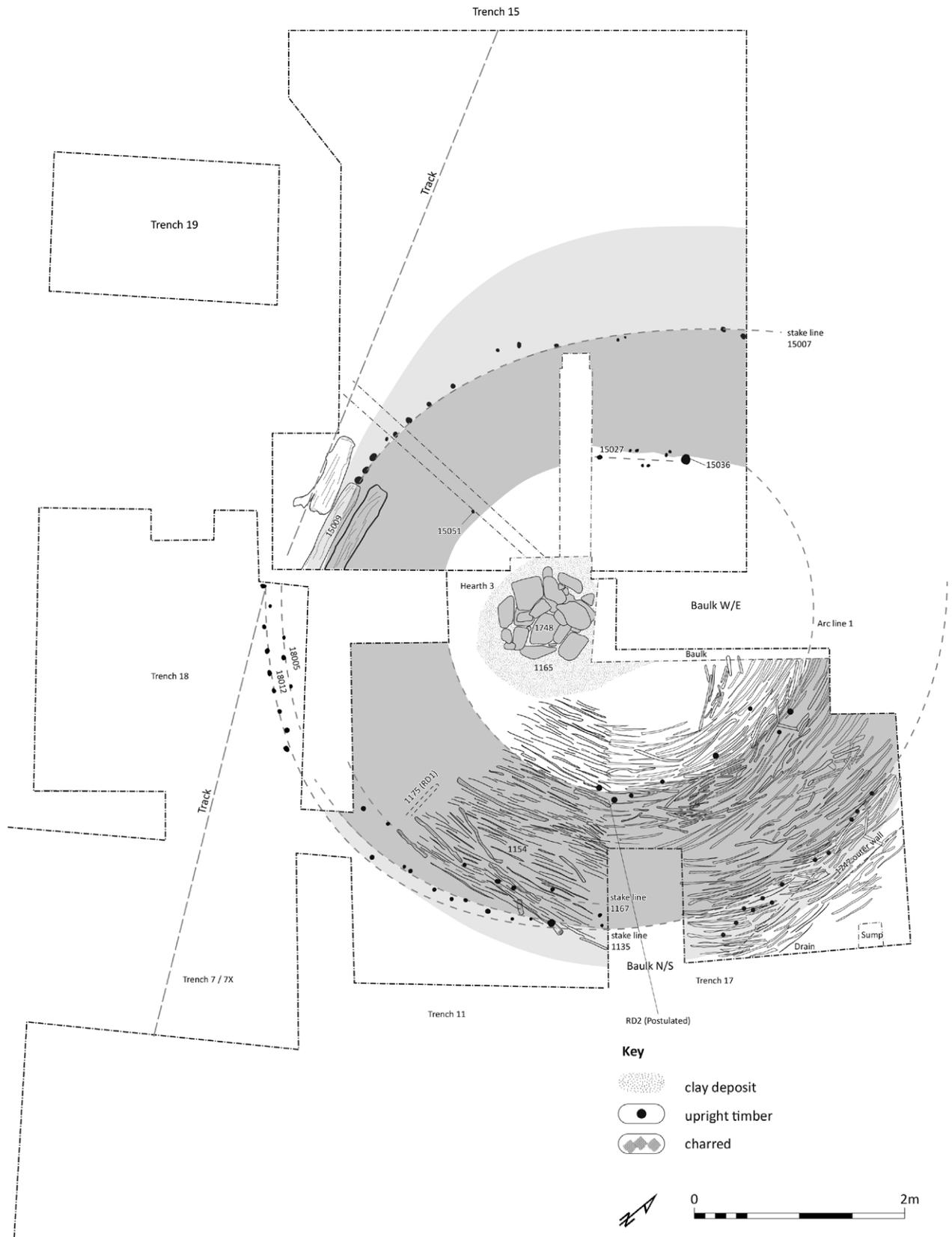


Figure 4.28. ST3 Phase 4.



Figure 4.29. The Phase 4 threshold timbers [15009] projecting out of the baulk in the upper right of the photograph. The middle timber lies along the line of the outer wall [15007], its stakes visible curving around the edge of the primary sub-floor. The trackway and external surface [15017/15028] lie in the foreground.

post-ring in the N half during this phase, possibly to act as a screen there.

The entrance was refurbished during this phase by placing three large alder half-logs [15009], each at least 1.5 m long and some 0.3 m wide, across the doorway; the middle log was aligned with the outer wall (Figure 4.29).

#### 4.2.7.2 The active floor surface

The sub-floor surface was covered by a deposit of plant litter up to 0.30 m thick, [1148] in the SW quadrant, [1728] in the SE quadrant and [15018B] in the N half. A thin layer of organic flooring [1771] was also laid over the old Phase 3 Hearth 8. This was sampled in thin section on the S edge of the hearth stack; it was a Type A occupation deposit rich in anthropogenic residues and hearth debris (MM).

Deposits [1148] and [1728] must incorporate the active floor surfaces of both Phases 4 and 5 but the change from one phase to the next could not be distinguished in the field. However, in thin section it was possible to distinguish boundaries in [1728], so [1728A] represents Phase 4 and [1728B] represents Phase 5. It was not possible to distinguish boundaries in [1148], although, broadly, the lowermost deposits must represent Phase 4 whilst the uppermost represent Phase 5.

#### N half = [15018B]

This consists of Type E deposits some 0.36 m thick in places which have probably built up through the use of peaty turves to create and repeatedly resurface the floors in the N half of the house (MM). Further away from the hearth large quantities of bracken were found in the bulk sample

(MA) suggesting that, in parts of the floor at least, the peaty turves were supplemented by layers of bracken.

Despite the sampling locations being located as close to the hearth stack as those of the earlier Phase 2/3 [15018A] deposits (Figure 4.11) there was very little anthropic input suggesting that in Phases 4 and 5 this area of the house was kept exceptionally clean. Nonetheless, faecal matter was detected throughout [15018B] close to the hearth, changing from human (horse) in the lowest layers, to pig, to ruminant and finally to human (horse) again (LB).

#### SE quadrant = [1728]

This was a dark orange colour when first exposed and was described as looking like 'chipboard'. MM has identified that [1728A] is a Type B floor, constructed using layers of bracken intermixed with roundwood bark, some rushes and sedge. In the lowest units, possible herbivore coprolite fragments were identified which, together with the evidence for trampling and elevated faecal signatures for herbivores (LB), suggests that the E side of the house may have been used for stabling during this phase. These lower units also contained bracken rhizomes, indicating that the bracken had been dug up rather than cut, so the floors in this area would have been less clean, because the soil adhering to the roots would also have been brought in. Throughout [1728], so throughout Phases 4 and 5, there were at least 11 resurfacing events, and in three of these there was evidence for trampling and exposure, indicating that in the SE quadrant of the house the dirty floor surfaces were not always fully removed. Nonetheless, very little domestic debris had been incorporated into the floors in this area. There was a small quantity of burnt and unburnt

bone (BO), whilst MA found only trace amounts of food debris and no fuel debris. However, the largest assemblage of puffballs, 18 in all, was recovered from [1728].

#### SW quadrant = [1148]

In the field [1148] was very homogeneous and, like [1728], was a dark orange colour when first exposed; discontinuous lens of charcoal [1129] could be seen in section and discontinuous changes in colour and texture were observed in plan when first revealed but the dark orange colour soon oxidised and any changes disappeared. Deposit [1148] was sampled in thin section in two positions, to the W of the hearth stack (Figure 4.15 [1148W]) and to the S of the hearth stack (Figure 4.14 [1148S]), ie on either side of RD1.

Overall [1148] is a Type E floor created by the deposition of peaty turves (MM) and woody debris (MA). There were slight differences in composition which probably reflect nothing more than different armfuls of building materials. Deposit [1148W] contained more roundwood (hazel and alder) and woodchips (alder and oak) whilst [1148S] was dominated by brushwood (MA). Deposit [1148W] is the more homogeneous, with little anthropic content. Faecal matter was not detected in [1148W] either (suggesting that, as in the earlier phases, this area was regularly and rigorously cleaned LB). At least nine depositional events were observed in [1148S] indicating the frequency of refurbishment of this floor. Human (horse) faecal matter was detected in the lowest levels of [1148S] (which must equate with Phase 4) but otherwise these deposits were also relatively free of anthropic debris.

#### 4.2.7.3 Hearth 3

Hearth 3 was an open stone hearth with a clay kerb. It was built in a shallow hollow in the old Phase 3 floor [1743], the surface of which appeared to be completely charred. However, MA analysis indicated that this surface (sampled separately as [1752]) consisted entirely of cereal straw fragments, very different from the composition of [1743] (see above), so the hollow must have been lined. A foundation layer of grey gritty clay [1751] up to 0.12 m had been laid down over a roughly circular area some 2.9 m across. Layer [1751] contained 25% of all the shellfish found on the settlement, as well as a quantity of burnt bone (BO). The base of the hearth consisted of two layers of stones [1748], a primary layer of small, thin stones covered by larger greywacke slabs forming a base roughly 1.4 m in diameter. A halo of blue-grey clay [1165], forming in effect a wide kerb, was packed around the hearth, extending out beyond the edges of the stones to cover an area roughly 1.85 m by 1.85 m. Deposit [1165] was startlingly inorganic, the trace amounts of burnt limpet shell found in it probably coming from the hearth debris below and above it. Within the clay kerb and lying directly over stones [1748] was a yellow-grey clayey ash [1741]; this contained fuel and

food debris comprising burnt bone, cereal grains, chaff, hazelnut shell and limpet shell. MM suggests that this hearth debris was trampled to compact it down. In places, the clay halo appeared to be packed down over the edges of the ash, possibly in an effort to contain the spread. Another thick layer of hearth debris ([1740]/[1174]) covered both [1165] and [1741]. This hearth debris contained charcoal, burnt bone (BO), cereal grains, hazelnut shells, burnt peat and blackthorn stones (MA), and must represent the final use of Hearth 3 as the Phase 5/ Hearth 4 was built immediately on top of it (see below). Two unburnt rodent bones were found in [1740] (BO), perhaps evoking conditions in the structure at the end of this phase.

#### Floor surfaces around the hearth

The floor deposits to the W of Hearth 3 demonstrate the difficulties of identifying surfaces within the organic matrix. The organic deposits lying over the distinctive blue clay [1165] could not be distinguished from those under it. Deposit [1746] was a spread of food debris rich in burnt and unburnt bone (BO) which laps around the edges of Hearth 3, but apart from its contents there was no apparent boundary to distinguish it from the surface of [1743], the old Phase 3 active floor surface that it lay over.

### 4.2.8 Phase 5 (Figure 4.30)

#### 4.2.8.1 The active floor surface

As described above, the active floor surface for this phase lies within the upper levels of the thick deposit of plant litter [1148], [1728] and [15018B]. The floor surface to the W of the hearth, [1148W] continued to be clean during this phase, with no evidence of faecal matter (LB). To the E of the hearth MM identified [1728B] as a Type H stabling deposit, although no faecal matter was detected (LB).

#### The active floor surface around the hearth

The ashy layers of Hearth 4 (see below) had spilled out over the kerbstones onto the surface W of the hearth sealing a thin highly humified organic deposit ([1735]/[1164]), which contained quantities of burnt and unburnt animal bone (BO), as well as unburnt hazelnut shell and burnt cereals (MA). Deposit [1736] is a thin layer of rushes on the same surface (Figure 4.31) and probably represents a better-preserved patch of [1735]; it contained food debris including raspberry and blackberry seeds which could indicate the presence of faecal matter.

Both [1735] and [1736] contained weed seeds from burdock, fat hen and common nettle in quantities significant enough to suggest that they could have been deliberately collected (MA). Under this was [1744], a deposit of compacted woody debris which contained bone fragments (BO), as well as evidence for the presence of peaty turves (MA). These patchy deposits [1735], [1736], [1744] and [1745] (a

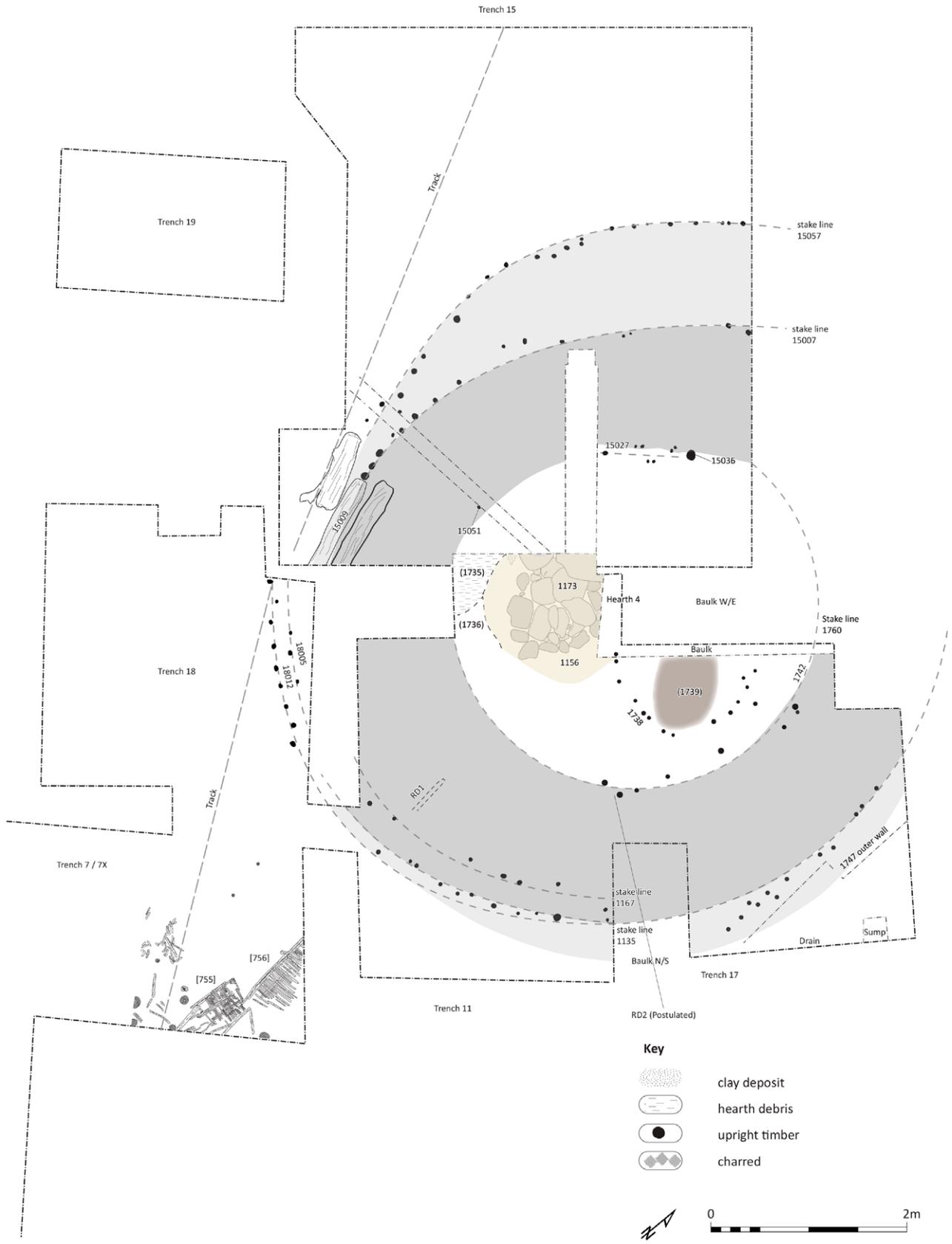


Figure 4.30. ST3 Phase 5

Figure 4.31. Hearth 4. The rounded boulders of the kerb are visible, the right edge having slumped off the hearth stack. The ash dome [1734] with its covering of charcoal-rich ash [1733] can be seen in section over the hearth stones. In the foreground the rushes within [1736] are distinct.



small spread of angular stones and burnt debris) represent the build-up of the floor surface associated with the use of Hearth 4 into which domestic debris has been trampled. Around the SE and N edges of the hearth the spillage of burnt food debris had also charred the floor coverings; on the N edge deposit [15020] contained burnt bone (BO), carbonised cereals, nuts and fruitstones, as well as large quantities of burnt plant stems, as did [1162] around the SE edge (MA). Deposit [1162] also contained four unburnt puffballs (MA) and an unburnt bone shaft (BO).

#### 4.2.8.2 Hearth 4

Hearth 4 was also an open stone hearth but with a stone rather than clay kerb (Figure 4.31). It was built directly over the hearth debris ([1740]/[1174]) from the last use of Hearth 3. It measures some 1.6 m by 1.4 m and consists of a surface of flat slabs with a kerb of medium-sized boulders [1173]. The hearth had not been cleaned out and a dome of yellow-white ash ([1734]/[1163]) some 0.13 m deep under a crust of charcoal-rich ash ([1733]/[1156]) had been left *in situ*. Deposit [1734] was rich in burnt bone (BO), whilst hazelnut shells had been found throughout the ashy layers in 2018. MM of [1734] indicates three burning episodes and two episodes of hearth rakeout; burnt bone and the presence of a vesicular ashy char, possibly from melted fat, suggests the cooking of meat at high temperatures. Deposit [1163] contained the burnt remains of a young

pig (BO) which may have been roasted in Hearth 4 and would account for the melted fat. Some of the other ashy deposits, [1163] and [1156], also contained large quantities of charred hazelnut shells (MA).

#### 4.2.8.3 Other features

Immediately under the Phase 6/Hearth 5 was a singular feature which must belong in this phase. A circle of small stakes [1738] some 2 m in diameter had been laid out, the stakes inserted into the surface of [1728] at roughly 0.2 m intervals. Within the circle of the stakes was a deposit [1739] which consisted of small lens of plant litter, burnt plant litter, clay and ash, and a piece of unburnt butchered animal bone.

#### 4.2.9 Phase 6 (Figure 4.32)

The house underwent major renovations during this phase. The original outer wall of the house appears to have collapsed in places, leading to a contraction in the size of the house to around 7.9 m from the threshold to the opposing wall. In the SE quadrant it was replaced by two walls, an inner [1710] and outer [1711]. These are not concentric; they lie 0.7 m apart on the S perimeter and converge to just 0.3 m apart on the E perimeter. Along the S perimeter [1711] lies on the line of the old wall [1747] but diverges inwards from the old wall by as much as 0.8 m along the E perimeter. It is unclear as to whether [1710] or [1711] continues

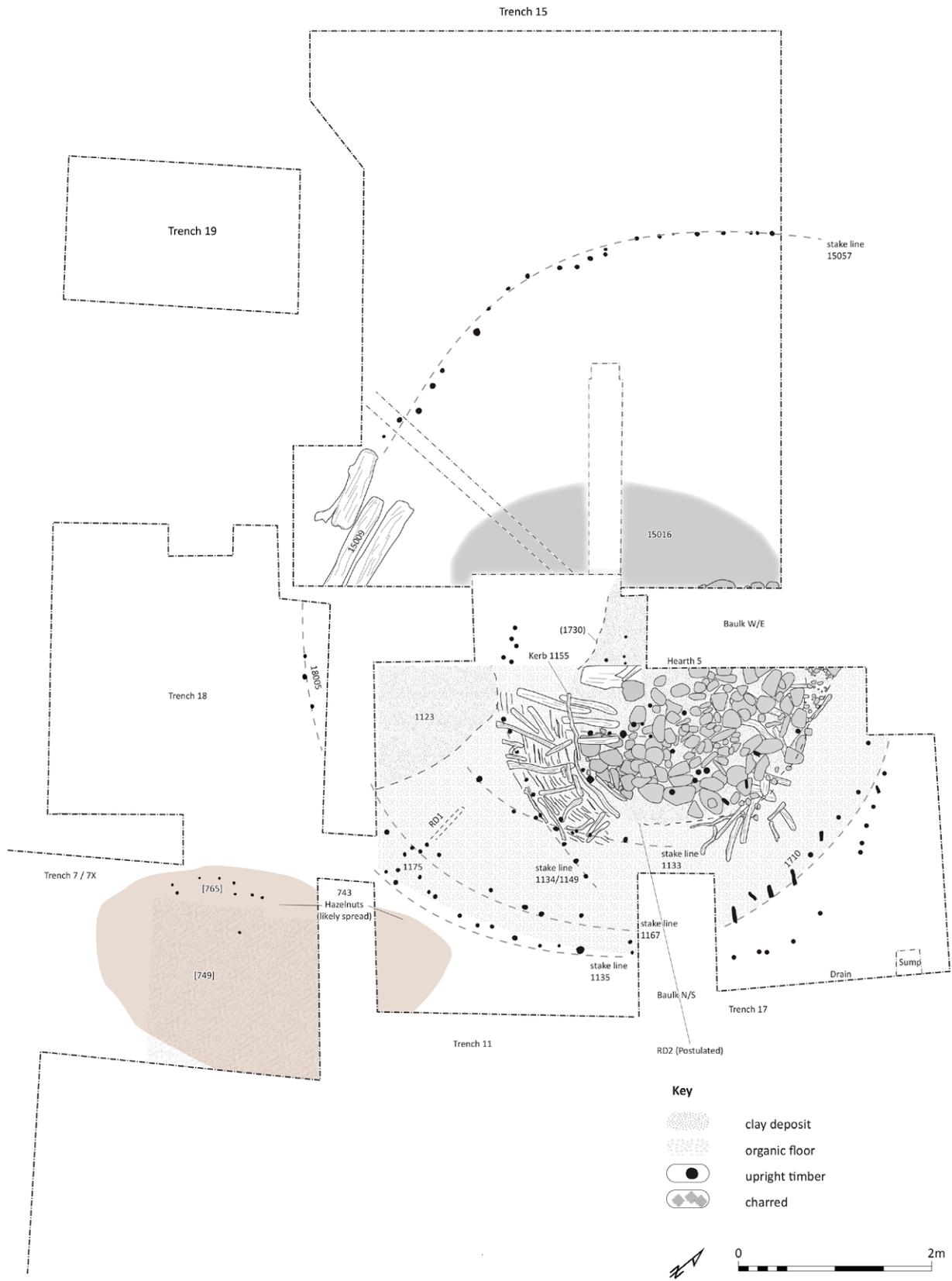


Figure 4.32. ST3 Phase 6.



Figure 4.33. Hearth 5. The stone surface after the removal of the yellow-grey clayey sand [1721]/[1151], traces of which can be seen around the edge in the sondage. The small stakes [1726]/[1158] are identified by garden tags.

the circuit of [1135], the outer wall in the SW quadrant; however, in Phase 7 an ashy deposit built up behind both [1710] and [1135] (see below) suggesting that they formed a continuous wall line. On the W perimeter stakeline [18005] may represent a contraction inward from the old wall line on this side [18012] (although it could equally represent a double wall – see Phase 1). Around the N perimeter the new wall line expanded outwards, with [15007] being replaced by [15008], an uneven line of stakes which lies approximately 0.4 m outside the original wall line. One of the new stakes had been rammed through a radial in the external wickerwork surface (see below). Willow, hazel, ash and birch had been used to construct [15008].

In this phase there is also a major shift of focus from the geometric centre to the SE quadrant with the construction of Hearth 5 built directly over the Phase 5 floor surface ([1728]/[1148]). Hearth 5 lay over the circuit of the original post-ring thus rendering it redundant although, of course, evidence of a later post-ring may not have survived if the posts were not earth-fast.

#### 4.2.9.1 Hearth 5

The size and construction of Hearth 5 is unusual for a hearth and it looks more like a working platform, raised high above the surrounding floor surface; nonetheless, some of the associated deposits are rich in charred and uncharred food debris, suggesting that it was used for food preparation. The structure consisted of a primary layer ([1737]/[1157]) of brushwood and branches, laid down rather haphazardly both radially and concentrically. A line of small hazel and ash stakes ([1134]/[1149]), 0.03 m in average diameter, appears to have formed the W boundary of this foundation layer. Woodchips and splinters cleft off alder, willow and hazel

logs in this layer suggest that woodworking took place *in situ*. Smaller branches had been laid tangentially around an oval area some 4 × 3 m across to form a kerb of sorts [1155]. The interior of this oval area was then more haphazardly filled with large logs, branches and tree roots [1727], a mixture of oak, alder and willow. There were also some fragmentary oak planks [1160]. These had then been covered by a layer of stones ([1706]/[1159]) within a matrix of yellow-grey clayey sand ([1721]/[1151]), into which trace amounts of food debris had become incorporated (MA:BO). The stones [1706] were a mixture of large boulders, flattish slabs and smaller cobbles, including one very large upright boulder on its W edge (Figure 4.33). In between the stones were the remains of small stakes ([1726]/[1158]), no more than 0.02 m in diameter and very decayed. There was no pattern to their placement and they may have been inserted in through the clay, their tops decaying away below the surface. The tops of some of the stakes were charred.

On the NW edge of the feature little pockets of hazelnuts [1725], both charred and uncharred, were found in the gaps and crevices between the stones. The clay [1721] covered the stones and was thicker around the edges of Hearth 5. The clay was greyer in colour [1730] around its N edge and contained small, decayed branches which appeared to lie in a roughly grid-like pattern. Its upper surface was more mottled with clay-rich [1718] and sandy [1719] patches, the edges of which were difficult to distinguish. These clay deposits contained primarily hazelnut shells, both charred and uncharred, as well as trace amounts of cereals (MA). There was no evidence of burning on the surface of this feature but a thick spread of ashy debris [1150] with visible lens of charred organics and clay lay over its western edges suggesting that it had functioned as a hearth. MA showed

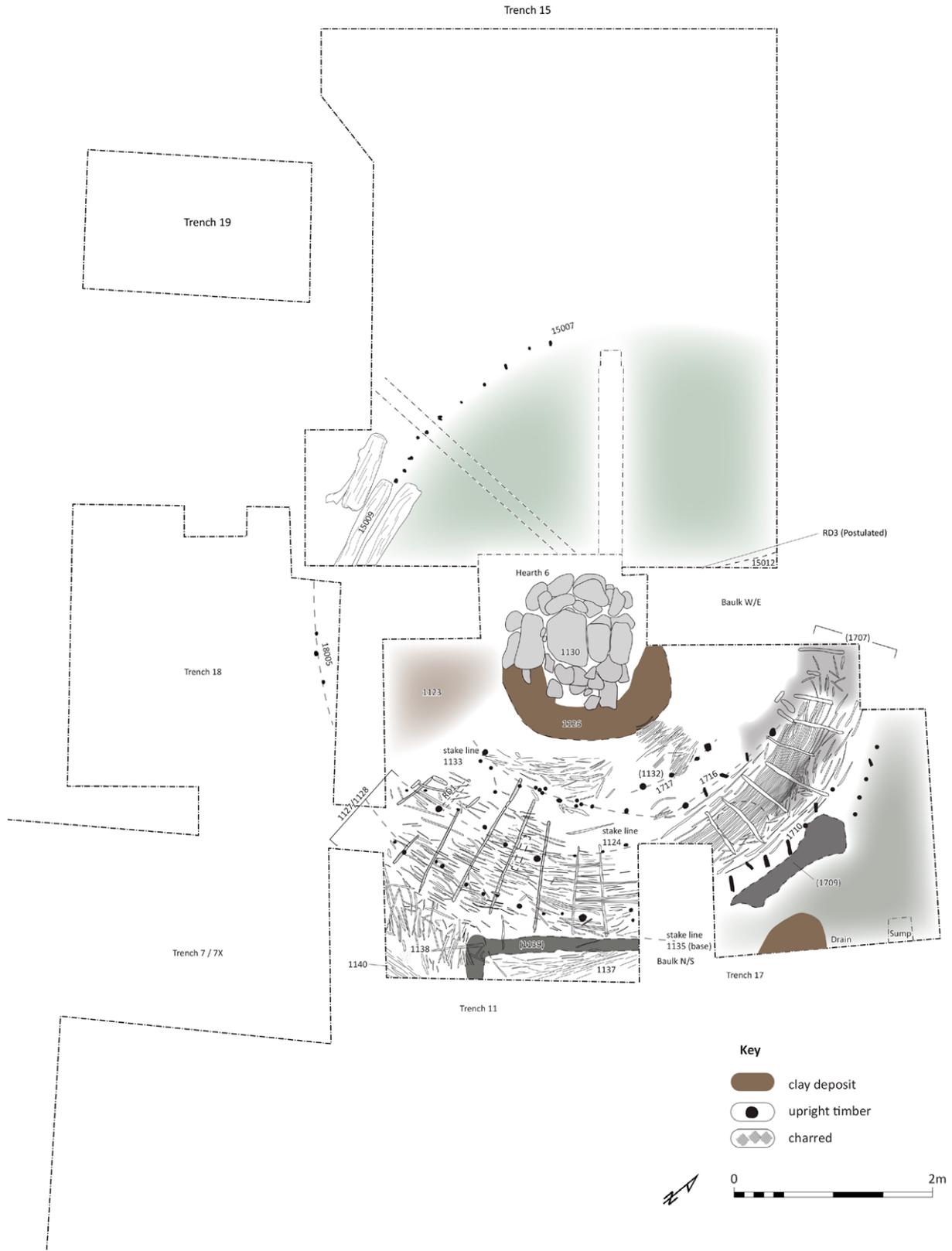


Figure 4.34. ST3 Phase 7.

that [1150] contained large numbers of cereal grains and chaff, as well as quantities of carbonised hazelnut shells. It also contained a quantity of burnt and unburnt bone (BO). On the S slope of the mound was a charcoal-rich deposit [1720] which consisted almost entirely of food waste; MA shows it was rich in cereal grain and chaff, as well as unburnt hazelnut shell, so may represent a single discrete spillage of waste.

#### 4.2.9.2 The active floor surface

The floor associated with Hearth 5 in the S half was [1144], a 0.16 m thick humified organic deposit which consisted almost entirely of bracken, with smaller amounts of rush, sedge and wood (MA). Both charred and uncharred food debris including burnt bone (BO) had been trampled into this floor. MM indicates that trampled domestic debris increased in the upper levels of this deposit and that the floor was subject to a fluctuating water table. Human (horse) faecal matter was detected in the lower levels of [1144] S of the hearth but not in the upper levels, and it was not detected in [1144] W of the hearth (LB). The insect fauna reflects a mixture of damp foul conditions and relatively drier conditions (IN). A biting louse and dung beetles were present, but these do not necessarily reflect the presence of live animals; they could have arrived via the processing of hides and fleeces.

Deposit [1147] is in the SW quadrant overlying [1144] which may represent the spillage of a bucket of hearth debris; it was rich in food debris including carbonised cereals and hazelnut shells, as well as charred peat which probably represents fuel debris. The sample also included charred sedge and rush stems which probably represents the surface burnt by the spillage (MA). Other patches of trampled debris [731/732] lie to the W of the hearth.

In the N half [15015] is the equivalent of [1144]; this was also composed primarily of bracken (MA). Although there were only trace amounts of food debris in the MA assemblage, MM shows that this surface had been raked or swept and ashy debris and food residues trampled into it. A diverse insect assemblage suggests varied origins for the fauna (IN); fauna associated with both dry conditions and foul damp conditions were present. Human (horse) faecal matter was also present (LB).

To the W a surface of orange/brown clayey sand ([1123]/[1705]) had been laid down, in which charred cereals and hazelnut shells as well as burnt bone had been trampled (MA:BO). The change in floor surface on this side of the structure lay just to the NW of the earlier RD1, suggesting that there was always a radial division in this area. Around the N edges of Hearth 5 a deposit extending *circa* 1.1 m beyond Bulk W/E (effectively within the post-ring) and comprising shattered stone and ashy debris [15016] may be the remnants of the floor surface on this side of the hearth. In MM the lower level of this deposit was shown to be an organic floor

surface into which hearth residues, burnt bone, charcoal and peat had been trampled; MA indicates that it was primarily bracken. This might be residual [15015] but in the upper level [15016] becomes more minerogenic, primarily clay, with more burnt peat than charcoal, suggesting a change in fuel types used in the hearth. In the SE quadrant the surfaces were also more minerogenic, again suggesting that RD2 continued in use during this phase. Deposits [1722] and [1724] were mineral-rich organic deposits, [1722] lying between the stakelines [1710] and [1711] whilst [1724] which lay inside [1710] was more mixed and included some brushwood and patches of small cobbles.

#### 4.2.10 Phase 7 (Figure 4.34)

The structure underwent further changes during this phase, with a shift of focus back to the geometric centre, where a new stone hearth, Hearth 6 was constructed.

##### 4.2.10.1 The sub-floor surface and structural refurbishments

As part of the renovations a new sub-floor structure was laid down. A surface [1132] consisting of bundles of small withies was laid down concentrically around the new hearth (Figure 4.35).

This surface may have been immediately covered by the hearth packing [1131] (see below) because it contained only trace amounts of food debris (MA). This surface had been laid down over the minerogenic slopes of the old Hearth 5 and conditions may consequently have been a little drier than elsewhere in the house; this may account for the relatively small size of the surviving insect fauna which nonetheless indicates damp conditions in this area (IN).

There are indications in the flooring patterns in this phase that RD2 continued in use. In the SW quadrant surface [1132] extended out as far as [1133], an arc of small hazel and birch stakes with an average diameter of 65 mm. There were occasionally paired stakes, one of which appeared to be a later replacement. Stakeline [1133] did not extend W beyond RD1 nor did it extend into the SE quadrant. Here another line of stakes [1716] continues along roughly the same circuit but meets the line of [1133] at a gentle angle, suggesting that a radial division intervened at that point. Like [1133] the stakes in [1716] were mainly hazel, with some birch with an average diameter of 0.056 m. Such small stakes are unlikely to have had a function in the superstructure but may have acted as a screen around the hearth. Lying some 0.4 m inside [1716] and concentric with it was another short arc of stakes [1717], only 1.25 m long and consisting of alder, willow, hazel and birch.

Beyond the stakeline in the SW quadrant a surface of hazel brushwood bundles [1142] had been laid down in a roughly herringbone pattern over an annulus *circa* 1.2 m wide (Figure 4.35). Mixed faecal matter dominated by



Figure 4.35. The Phase 7 sub-floor structures. From left to right – the stakes of the outer wall [1135], stakeline [1124] and stakeline [1133]. Hearth 6 lies in the upper right-hand corner. Within [1133] lies the brushwood surface [1132] and on either side of [1124] lies [1142], a surface of brushwood bundles laid out in a herringbone pattern.



Figure 4.36. Sub-floor [1127/1128]; charred patches are visible just in front of the upper baulk. The brushwood surface [1132] lies around the edges of Hearth 6. The boundary between the minerogenic surface [1123] in the left-hand corner and the brushwood sub-floor indicates that RD1 continued in use throughout the occupation of the house. The external surfaces around ST3 are also exposed; these include withies [1138] (at base of image) and [1137] around the S edge of the house.

human (horse) was present in [1142] (LB). In the SE quadrant the equivalent of this surface was [1713] which consisted of hazel branches laid down concentrically and rather more haphazardly than [1142]. These surfaces appear to have been intended as a foundation because immediately overlying them, and with no evidence for an intervening active floor, was the most formal sub-floor

surface observed in ST3. On either side of RD2 this sub-floor consisted of a combination of small radial timbers and concentrically laid withies. The radials were a mixture of hazel and birch roundwood *circa* 60–70 mm in diameter which had been laid *circa* 0.4 m to 0.6 m apart, whilst the withies were entirely hazel. However, the construction varied from quadrant to quadrant. In the SW quadrant



Figure 4.37. Crucible SF210 *in situ* at the end of one of the [1127]/[1128] radials.



Figure 4.38. Sub-floor [1707] in the SE quadrant, after the removal of the radials. The clay-covered stoney mound on the left is the earlier Hearth 5; charred patches of flooring are visible along its inner edge where it rises over the mound. The charred floor has been removed immediately in front of the baulk but is visible in section in Baulk W/E.

the sub-floor [1127]/[1128] consisted of withies which had been woven over and under the radials (Figure 4.36).

Insect fauna in the sediment around the withies indicates that quite foul, stable-like conditions developed in this surface (IN). The radials extended from stakeline [1133] out between and beyond the stakes of the outer wall line [1135]. Crucible SF210 had been placed at the outer end of one of the radials in this quadrant (Figure 4.37).

In the SE quadrant the sub-floor [1707] consisted of bundles of withies up to 70 mm thick which had been laid down first and then the radials laid over them, each

radial extending from stakeline [1716], aligned on and ending at the stakes of the wall line [1710] (Figure 4.38).

There was evidence of a major conflagration during this phase of occupation. The sub-floor surface in both quadrants had been burnt; there are charred patches on the inner edge of sub-floor [1707] as it rises over the mound of the earlier Hearth 5, but it is most heavily charred in front of Baulk W/E (Figure 4.38). The charred *in situ* wickerwork in deposit [15012] uncovered on the other side of Baulk W/E probably represents its continuation into the N half of the house; it consisted of 80% hazel and 20% birch, a similar combination to

the sub-floor in the S half. However, this deposit did not extend much more than 1 m N of Baulk W/E so there was probably also a radial division defining the N edge of this sub-floor surface (RD3). Deposit [15012] contained a small amount of burnt bone, probably trampled from the hearth. In the SW quadrant patches of sub-floor [1127]/[1128] were also heavily charred (separately labelled [1136]), particularly in the area immediately adjacent to Baulk N/S, whilst other proximate areas remained unburnt, so the fire had probably burnt through the active floor surface (see below) in specific areas. IN in [1128] indicated damp conditions and interestingly none of the insects were burnt. The tops of some of the stakes in stakeline [1717] were charred, as were the easternmost stakes in stakeline [1133], suggesting that the focus of the fire had been in this area. Stakeline [1124] may have been inserted in the SW quadrant after this conflagration; it lay concentric with [1133] but some 0.7 m further out from the hearth; it consisted of a line of eight stakes, 0.0615 m in average diameter and a mixture of hazel and birch which, like [1133], extended only as far W as radial division [1175].

Floor deposits along the very W edge of the house were recorded in Trench 18 ([18004] Figure 3.16). These include a thin but continuous deposit of charcoal (18004(A)) overlain by a badly decayed oak plank [18035] which was burnt on its underside; these deposits may also belong to this conflagration event.

#### 4.2.10.2 The active floor surface

The compacted plant litter floor that covered this sub-floor structure lay over the charred patches so it must represent re-flooring after the conflagration. In the SW quadrant this floor [1116] had survived as a thick deposit 0.3 m deep in places but in the SE quadrant floor [1708] had only survived in patches, suggesting that it may have been a much thinner covering. Nonetheless, a lot of small white quartz pebbles were found in [1708]. MA shows that [1116] consisted of distinct layers of wood and bracken, and turf may also have been employed as flooring material. As there were only trace amounts of food debris the floor was probably laid down rapidly. MM identified some of the wood as birch and hazel and the presence of charred roundwood suggests that some of the underlying sub-floor had become incorporated into the active surface. IN suggests that damp and somewhat foul conditions existed, although the floor would have been superficially dry, and LB has identified low concentrations of faecal matter. Thicker deposits of compacted plant litter [1714] were found between wall lines [1710] and [1711]. MA shows that [1714] consisted primarily of bracken with smaller amounts of sedge, rush and wood, trace amounts of food debris and possible faecal matter. This material could represent insulation between the wall lines, although it was very compacted like the floor surfaces elsewhere in the house. The insect fauna is representative of a damp,

somewhat foul internal floor that was attractive to flies so it could be discarded floor litter used as insulation (IN). To the W of the hearth the minerogenic surface [1123]/[1705] laid down in Phase 6 probably continued in use.

Lying over [1714] between wall lines [1710] and [1711] was a spread of white ash [1709]. This is the equivalent of white ash [1139] which lay in the same position behind wall line [1135] in the SW quadrant. Deposit [1139] contained remnants of flooring materials, ie sedge and bracken, some of which had been burnt, charred peat and food debris, primarily hazelnut shells; clusters of hazelnut shells along the wall line had also been observed during excavation. These deposits may represent the charred remains of the floor coverings removed after the conflagration that damaged parts of the sub-floor structure and dumped behind the wall line. It does beg the question as to whether there was another wall line outside [1135] which was not identified.

#### 4.2.10.3 Hearth 6

The foundation of Hearth 6 consisted of a broadly circular platform of large flattish stones [1152] some 2.4 m in diameter which had been laid down directly over the Phase 6 hearth debris [1150] (Figure 4.35). A thin discontinuous layer of grey clay [1143] had been packed around the stones, whilst around the edges of the stone spread, and lying over the brushwood floor surface [1132], was a more gritty, gravelly clay [1131]. An irregular layer of small to medium-sized boulders [1130] had been spread over clay [1143] and these had been capped by an orange-white clay [1126] which had also been packed around them to form a halo some 40 mm thick. All the packing materials, [1143], [1131] and [1126] contained small quantities of charred cereals, hazelnut shells (MA) and bone (BO). A very mixed deposit [1125] which consisted of lens of orange sand, clay, charcoal, charred hazelnut shell and burnt bone lay over the W edge of the hearth and presumably represents the final use of Hearth 6.

#### 4.2.11 Phase 8 (Figure 4.39)

The only evidence for the final phase in ST3 consists of a badly damaged hearth structure and some associated surfaces. As it lay immediately under the topsoil and well above the water table the organic elements of the structure had all but decayed away. It is assumed that the Phase 7 superstructure was still in place. The tops of stakeline [1124] survived immediately under the Phase 8 floor surface [1120] so this internal division may have continued to function into Phase 8 too.

##### 4.2.11.1 Hearth 7

A spread of sharp angular stones [1704]/[15013]/[1109] had been laid over the previous hearth mound, possibly as a foundation for Hearth 7. It was up to 0.4 m deep and

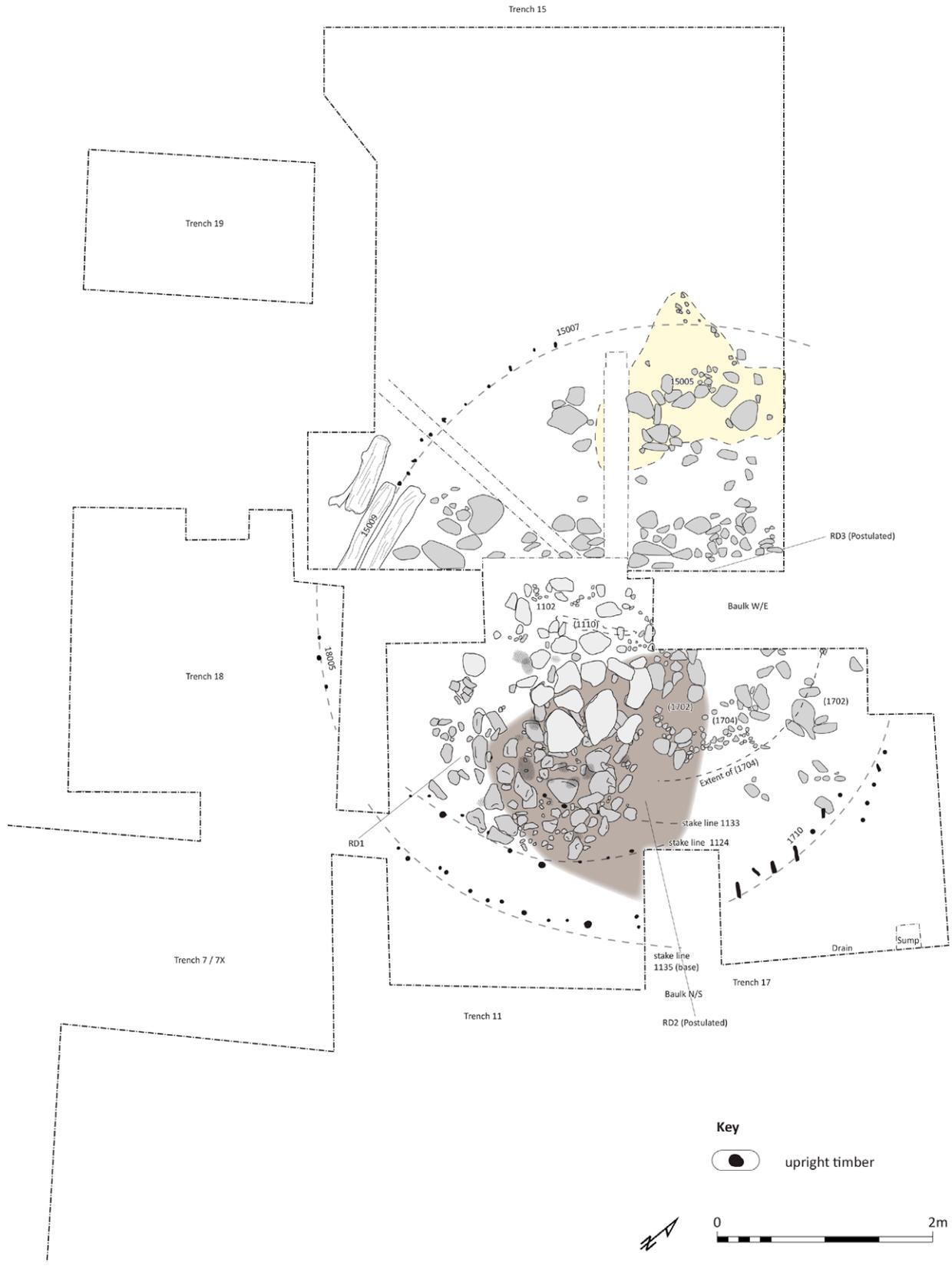


Figure 4.39. ST3 Phase 8.



Figure 4.40. Hurdle screens [755] and [756], the former lying over the corner of the latter (the cut under the ranging rod is a drain).

covered an area approximately 5 m in diameter. A surface of large flattish slabs [1102]/[1702] roughly 2.9 m x 2.9 m was laid over this surface to form the hearth. A dispersed spread of flat stones, boulders and cobbles [1107] extending out and down the slopes of the hearth mound probably represents tumble and may contain elements of a kerb and other structural components. Patches of clay [1110] were visible around some of the *in situ* slabs and was found adhering to some of the tumbled stones. The matrix for the tumble was [1103/1104/1105/1113], a very mixed deposit of hearth debris consisting of grey clayey silt, orange ash, lens of pinky clay, lots of burnt bone (BO), charcoal and hazelnut shells. Vitreous material SF191, tuyere SF192 and the spindlewhorl SF160 were found in this matrix. Some of the clay [1122] contained charred food residues (MA) and burnt bone (BO).

#### 4.2.11.2 Associated surfaces

Under the tumble of the hearth and spreading into the SW quadrant was [1120], a sandy organic deposit which contained burnt bone (BO), charcoal, carbonised cereal grains and hazelnut shells (MA). The organic component, which was highly humified, may represent the active floor surface of this phase, into which hearth debris has been trampled. There were surviving patches of other minerogenic surfaces which probably belong in this final phase. To the W of the hearth mound an orange-brown sandy gravel [1119] was laid down over the earlier minerogenic surfaces in this area, its S edge appearing to respect the earlier radial division [1175]. Deposit [1119] contained lots of trampled food debris, carbonised cereal grains and hazelnut shell (MA), and burnt bone (BO). Vitreous materials SF202 and SF206 were also recovered from this deposit.

Around the N periphery of the house was [15005], a spread of orange-brown clay, some 0.1 m thick and containing numerous cobble stones, into which carbonised food debris had been trampled. This was a very distinct spread, some 3 m by 2.2 m across, standing out from the earlier organic surfaces over which it lay, and may represent a specific activity area.

#### 4.2.12 External surfaces around ST3

Around the N perimeter of ST3 a surface similar in construction to that of the primary foundation surface within the house had been laid down during Phase 1. This consisted of concentrically laid withies [15017] and larger radial timbers [15028], the ends of which had been inserted in between the stakes of the original wall line along this section, [15007] (Figure 4.18). The outer edge of this surface was defined by an arc of stakes [15057]; this might represent a fence but equally it might represent pinning to secure the edge of the wickerwork surface. The surface [15014] that covered the withies was free of any evidence for occupation debris (MA).

Around the S perimeter of ST3 were a series of deposits which respected the circuit of its outer wall suggesting that they relate to its occupation and use, although they mostly could not be tied stratigraphically into the phases outlined above.

A series of surfaces were laid down directly over [748], the uppermost of the Episode 1 ditch fills, the edge of which lay immediately under the SW edge of ST3. These include [747], a layer of reeds and rushes 0.02 m thick and two small, well-preserved hurdle screens (Table 14.2), [755] lying partially over [756] (Figure 4.40). They could have been discarded there but it seems more likely that they had

been laid down to form a surface. Immediately outside the walls of ST3 [1146], a thin deposit of brushwood and brash, rushes and bracken had also been laid down somewhat haphazardly over [748]. The insect assemblage contained a large decomposer fauna very similar to that found in the internal surfaces, with very little evidence of outdoor fauna, suggesting that [1146] could represent discarded plant litter flooring from the house (IN).

Overlying all these features was one of the more extraordinary deposits found at BLoM. Deposit [743]/[1145] consisted almost entirely of unburnt hazelnut shells; five barrowloads of shells were removed from Trench 7E! It formed a mound in the centre of Trench 7E where it was 0.37 m deep, tapering away to the W and E but butting up against the outer wall of ST3. MM found thin layers of plant litter within this deposit, suggesting that it represents multiple episodes of processing, each one being covered over by plant litter. The insect fauna in [1145] was dominated by decomposers suggesting damp and dirty conditions (IN).

Along its N edge was a scatter of small stakes [765], 0.02–0.03 m in diameter which may have formed a retaining fence for the mound. Within the hazelnut mound was [749], a roughly circular deposit 0.7 m in diameter which consisted of charred hazelnut shells, grey clayey ash and orange sand. It resembles a dump of hearth debris which has possibly continued to char *in situ* leaving a depression in the surface of [748] below it. It is tempting to align the build-up of the hazelnut mound with the use of Hearths 4 and 5 (Phases 5 and 6 respectively) because both contained large quantities of charred and uncharred hazelnut shell. We might speculate therefore that the hurdles were laid down at the beginning of Phase 5 to provide a surface for the hazelnut processing.

The area immediately outside ST3 was resurfaced, a surface of hazel and ash withies [1138] laid over the hazelnut mound, the withies lying at an oblique angle to the outer wall (Figure 4.36). The outer edge of [1138] was defined by a hurdle screen [1140]/[1141] which had collapsed outwards (Table 14.2). Further W the expansive deposit [744], which lies between the trackway and ST3 may have been part of this resurfacing event. Further to the E bundles of very thin (0.01 m diameter) withies, [1137] and [1712], were laid down concentrically outside the outer wall (Figure 4.36). Immediately behind the outer wall and lying over [1137] was the spread of clayey white ash [1139] which is interpreted as the charred remains of the floor coverings removed after the conflagration in Phase 7 (see above). These surfaces may therefore relate to this phase.

Further around in the SE quadrant the surface outside the house was [1715], a green homogenous fibrous deposit which MA shows to have been composed primarily of sedges, unlike other surfaces associated with ST3. Bran

fragments may indicate the presence of faecal matter, raising the possibility that this deposit contained stabling waste. IN suggests that this deposit had likely been a damp, foul internal floor surface infested by flies which was subsequently discarded outside. Other external surfaces in this area include [1703], [1722] and [1723], all small patches of organic deposits containing varying quantities of mineral matter.

Small horizontal timbers and small *in situ* posts were found in Trench 5, some 5.5 m from the SE perimeter of ST3. The later Episode 3.2 Rampart 2 was built over the horizontal timbers (Chapter 6.2.2) so they could relate to its construction but it is equally possible that they and the posts relate to a construction associated with ST3.

#### 4.2.13 Summary of ST3

A greater proportion of ST3 was investigated than in any of the other houses on the settlement but problems of understanding and interpretation have been incurred as a result of its excavation across three trenches and over two years. These have been compounded by the difficulties in identifying active floor surfaces in plan and correlating depositional events seen only in thin section with the bulk deposits recorded further from the baulks. This leaves us with many interpretational issues which will probably never be resolved. The key features of its construction and use are summarised below.

##### 4.2.13.1 Construction

As with the other Episode 1 and 2 structures ST3 was built directly on the old ground surface and similar strategies for creating and maintaining a dry interior were employed; sub-floors of radial timbers overlaid with wickerwork and/or brushwood were laid down and active floors consisting of massive quantities of plant litter were laid down, cleaned out and replenished probably every time a new hearth was built.

The evidence for the superstructure of the house is less clear-cut than in ST1 and ST2. The outer wall was a stake and wickerwork construction with a simple entrance opening directly onto the trackway on the W side. There was no evidence for daub cladding or insulation but other features, such as the gap between the Phase 4 sub-floor surface and the outer wall, hints at a double wall, the inner face of which has been removed. The stakes in the outer wall were quite slender and by Phase 6 sections of it appear to have collapsed and were replaced or strengthened by new lengths of walling.

The roof was supported by a post-ring, of which only three posts survive, and one of these posts was replaced, so the post-ring must have required refurbishment during the lifetime of the structure. In Phase 6 Hearth 5 was built over the circuit of the post-ring making it redundant. These changes to the superstructure of the house are difficult to

understand in terms of its roofing. Overall, ST3 gives the impression of a more ramshackle construction than the earlier Episode 1 houses, with smaller stakes and posts used in its construction and evidence for collapse and refurbishment.

Throughout the lifetime of the house there was always a focal structure, either a hearth or working platform at the centre of the house. This focal structure had been replaced eight times, most of them built one on top of the other, but some of them lay off-centre, in particular the primary Hearth 1 which lay more to the NW, Hearth 8 which lay to the W of centre and Hearth 5 which lay mostly within the SE quadrant. They varied in design, size and construction, as though intended for different functions. Most were constructed with bases of flattish stones and slabs packed in with clay but Hearth 3 had a distinctive broad halo of blue-grey clay whilst Hearth 4 had a kerb of stone boulders. None were fully uncovered but they all appeared to be quite amorphous in shape ranging from roughly circular (Hearth 3) to roughly square (Hearth 2), and ranging in size from Hearth 4, at 1.6 m x 1.4 m across to Hearth 6 at 2.4 m across.

Hearths 1, 2, 3, 4, 6 and 7 were all recognisably open stone-built hearths but neither Hearth 5 nor Hearth 8 look like hearths, although they were labelled as such because they lay within the central hearth stack. Hearth 8 consisted primarily of dumps of hearth debris roughly defined by a distinctive semi-circle of oak stakes; its use may be associated with [15032], another enigmatic feature consisting of a shallow hollow lined with hazel stakes. Whatever its purpose Hearth 8 was the focal point during Phase 3. This may have been a very short-lived phase, something suggested by the difficulty in distinguishing an associated floor surface from that below it, and so Hearth 8 may have served some *ad hoc* function whilst preparations for the Phase 4 refurbishment were underway. There is nothing *ad hoc* about Hearth 5, a large, raised platform 4 m x 3 m across consisting of a surface of stones within a clayey sand matrix laid over a foundation of wood, which took up a large part of the SE quadrant. Deposits of charred food debris on its slopes and hazelnut shells scattered amongst the stones indicate that it was probably used for food preparation but its scale and construction is so unlike the other hearths in the stack that it hints at other functions too.

All the hearths had associated deposits of charred and uncharred food debris indicating that they had been used in food preparation. In Hearth 4 there was evidence to suggest that pigs had been roasted on it, whilst Hearth 8 may be associated with the preparation of shellfish. Both Hearths 2 and 7 may have been used for metalworking.

#### 4.2.13.2 Use of internal space

There is some slight evidence that there may have been wickerwork screens between the posts of the post-ring

which would have created an annular division but over the lifetime of the house the dominant pattern was one of radial division. Only one such division was clearly identified in the field but the presence of others is postulated because of differences in sub-floor structure and flooring content. RD1 was defined by a short line of stakes and a fault line in the flooring material and formed a boundary across the SW quadrant, possibly cutting off that area from the entrance area. Another division RD2 is postulated running N/S under Baulk N/S; differences in sub-floor structure on either side of the baulk and misaligned stake arcs suggest that there was a physical boundary at this point throughout the occupation of the house. The abrupt edge of carbonised *in situ* wickerwork [15012] also suggests that there was another boundary, RD3 running roughly W/E and separating the N half of the house from the S. There were also short arcs of stakelines; these always lay around the S edge of the hearths and may have formed semi-permanent screens around the hearths.

Throughout the house the organic flooring consisted primarily of large quantities of bracken and peaty turves, with much less evidence for the use of sedges and rushes as seen in the Episode 1 houses. However, there were significant variations in terms of sub-floor structure and the distribution of domestic debris, which must reflect major differences in the use of space N and S of the hearth complex. Other than the primary sub-floor there were no wooden sub-floor structures in the N half, resulting in the build-up of a 0.6 m thick deposit of organic flooring [15018]. This suggests that activities taking place in the N half did not require a firm foundation underfoot so this area may have been reserved for sleeping and relaxing. This is supported by the relative cleanliness of the flooring and the lack of artefacts in the N half, suggesting that work-related activities did not take place there. The screens around the S edge of the hearth may also have been intended to provide privacy in the N half whilst also leaving the source of heat on that side too.

In the S half new wooden sub-floor structures were laid down between Phases 1 and 2, Phases 3 and 4 and Phases 6 and 7. The style of the sub-floor varied from quadrant to quadrant, that between Phases 1 and 2 being limited to the SE quadrant, so each quadrant of the house may have been designated for different activities. Although the floors in the S half were regularly cleaned out there was still more food and fuel debris, as well as faecal matter in this area in comparison with the N half, although there is some evidence to suggest that the floors in the N half became dirtier in the later phases. The artefacts were also concentrated in the S half, suggesting that this is where most work-related activities took place. The presence of the sub-floor structures indicates the need for a firm robust surface, perhaps because traffic was heavier in this area. It is possible that during Phase 4 the SE quadrant was used for stabling.

If, as the evidence suggests, the quiet private space lay in the N half and the active space lay in the S then the position of the entrance in the NW quadrant is problematic because it would appear to lead directly into the quiet space. Furthermore, there is the issue of light for working activities, the door being the only postulated source of light in any reconstruction of roundhouse dynamics (see Chapter 18.2.2.5). With an entrance in the NW and a radial division between it and the working spaces in the S, light would be excluded from these spaces. One possible explanation is that there was a second entrance on the E side of the house which was unexcavated. This would help to explain the presence of possible stabling deposits on this side of the house, the animals being brought in directly from this side.

ST3 contained considerably more artefacts than any of the houses excavated at BLoM, including evidence for metalworking and this, together with the more ramshackle nature of its construction and the apparently non-domestic nature of the working platforms and some of the hearths, raises the possibility that the structure functioned as a workshop at least at certain times during its existence.

#### 4.2.13.3 Duration of occupation

The chronological modelling estimates a minimum of 45 years at 95% probability for the duration of ST3 but the hazel tree-ring data suggests that it may have been used for as little as 16 years. Other evidence from the house is examined here to see whether this apparent conflict can be resolved. The use of ST3 has been divided into eight phases based on the number of hearths and working platforms stacked in the centre of the house and such a large number of refurbishments is often interpreted as implying longevity. However, there is evidence to suggest that at least some of these refurbishment phases followed rapidly on from each other. The dendrochronological relationship between one of the Phase 1 posts and the Phase 2 sub-floor structure suggests that the Phase 2 refurbishment occurred either within the same or following year as Phase 1. The lack of sub-floor structures and therefore the difficulty in identifying occupation horizons within the build-up of active floors between Phases 2/3 and Phases 4/5 also suggests that these phases followed rapidly after each other, preventing the development of strongly defined horizons.

There is also the superstructure; ST3 was built almost entirely with walls of wickerwork around slender earth-fast stakes with a post-ring of more substantial posts. In discussing the deconstruction of replica roundhouses at Castle Henllys which had stood for 30–35 years Mytum & Meek (2020: 18) say that this type of structure could have lasted indefinitely if maintained every time the roof was removed and the thatch renewed. There is evidence of refurbishment; in Phase 6 sections of the outer walls

were replaced and one of the posts in the post-ring was replaced, possibly in the same phase. Perhaps the roof and thatch were renovated at this point. However, in the Castle Henllys reconstruction, the wickerwork walls were daubed and during deconstruction it was evident that the daub had eventually provided the structural integrity, the wattle itself having become brittle and structurally weak (*ibid*: 7, 15). At BLoM daub had not been used so the wickerwork walls may have become structurally unsound sooner.

#### 4.2.14 ST3 ecofact summaries

Table 4.2 summarises the type of ecofact analysis undertaken for each of the contexts described below.

##### 4.2.14.1 [743]

###### Micromorphology

The high number of identifiable hazelnut fragments within [743] indicates that this context represents a food processing or storage area. The fragmented nature of the hazelnut alongside its banded distribution between fibrous organic tissue remains indicates perhaps that this is more likely a processing area and represents numerous episodes of process and discard where shells have been trampled between layers of plant tissues which are not dissimilar to floor surfaces observed in ST2 and ST3. The relatively high quantities of charcoal and phytoliths are indicative of higher levels of human activity than are typically seen in floor surfaces at this site and again indicate an area of the site used for food processing and general human activity. Although levels of charcoal are relatively high, the shells themselves are not charred and the presence of well-preserved fresh plant tissue throughout the unit indicates that charcoal was incorporated into the unit accidentally and that this was not a primary cooking area.

##### 4.2.14.2 [1113]

###### Macroplant

This deposit contained only seven charred hazelnut shell fragments.

###### Bone

A total of 777 fragments (166.7g) were recovered from this deposit of which 96% had been burnt. The species present were cattle (6), sheep/ goat (1), pig (11), L/M (1), M/M (75), S/M (2) and indeterminate (I/M) (681). The cattle, sheep/ goat and pig elements were composed of fragmented teeth of which only the pig remains had been burnt. There was also a fragment of cattle horn which was badly weathered. The L/M and M/M elements were a mix of skull fragments, tooth fragments, vertebrae, ribs and long bones.

CONTEXT	MM	LP	MA	BO	INS
743	*				
1113			*	*	
1116	*	*	*	*	*
1119			*	*	
1120			*	*	
1121				*	
1122			*	*	
1123			*		
1126			*		
1128			*		*
1131			*	*	
1132			*		*
1136	*				
1137			*		
1139			*		
1143			*		
1144	*	*	*	*	*
1145			*		*
1146			*		*
1147			*		
1148	*	*	*		
1150			*	*	
1151			*	*	
1153	*	*	*	*	*
1154		*	*		
1156			*		
1162			*		
1163			*	*	
1164				*	
1705			*	*	
1709			*		
1714			*		*
1715			*		*
1718			*		
1720			*		
1725			*		
1728	*	*	*	*	

CONTEXT	MM	LP	MA	BO	INS
1730			*		
1731			*	*	
1734	*		*	*	
1735			*	*	
1736			*		
1737			*		
1739			*		
1740				*	
1741	*		*		
1743	*	*	*	*	
1744			*	*	
1746			*	*	
1749				*	
1751				*	
1752			*		
1757			*		
1761	*	*	*		
1762				*	
1763	*				
1764	*		*		
1767			*	*	
1771	*				
15005			*		
15012			*	*	
15014			*		
15015	*	*	*		*
15016	*	*	*		
15018A	*	*	*		
15018B	*	*			
15020			*	*	
15026			*	*	
15030			*		
15031			*		
15033					*
15037			*		*
15038		*	*		*
15049			*		

Table 4.2. Summary of ecofact analyses for ST3 contexts.

#### 4.2.14.3 [1116]

##### Micromorphology

Context [1116] occurs within Unit 3 of sample ST3/M1/K1. It is a Type A deposit with a complex, weakly developed subangular blocky to lenticular microstructure. The coarse organic component comprises 65% of the unit and is composed of charred roundwood and woody root fragments (ring porous hardwood (birch and hazel; where pith preserved)) (35%); reddish brown disaggregated cell tissues and sand sized cells. Numerous charred peat/ plant fragments (5%) indicate use of peat as fuel as well as wood. Anthropogenic indicators include the charred fuel remnants as well as rare bone, a single charred seed and anorthic sediment patches trampled into the layer from outside of the structure. Organic remains are heavily fragmented and generally aligned horizontal to the base of the slide. Pedofeatures include trace clay coatings to voids which are indicative of disturbance further up the profile.

##### Lipid biomarkers

Low concentrations of faecal matter present (source undetermined)

##### Macroplant (M1)

Excavation of Monolith 1 revealed distinct layers within this plant litter floor. The upper part of the sample [1116A] was clearly more homogenous and was formed of poorly preserved decomposed organic matter and fibrous roots. Sample [1116B] was noticeably better preserved than [1116A]. This surface had distinctive layers of wood and bracken which peeled apart. The floor also had some inclusions of bark and buds. This variation in preservation is probably because the upper part of [1116A] had suffered some periods of aeration. Heather, peat fragments and *Sphagnum* sp. were also recorded and it is possible turves were used to refurbish this surface.

Evidence of food consisted of a few fragments of waterlogged hazelnut shell, six carbonised macroplant remains, two barley, one cereal caryopsis and three fragments of hazelnut shell. The small quantity of food remains, weeds and moss suggest this floor accumulated rapidly thus reducing the opportunity for domestic waste and weeds to become trampled into the surface.

##### Bone (M1)

Two fragments of bone (11.4g) of which one was burnt. The other was a single waterlogged cattle molar which had fragmented into 10 pieces.

##### Insects [1116b]

A 5 l sample produced an assemblage of 103 beetles and bugs of 49 taxa (21 individuals l<sup>-1</sup>;  $\alpha = 37$ , SE = 6). Decomposers were well represented but were of rather low

diversity (RT 62%,  $\alpha$ RT = 11, SE = 2). *Carpelimus bilineatus* group was common and probably bred within the floor, indicating damp, somewhat foul conditions. Decomposers specifically associated with foul organic matter, including dung (*Cercyon haemorrhoidalis*, *Cryptopleurum minutum*, Aphodiinae spp., *Geotrupes* s.l.) accounted for 6% of the assemblage. Without other evidence, the group is probably not abundant enough to indicate that livestock was kept in the building. The floor surface was probably superficially dry since a small house fauna associated with relatively dry, mouldering organic litter was recorded (*Latridius minutus* group, *Atomaria*; 4% of the assemblage). Outdoor taxa were fairly common for an internal deposit (16%) and it is likely that many of these were imported into the building with materials used in construction or as floor litter. Records of *Conomelus anceps*, a small planthopper found on rushes (*Juncus*), and *Protapion ?apricans*, which occurs on red clover (*Trifolium pratense*), suggest cut vegetation may have been obtained from both wetland and dryland locations (the latter potentially including hay). Diaspidid scale insects were most likely imported with brushwood or branches.

#### 4.2.14.4 [1119]

##### Macroplant

There were 173 cereal caryopses and one spikelet. The cereal species were emmer (66%), barley (12%), wheat (8%) and cereal (14%). A minimum of 100 hazelnut shells were recorded. This large concentration represents food waste trampled into the surface.

##### Bone

There were 838 fragments (129.7g) of which 98% had been burnt. The species were cattle (15), pig (1), L/M (22), M/M (17) and I/M (783). The cattle and pig fragments were unburnt but the rest of the assemblage had all been calcified. The cattle consisted of a mandible and loose teeth. A premolar was still present within the mandible but given the extent of the damage it had suffered it was not possible to identify it or give an approximate age of death for this individual. Analysis of the cattle third lower molar and upper molar, both of which were loose, demonstrated some wear to the cusps. The pig remains were identified as a broken molar cusp which had no wear to the surface. The L/M and M/M remains were a mix of ribs and long bone shafts.

#### 4.2.14.5 [1120]

##### Macroplant

The carbonised assemblage consisted of eight cereal caryopses and 84 fragments of hazelnut shell. The cereal species were four barley, two emmer, one wheat and one cereal.

### Bone

Of the 450 fragments of bone (55.5g) 91% had been burnt. The assemblage consisted of cattle (16), pig (1), M/M (25) and S/M (1). The cattle skeletal elements consisted of 16 molar fragments which were badly fragmented but may represent a single tooth. There was one burnt pig molar which was badly warped due to exposure to heat. The M/M elements were a rib, long bones and metapodials. There was a single rib recorded as S/M.

#### 4.2.14.6 [1121]

### Bone

There was one waterlogged cattle metacarpal which could be butchery refuse.

#### 4.2.14.7 [1122]

### Macroplant

The charred macroplants consisted of two emmer caryopses, two cereal caryopses, 46 hazelnut shell fragments and one blackthorn stone.

### Bone

Of 131 fragments of burnt bone (12.7g) one was identified as M/M.

#### 4.2.14.8 [1123]

### Macroplant

The carbonised macroplant assemblage consisted of 65 cereal caryopses, one spikelet and 16 hazelnut shell. The cereal species were emmer (38%), wheat (21%), barley (15%), bread/club wheat (9%) and cereal (17%). This assemblage represents food waste trampled into the surface.

#### 4.2.14.9 [1126]

### Macroplant

The carbonised macroplant assemblage consisted of 14 cereal caryopses and 79 hazelnut shell fragments. The cereal species were barley (43%), emmer (29%), bread/club (14%) and cereal caryopses (14%).

#### 4.2.14.10 [1128] (M1)

### Macroplant

The wood formed distinctive bands, some of which were noticeably compressed indicating that this floor had experienced some trampling. There were also bracken, sedge, bark and buds that were probable additional packing material used to insulate the surface but these plants were only a minor component of the wickerwork floor. Some of the bracken had

been charred and some hazel roundwood and wood fragments had also been burnt.

Evidence of waterlogged food was emmer chaff and hazelnut shell. The carbonised macroplant assemblage consisted of five cereal caryopses, one chaff fragment, five hazelnut shell fragments, three buds and a large quantity of bracken. The cereal species are two barley, three emmer caryopses and one wheat glume. The food debris is a small accumulation of domestic waste trampled into the surface.

### Insects

A moderately-sized assemblage of beetles and bugs with a low diversity was recovered from a 4 l sample (94 individuals of 36 taxa; concentration 24 individuals l<sup>-1</sup>;  $\alpha = 21$ , SE = 4). Decomposers were dominant, their low diversity suggesting a breeding population (RT 72%,  $\alpha$ RT = 7, SE = 1). The range of insects indicates that the floor was generally damp and open-textured, and parts of the deposit were foul and stable-like although there may have been superficial dryness at least initially. Almost half of the assemblage (46%) consisted of an oxyteline association typical of damp conditions, dominated by *Carpelimus bilineatus* group. *Oxytelus sculptus* which occurs in open-textured rotting vegetable matter was relatively common (10% of the assemblage) and several other taxa were suggestive of foulness (*Cercyon nigriceps*, *C. ?terminatus*, *Cryptopleurum minutum*; 3%). Members of a house fauna associated with drier mouldering material were present in low numbers (*Latridius minutus* group, *Atomaria*; 3%). *Conomelus anceps*, a planthopper found on rushes (*Juncus*), and *Olophrum* which is typically associated with mosses, were probably imported into the building with natural materials used in the floor.

#### 4.2.14.11 [1131]

### Macroplant

The waterlogged assemblage was dominated by many hazelnut shells along with a much smaller number of bracken, fat hen and moss. There were 10 charred cereal caryopses, four chaff and 100 hazelnut shell fragments. The cereal species were emmer (50%), barley (29%) and cereal (21%). The bracken may be the residue of a decomposed floor whereas the cereal and hazel are food and/ or kindling debris from the hearth.

### Bone

The 162 burnt fragments (11.2 g) were recorded as I/M, none of which were identifiable to species and element. Context [1131] was described as not containing any charcoal or burnt bone and, based on this assumption, this deposit was described as forming the foundation of the hearth. The subsequent recovery of domestic food debris from the bulk sample suggests that this context may have been more than just the foundation for this hearth.

#### 4.2.14.12 [1132]

##### Macroplant

Floor [1132] was also a surface of withy bundles and the dominant find within this waterlogged assemblage was roundwood and wood fragments. There were also smaller concentrations of buds, leaves, bark, bracken, sedge and rush. The only evidence for edible plant remains was both charred and uncharred hazelnut shell and carbonised cereals, one barley, four emmer and three cereal.

The small quantities of domestic food debris and weeds indicate that this floor was rapidly constructed, thereby restricting the opportunity for these remains to be incorporated within this surface.

##### Insects

Insect remains other than fly puparia were present in low concentrations; a minimum of 55 individuals of 31 beetle and bug taxa were recovered from a 5 l sample (concentration 11 individuals l<sup>-1</sup>). A rapid build-up of floor litter was suggested by the plant macrofossil assemblage which could account for the low concentration of insect remains compared to most other floors. An alternative explanation might be that the deposit was aerated or drier for at least some of time which would have been detrimental to the preservation of insect material, although there were few signs of decomposition amongst the recovered remains. A house fauna associated with relatively dry mouldering litter was quite well-represented (*Latridius minutus* group, *Atomaria* spp.; 7%) but any dryness was probably superficial or temporary since damp conditions were indicated by a substantial oxyteline association (33%). Insects likely brought into the building with materials included *Conomelus anceps*, found on rushes, and *Lesteva cf sicula heeri* which is associated with moss and wetland, whilst *Protapion ?apricans* found on clover (*Trifolium*) hints at vegetation from dryland habitats, and occasional diaspidid scale insects would have arrived on twigs and branches. *Trechoblemus micros* is a small subterranean ground beetle found in soil crevices often close to water, and also in small mammal burrows. It may have been a post-depositional invader rather than living within the layer during its formation.

#### 4.2.14.13 [1136]

##### Micromorphology

Deposit [1136] was described as a carbonised surface found intermingled with sub-floor [1127]/[1128]. It is represented by Unit 3 of sample ST3/M1/K2 and Unit 1 of ST3/M1/K1 and comprises a mix of charred material and heavily humified plant remains which have been blackened through exposure to oxygen and partial decay. The blackened appearance that gave the impression of

a charred layer during excavation has resulted from a combination of burning and humification of organic matter. The sediment matrix adjacent to the charred components is commonly reddened which indicates that the sediment has been partially heated through direct contact with the burning/ heated organic material. Given the location of this context below a sub-floor it is possible that it represents the remains of a former Type B floor deposit which has been stripped back and burnt prior to the relaying of a new floor. The surface was likely left open for a period of time following the initial charring event which has allowed for the partial decomposition of organic remains and blurring of boundaries between sedimentary units.

#### 4.2.14.14 [1137]

##### Macroplant

This floor was constructed from waterlogged hazel withies with bracken, sedge and rush some of which was burnt. Within this layer there were also buds, leaf and bark fragments. Heather and Sphagnum sp. were noted and these could be from turves or from plants that grew in this damp environment outside the house. The weeds included species such as water-plantain and floating pondweed that grow in ponds and ditches. Their presence in this part of the site suggests that this location was subject to damp or flooding. The large number of burnt bracken and plant stems suggests that at some stage there was a burning event in this location.

The only evidence for waterlogged food residue was a small number of hazelnut shells and one charred cereal caryopsis.

#### 4.2.14.15 [1139]

##### Macroplant

The waterlogged assemblage was dominated by fragments of hazelnut shell followed by flooring material, weeds, moss and crops. The flooring material consisted of small quantities of sedge, bracken, wood fragments and buds, many of which had been charred. The floor may have been burnt by the dumping of hearth debris on it.

The carbonised food remains consisted of three cereal caryopses, three chaff fragments and 12 hazelnut shells. The cereal species were two barley rachis, one emmer glume, one bread/ club wheat caryopsis, one wheat and one oat caryopsis. A large concentration of charred peat was also recorded.

#### 4.2.14.16 [1142]

##### Lipid biomarkers

M2: Mixed faecal matter dominated by human/horse.

M1 Samples A & B: No faecal input detected.

#### 4.2.14.17 [1143]

##### Macroplant

There was one carbonised barley, two emmer and 82 fragments of hazelnut shell.

#### 4.2.14.18 [1144]

##### Micromorphology

Deposit [1144] was a highly organic Type B deposit with a lenticular microstructure. Organic material includes a mix of horizontally aligned plant tissues, heavily fragmented plant material and wood fragments. It was noted during excavation of Monolith 2 from which sample ST3/M2/K1 was derived, that the organic layers were drier in the upper sections. This observation is borne out by the thin section evidence which revealed greater decomposition of plant material in the upper units and may reflect the stratigraphic position of the upper parts of the unit higher in the sediment profile and thus more exposed to aeration. Cracks and fissures are present throughout the context and cut through pedofeatures indicating that they are post-depositional in origin. It is likely that this deposit has been subject to shrink swell processes caused by a fluctuating water table and this will have somewhat distorted the sedimentary signature.

Anthropic indicators in the lower layers of sample ST3/M1/K2 are limited to <1% cellular charcoal and 1–2% phytoliths. Anthropic indicators are more frequent upwards and suggest a higher level of human influence on the upper layers of this context. The reasons for this change could be numerous. It is possible for example that the upper units reflect a more active floor surface with lower units comprising plant litter laid down as a foundation floor covering and immediately covered over preventing their contamination with charcoal and food refuse. Alternatively, it is possible that the slight contamination of the upper unit reflects a period of less intensive cleaning ie a period when the upper dirty layer of the floors was not so thoroughly removed thus leaving behind a stronger anthropic signature.

##### Lipid biomarkers

*Phase 5*: No faecal input detected.

*M1* [1144S]: No faecal input detected.

*M2 Samples A & B*: Faecal matter dominated by human/horse.

##### Macroplant M1 & M2

Analysis showed that this floor consisted of multiple surfaces of bracken which had become very compressed, but which easily peeled apart into distinct layers. Within the deposit there was a homogenous lump of peat type material which was discoloured, had plant stems embedded within it and was initially thought to be faecal matter. However, on closer examination the plant stems were all identified as bracken and it appears that the fronds had decomposed

*in situ*. This would explain the rusty/ brown discolouration and the change in texture because when the bracken fronds broke down, they chemically altered the surrounding sediment. The more robust bracken stems were then able to survive within this sediment. The bracken formed the main component of this surface with smaller inclusions of sedge, rush, wood rush, roundwood, wood fragments, hazel buds and bark.

Domestic debris in the form of waterlogged food debris including wheat, hazel and raspberry became incorporated within the bracken layers of this floor surface.

Charred food debris was also incorporated into the floor deposits. There were 416 charred cereal remains composed of one spikelet, 333 caryopses, 43 chaff fragments and 40 culm nodes. The cereal species were emmer (80%), six-row barley (6%), wheat (3%), barley (2%), bread/ club wheat (1%) and cereal culm nodes (6%). Other edible items were 10 fragments of hazelnut shell and what could be part of a blackthorn stone. There were also small inclusions of burnt sedge and rush stems, likely burnt flooring.

##### Bone

30 fragments (39.9g) of which six had been burnt. There were seven fragments of a cattle molar, a sheep/goat mandible and a M/M humerus and radius shaft.

##### Insects

An assemblage of 186 beetles and bugs of 103 taxa was recovered from a 5 l sample (concentration 37 individuals l<sup>-1</sup>). Diversity was surprisingly high for an internal floor deposit ( $\alpha = 95$ , SE = 12) suggesting mixed origins. Decomposers were proportionally less well-represented than they were in other flooring deposits in ST3 (RT 44%;  $\alpha$ RT = 20, SE = 4). They included a house fauna associated with relatively dry mouldering plant litter (8%), and human flea (*Pulex irritans*) and a head of a biting louse (*Bovicola*) found on domestic mammals were also recorded. *Bovicola* species are specific to particular animals but the poor condition of the head precluded close identification. The floor may have been superficially or temporarily relatively dry, but an oxyteline association (17%) indicated generally damp conditions and decomposers specifically associated with foul matter accounted for 8% of the assemblage. Over half of the foul matter species were scarabaeoid dung beetles (5% of the whole fauna) and their relative abundance is somewhat equivocal since they might tie in with the large outdoor component in this sample. The record of *Bovicola* does not necessarily imply the presence of live animals but may simply represent the use of the building as a workshop where skins or wool were processed, activities that in themselves might produce foul debris, including a certain amount of faecal matter.

Insects from outdoor habitats were common (39%) and the whole assemblage has many similarities with that from the preconstruction layer [15037], where many of the remains

appear to have come from the natural ground surface pre-dating occupation. Aquatic beetles were relatively common (10% of the fauna) and the eight species of ground beetles recorded (Carabidae) included *Dyschirius globosus*, *Pterostichus vernalis*, *Agonum fuliginosum*, all indicative of damp ground and wetland. Other wetland beetles included *Pselaphus heisei*, *Notaris* and *Contacyphon*, whilst the presence of drier ground was suggested by *Calathus melanocephalus*, and *Phyllopertha horticola* and *Dascillus cervinus* are both usually associated with grassland. Click beetles (Elateridae) were represented by small scraps of adult cuticle and larval apices may have developed in the ground feeding on plant roots. Other insects, however, probably represent imported materials: *Livia junci* and *Conomelus anceps* are associated with rushes, and diaspidid scale insects probably arrived attached to brushwood or branches. Shed skins of a *Craspedolepta nervosa* nymph, found on yarrow (*Achillea millefolium*) often occur in archaeological deposits where there is a connection with grassland vegetation such as hay. At least some taxa in this deposit are suggestive of the importation of materials such as peat or turf into the building, as well as cut vegetation from both wetland and dryland habitats. *Trioza urticae* nymphs found on nettles (*Urtica*) are perhaps more likely to indicate plants growing very close to the structure on nutrient-rich ground.

#### 4.2.14.19 [1145]

##### Macroplant

The waterlogged plant assemblage consisted of food remains, floor material and weeds. The largest component was whole hazelnuts and shell fragments which suggests that this area was used for the large-scale processing and then disposing of these food items.

The floor litter was made up of bracken and wood fragments with smaller inclusions of sedge, hard/ soft/ compact rush, buds and bark fragments. The only carbonised finds were two cereal caryopses.

##### Insects

A large assemblage of 269 beetles and bugs of 68 taxa was recorded from a 5 l sample (concentration 54 individuals l<sup>-1</sup>). Diversity of the whole assemblage was rather low ( $\alpha = 29$ , SE = 3). Decomposers were the most abundant ecological group and had a restricted diversity (RT 76%;  $\alpha$ RT = 8, SE 1) suggesting domination by a breeding community that likely included *Carpelimus bilineatus* group, *Cercyon analis*, *Oxytelus sculptus* and *Neobisnius ?villosulus*. Several uncoded Staphylininae and Aleocharinae species probably also belong with this group. *Carpelimus bilineatus* group and other members of an oxyteline association accounted for half of the assemblage suggesting damp dirty conditions, whilst *Cercyon haemorrhoidalis*, *C. nigriceps*, *C. ?quisquilius*, and *Cryptopleurum minutum* (6%) suggest foulness, perhaps in the wetter parts of the deposit. *Oxytelus sculptus* (3% of

the assemblage) is particularly associated with decomposing open-textured, rather foul vegetable matter including stable litter and plant material with similar characteristics. Relatively dry mouldering litter was indicated by a house fauna (*Latridius minutus* group, *Atomaria*, *Lyctocoris campestris*; 5% of the assemblage). *Conomelus anceps* found on rushes (*Juncus*), *Olophrum*, typically associated with mosses, and *Erichsonius cinerascens* found in permanent wet mires on peat, suggest the importation of materials from wetland habitats, and perhaps peat, into the building, whilst occasional diaspidid scale insects most likely arrived with brushwood or branches.

#### 4.2.14.20 [1146]

##### Macroplant

The largest components of the waterlogged assemblage were flooring materials and hazelnuts. The flooring materials consisted of bracken, roundwood, wood fragments, hazel buds, with much smaller number of leaves and hard/ soft/ compact rush that had been haphazardly deposited. There was a large cache of hazelnut shell fragments and a smaller number of whole nutshells which either represent food processing waste or storage.

There were four carbonised macroplants, one bread/ club wheat caryopsis, one water-pepper, one pale persicaria and one knotweed.

##### Insects

Insect remains were particularly abundant in this deposit: a minimum of 527 beetles and bugs of 56 taxa were recorded from a 4 l sample (132 individuals l<sup>-1</sup>). Diversities of both the whole assemblage and the large decomposer component were low ( $\alpha = 16$ , SE 1; RT 83%,  $\alpha$ RT = 5, SE 1) indicating that the assemblage included a substantial breeding community that had probably originated in dumped floor litter. The breeding group likely included *Carpelimus bilineatus* group, *Oxytelus sculptus*, *Cercyon analis* and *Lithocharis ochracea*, that are together indicative of damp, open-textured, probably somewhat foul, decaying plant matter. *O. sculptus* was particularly abundant (14% of the assemblage). *Cryptopleurum minutum*, associated with dung and other foul organic matter, was the best represented foul matter species (nine individuals), but obligate foul taxa in general accounted for only 3% of the assemblage. A similarly small house fauna was also present (*Latridius minutus* group, *Atomaria* spp. 3%). Diaspidid scale insects were common, presumably originating on the brushwood that was a common element in this deposit.

Despite this sample being from an external surface, the beetle assemblage is very similar in composition to those from internal floors of ST3 except that *Oxytelus sculptus*, a species associated with accumulations of nutrient-rich decaying organic matter such as compost and dung heaps

(Lott 2009: 38), is much more abundant in this deposit. Outdoor taxa account for only 3% of the terrestrial fauna, levels that are much lower than would be expected in a deposit formed in the open, strongly suggesting that the layer consisted almost entirely of disused floor litter that had been deposited onto the external surface. Aquatic beetles were poorly represented (1% of the whole assemblage). Several anal spiracles of rat-tailed maggots, the larvae of a hoverfly (Syrphidae, probably drone fly *Eristalis tenax*) that live in stagnant water may suggest that pools of dirty water suitable for breeding drone flies formed on the surface.

#### 4.2.14.21 [1147]

##### Macroplant

The waterlogged assemblage included plant litter, food and weeds. The plant litter was mostly wood fragments, roundwood, sedge and wood rush. Some of the sedge and rush stems had been burnt. The food remains were dominated by intact hazelnut shell and shell fragments with smaller concentrations of emmer spikelets, wheat caryopses and glumes.

The carbonised macroplant assemblage was large. It consisted of 1,548 finds of which 1,484 were cereal. The cereal consisted of caryopses, rachis, spikelets, glumes, forks, glumes and cereal nodes. The dominant species was emmer (72.2%) followed by barley (14.4%), wheat (1.2%) and bread/club wheat (0.2%). The rest of the cereal (12%) could not be identified further. Cereal straw fragments were noted but these were semi-quantified. There were also 48 fragments of hazelnut shell which were partly charred. There was also a large quantity of charred peat. A single fragment of heather could represent an inclusion within a peat turf used for fuel.

This deposit consists of food and fuel debris which has been spilled onto the surrounding floor surface which is represented here by the waterlogged plant litter. The fuel used within the hearth appears to have been a mix of wood and peat. Given the large number of chaff and straw fragments it appears that some processing of cereal occurred in this location.

#### 4.2.14.22 [1148]

##### Micromorphology

Deposit [1148] was described during excavation as a dense wood layer containing visible reeds and resembling 'chipboard'. The micromorphological characteristics of [1148] were found to vary according to where it was sampled within the structure and thus it has been split here into [1148W] (W of the hearth) and [1148S] (S of the hearth).

[1148W]: this was located in Units 1–8 of Sample ST3/M3/K1, Units 1–2 of Sample ST3/M4/K1 and Unit 1 of Sample ST3/M4/K2. It is interpreted as a Type E deposit representative of the deposition of peaty turves deliberately

brought into the site as a floor covering. Huisman & Milek (2017: 117) note that structures built from turf typically have repeated soil horizons and thus the repeated horizons identified within [1148W] are consistent with use of turves as a construction material – perhaps as raised beds or seating areas or perhaps just as flooring.

Deposit [1148W] within ST3/M3/K1, ST3/M4/K1 and ST3/M4/K2 was found to be generally homogenous in terms of microstructure and overall organic content with only rare anthropogenic indicators. The slightly spongy nature of the context and excellent preservation of plant remains suggests that persistent trampling activity pushed the surface below the water table causing the sediment to absorb water and swell and thus lose some of its structural integrity. Post-depositional swelling of the plant material will have increased the apparent volume of this deposit from one that was heavily compressed and dense into a thicker spongy deposit. Therefore, although we tend to consider thick deep deposits to be representative of time depth, the high sedimentation rate and subsequent submersion of this deposit does not preclude it having formed over a relatively short period. Consideration should also be given to the possibility that this deposit is representative of the remains of a deliberate construction of a raised seating or bedding area with the imported peaty turves performing a structural role.

Observed anthropic indicators are rare although straight edges to wood fragments observed in each sample may indicate that they have been worked. Unit 1 of sample ST3/M4/K1 contained a range of occupation evidence including burnt bone, charred seeds, charcoal and possible charred peat and may correspond to a change between phases but this is not conclusive.

*Floor* [1148S]: this was located within Unit 4 of sample ST3/M2/K3, Units 1–7 of ST3/M2/K2 and Unit 1 of sample ST3/M2/K1. Nine separate depositional events were identified within samples ST3/M2/K2–K5 on the basis of differences in preservation and proportions of organic matter. Units are also distinguishable by the presence/absence of soil fauna excremental pedofeatures which appear to be present in alternate bands of material. The banded distribution of these features is indicative that the post-depositional reworking that they represent either happened shortly following their deposition, perhaps during a period of drying out when the floor was left open to reworking by soil biota, or perhaps more likely that these features are inherited from the natural sediment from which the layers were formed. Many of the roundwood and wood fragments were lath shaped suggesting that they had been compressed and that the deposit had experienced trampling. Coarse organic materials including roundwood and elongate plant tissues display a strong horizontal orientation, also consistent with trampling. Other than slight changes in quantities of anthropic

indicators it was not possible to distinguish between the depositional events.

#### Lipid biomarkers

*M2*: Faecal matter dominated by human/horse.

*M4 Samples A & B*: No faecal input detected.

#### Macroplant *M2* [1148S] and *M4* [1148W]

The leading waterlogged macroplant component in both monolith samples was brash wood including bracken. This material formed laminated layers which peeled apart during processing. Of note was that the wood fragments in *M2* were generally much smaller than those pieces present in *M4*. The remains of heather, moss along with inclusions of fat hen, pale persicaria and cinquefoils were also noted in *M4* which were all absent in *M2*. This distinction in how the brash wood formed suggests that the flooring material, whilst similar, was laid down in two separate events which is why there are some differences in composition even though it may still represent a rapid depositional build-up in this area.

#### 4.2.14.23 [1150]

##### Macroplant

The plant remains were preserved entirely through charring. The two dominant finds within the assemblage were cereal and hazelnut shell. There were 13 spikelets, 141 caryopses, 38 chaff fragments, one culm node and a small quantity of cereal straw that were semi-quantified. The cereal species were emmer (61%), barley (25%), wheat (2%), bread/club wheat (1%) and cereal (11%). There were over 100 fragments of hazelnut shell present. This deposit lay over one edge of Hearth 5 and the food debris was presumably associated with the use of this feature.

##### Bone

There were 52 fragments of bone (100.0 g) of which 28 were burnt. The species were cattle (4), sheep/ goat (4), L/M (3), M/M (20) and S/M (1). The cattle fragments were represented by molars which had slight wear to the occlusal surface. The sheep/ goat bone consisted of three molars and a humerus, the distal epiphysis of which was fused indicating that this animal was older than 10 months at time of death. There was also a single S/M rodent rib which was not burnt. The rest of the assemblage included some M/M long bone shafts.

#### 4.2.14.24 [1151]

##### Macroplant

There were nine charred macroplants identified as one emmer, one wheat, two cereal caryopses and five fragments

of hazelnut shell representing food waste trampled into the deposit.

##### Bone

Of 18 fragments (44.1 g) two had been burnt. The species present were sheep/ goat (3), pig (5), M/M (6) and I/M (4). The sheep/ goat and pig fragments were all composed of teeth. The sheep/ goat teeth were identified as the first, second and third molars and appeared to fit together. There was minimal wear to the occlusal surface. The pig teeth were a mix of three incisors, one canine and one molar. There was little to no wear on any of the pig teeth. The pig canine belonged to a female.

#### 4.2.14.25 [1153]

##### Micromorphology

Deposit [1153] was extensively sampled for thin section analysis as numerous thin lenses of charcoal, ash and fly pupae, as well as numerous artefacts were observed during excavation, but no distinct surfaces or layers could be discerned. In total [1153] is represented in 11 sedimentary units across six kubiena samples. These units have distinct sedimentary characteristics which has allowed the context to be split into two distinct deposits on the basis of their location within the structure, [1153W] and [1153S].

When analysed in thin section numerous distinct stratigraphic units were observed. These are broadly similar in terms of microstructure and observed differences focus on proportions and types of anthropic indicators and organic material present as well as differing levels of preservation of organic matter.

[1153W]: this as represented within samples ST3/M4/K2, ST3/M4/K3 and ST3/M4/K4 in the SW quadrant share broadly the same sedimentary characteristics and is interpreted as a Type E peat deposit. The observed patches of crumb microstructure are typical of peaty turves (Goldberg & Macphail 2006). Anthropic indicators are rare to absent. Analysis of faecal sterol and bile acid ratios from these samples revealed no evidence for faecal matter (internal ref). It is therefore concluded that [1153W] in ST3/M4/K2, ST3/M4/K3 and ST3/M4/K4 is comprised of peat material deliberately imported into ST3 as a means of resurfacing the floor and also likely as a means of raising the floor level and possibly also providing insulation and/ or bedding. The deposition of such a large quantity of material with limited evidence for human input indicates it was likely imported over a short duration and represents a single phase of deposition.

[1153S]: this as represented within ST3/M2/K3, ST3/M2/K4 and ST3/M2/K5 located to the S of the hearth to the E of RD1 was found to be dominated by coarse organic material with a preferred horizontal orientation which gives rise to a lenticular microstructure in each case. In

contrast to samples from [1153W], distinct sedimentary units are visible in thin section within [1153S]. The sedimentary units are distinguished primarily on the basis of the nature of coarse organic material, with Unit 1 of ST3/M2/K5 displaying a much higher proportion of well-preserved roundwood as well as low levels of anthropic indicators in the form of charcoal (2–3%) and phytoliths (2–3%). Unit 2 of ST3/M2/K5 by contrast contains very little roundwood and is finer in composition with slightly higher proportion of anthropic indicators in the form of charred organics (10%) although still less than would be expected from an occupied floor surface. Sample ST3/M2/K4 also contains two sedimentary units which are distinguished by differences in the level of preservation of organic material with that in the lower unit more frequently dominated by lignin and xylem tissues. The lower part of Unit 1 of ST3/M2/K4 is dominated by short fragments of plant tissue embedded within a dark sedimentary matrix and likely represents herbivore coprolitic material. This is consistent with studies of faecal sterols and bile acids which found low concentrations of faecal matter within [1153S] in Monolith 2 (internal ref). Unit 2 of ST3/M2/K4 has a higher porosity and more frequent patches of crumb microstructure and faecal pellets of microfauna indicating that it has been subject to some reworking. The evidence for the formation of [1153S], which is situated to the east of RD1, shows a greater variation in the context and appears to represent at least four distinct phases of deposition, possibly reflecting a different activity regime within ST3 and thus the need to more frequently replace floors.

Given that there are four distinct phases of sedimentary deposition identified here it is considered logical that the lower two units could be considered representative of Phase 2 activity whilst the upper two units are likely representative of later Phase 3 activity. However, in the absence of comparative data this cannot be confirmed.

There is limited evidenced for occupation activity within these units and thus if they represent the remains of floor surfaces it must be assumed that the 'dirty' occupation layers were removed prior to the importation of a new layer of plant matter/ peat. The fact that artefacts were recovered from within this context is intriguing given the relative absence of evidence for other signatures of human activity in thin section. The possibility that artefacts were deliberately deposited as part of the foundation layer of the floor rather than accidentally discarded as part of day to day living activities must therefore be considered (internal ref).

#### Lipid biomarkers

M2 [1153S] *Samples A–C*: low concentrations of faecal matter present in A & B. Mixed faecal source dominated by human/ horse in C.

M4 [1153W] *Samples A–D*: faecal input detected in A & C but source cannot be determined.

#### Macroplant M2 [1153S] & M4 [1153W]

The waterlogged plant assemblage consisted of food remains, plant litter and weeds. There was a large quantity of hazelnut shell, a small number of emmer glumes and raspberry. The plant litter consisted of layers of mostly bracken, roundwood, wood fragments and bark, with smaller amounts of buds and sedge. Large quantities of *Sphagnum* sp. and moss were noted. There were also three complete puffballs along with two fragments. The only puffball identified from this context was a single deceiving bovist. The remainder were subjected to a rapid scan and were more reminiscent of brown puffball.

There was one barley and two emmer caryopses which were all carbonised. A small quantity of burnt peat was also present.

The ecofact finds from this floor surface are a mixture of plant litter with inclusions of domestic food and fuel waste. Analysis of the monolith samples revealed that the plant litter formed laminated layers which peeled apart and could represent multiple floor layers. It was also observed that [1153] was not as compressed as the context directly below or above. This suggests that context [1153] was rapidly built up with new layers of plant litter. Large concentrations of fly pupae were also noted and this level of foulness could have encouraged the rapid build-up of new floor layers within the same context.

#### Bone M2 [1153S] & M4 [1153W]

Of 28 fragments (302.5 g) four were burnt. The species were cattle (5), sheep/ goat (1), pig (2), L/M (11), M/M (1) and I/M (7). The cattle fragments were a molar, radius, ulna, calcaneum and phalanx. The radius proximal epiphysis was fused as was the phalanx so the radius belonged to an animal older than 12 months at time of death and the phalanx to an individual older than 18 months. The sheep/ goat remains were a second molar which had some wear to the surface but was not extensive. The pig consisted of a maxilla in which the only tooth present was a canine belonging to a female older than eight months and an unfused fibula. A single thoracic vertebra had been cut in two probably when the carcass was dismembered. Two of the L/M ribs had been worked (SF230 & SF 231; see Chapter 15.3).

The bone is a mix of domestic food and butchery waste.

#### Insects

A large, moderately diverse assemblage was recorded from a 5 l sample (296 beetles and bugs of 83 taxa, 59 individuals l<sup>-1</sup>;  $\alpha = 38$ , SE = 4). Decomposers accounted for almost three-quarters of the assemblage (RT 73%;  $\alpha$ RT = 12, SE = 1). *Carpelimus bilineatus* group was very abundant, likely breeding in the deposit. A house fauna (*Latridius minutus* group, *Atomaria*, *Cryptophagus* spp.; 6%) and occasional

human fleas (*Pulex irritans*) were also recorded. Woodworm beetle (*Anobium punctatum*) and *Stephostethus lardarius* probably belong with the house fauna. Foul decomposers were also present (*Cercyon haemorrhoidalis*, *C. terminatus*, *Geotrupes* s.l., Aphodiinae spp.; 3%).

Terrestrial outdoor taxa were quite well-represented (16%), many of them probably indicating the use of cut vegetation and other materials in the building. *Conomelus anceps* and *Livia junci* are found on rushes, and several other taxa are associated with mosses and wetland habitats (eg *Olophrum*, *Pselaphus heisei*). Diaspidid scale insects are likely to have been imported with brushwood or branches. *Isochnus* cf *foliorum*, whole larvae mine willow leaves, may suggest that some branches still bore leaves. *Rhinoncus pericarpus*, a weevil found on docks (*Rumex*), may be more likely to have lived on plants growing outside the building.

#### 4.2.14.26 M4 [1154]

##### Macroplant

The waterlogged plant assemblage consisted of plant litter along with some weeds and one puffball. The floor had been constructed using roundwood, wood fragments with more minor inclusions of bark and bracken. Analysis of the monolith sample revealed that the brushwood had been deliberately laid down in the same alignment and that the surface of the upper bundles was noticeably more compressed than the underlying material. The puffball was probably part of the larger cache of puffballs stored in this structure (internal ref). There were two carbonised barley caryopses.

##### Lipid biomarkers

Faecal matter dominated by human/horse.

#### 4.2.14.27 [1156]

##### Macroplant

There were over 100 fragments of charred hazelnuts shells recorded within this deposit.

#### 4.2.14.28 [1162]

##### Macroplant

Both the waterlogged and carbonised assemblage consisted of layers of flooring material with food, weeds and medicine reworked in as components of domestic debris. The floor litter consisted of bracken, wood, some buds and sedge, which was a very minor component of this floor. Heather, moss and peat were present and this could be evidence of turves. Waterlogged food remains were emmer and hazelnut shell. The four puffballs belonged to a larger cache of this material that was collected deliberately. The puffballs were mature so were unlikely to have been stored for food,

but instead were being kept for another purpose such as medicine or as a fire starter.

The carbonised macroplant assemblage consisted of 62 cereal remains, one hazelnut shell fragment, three sedge, three pale persicaria and one indeterminate seed. There was also a large quantity of carbonised plant stems and some bracken which probably represent the floor surface charred by the overspill of hearth debris. There were also small inclusions of charred peat which may have been fuel from the hearth.

#### 4.2.14.29 [1163]

##### Macroplant

The contents of this ashy deposit consisted entirely of carbonised hazelnuts; with a minimum of 500 fragments counted. This large quantity of hazelnut shells suggests they were processed and roasted in the hearth with the shells either thrown into the hearth to dispose of them or recycled for kindling.

##### Bone

Of 302 fragments of bone (61.2 g) 289 had been burnt. The identifiable fragments were skull fragments, long bone shafts and foot bones, all from a pig with the remainder formed of ribs, vertebrae, long bones recorded as M/M. Analysis of epiphyseal fusion of an unfused pig phalanx indicates this animal was younger than 12 months at time of death. It is probable these skeletal elements belonged to a single individual roasted within the hearth. The presence of animal fat was observed within MM. The meat was likely carved as the carcass was rotated with some of the bones left as residual waste within the oven.

#### 4.2.14.30 [1164]

##### Bone

Nine fragments of unburnt bone (67.3 g) were identified as cattle (1), L/M (5) and M/M (3). The cattle skeletal element was a radius and the distal epiphysis was unfused at time of death indicating that this individual was younger than four years at time of death. The remaining skeletal elements were ribs and long bone shafts. Only one fragment, an L/M bone had been burnt.

#### 4.2.14.31 [1705]

##### Macroplant

The assemblage was entirely carbonised and consisted of 280 cereal caryopses and two hazelnuts. The cereal species were emmer/ spelt (72%), six-row hulled barley (20%), barley (2%), two-row hulled barley (1%), emmer (1%), wheat (1%) and cereal (3%). There was also a minimum of 100 hazelnut shell fragments that were partly carbonised.

## Bone

There were 101 burnt fragments (19.7 g) which included one M/M tooth and rib.

### 4.2.14.32 [1709]

## Macroplant

The charred macroplant assemblage consisted of 22 cereal caryopses, 16 blackthorn stones and one bud. There were also 31 fragments of hazelnut shell that were partly charred. The cereal was emmer (36%), six-row hulled barley (18%), barley (14%), wheat (9%), two-row hulled barley (5%) and cereal (18%). The cereal, nuts and fruit are the remains of domestic food waste spilled on the floor.

### 4.2.14.33 [1714]

## Macroplant

This waterlogged floor was constructed using mostly layers of bracken with sedge, rush, wood and bark having a more minor role. The weed assemblage was large and included large quantities of selfheal. The selfheal could be a contaminant of the flooring material but it does have medical properties so it is possible it was deliberately collected. Food remains included cereal bran, hazelnut shell and blackthorn. The bran could indicate that faecal matter was trampled into this surface.

The charred macroplants consisted of five cereal caryopses and five fragments of hazelnut shell. The cereal species were one six-row hulled barley, one two-row hulled barley, one barley, one emmer and one wheat. The small quantities of domestic waste suggest this floor was kept relatively clean.

## Insects

It was unclear during excavation whether this deposit was a floor or an external layer. A substantial, moderately diverse beetle and bug assemblage was recovered from a 5 l sample (182 individuals of 72 taxa; concentration 36 individuals l<sup>-1</sup>;  $\alpha = 44$ , SE = 5). There were signs of significant chemical erosion in some of the remains: some sclerites were peppered with tiny holes whilst other had become pale and soft. Fly puparia were common.

The assemblage was dominated by decomposers, their low diversity suggesting a breeding community (RT 64%,  $\alpha$ RT = 11, SE = 2). *Carpelimus bilineatus* group associated with damp substrates was by far the most numerous taxon and *Oxytelus sculptus*, which is typical of rather foul, open-textured, nutrient-rich, organic material was common (6%). *Cercyon unipunctatus* and *C. haemorrhoidalis* are indicative of foulness but they are not common enough to suggest (without other evidence) that the deposit included substantial amounts of dung. *Quedius cinctus*, found in microhabitats with concentrations of insect larvae (Lott &

Anderson 2011: 219), probably preyed upon the numerous fly larvae living in the deposit. A house fauna associated with relatively dry, mouldering vegetable matter (2% of the assemblage) may have been limited because the floor was generally too damp for their requirements. Similarly low proportions of house fauna were recorded from some other floor layers in ST3 and ST4.

Outdoor taxa made up 23% of the fauna, a relatively high proportion for an internal deposit, but well within the range seen in clearly identified floor deposits elsewhere in ST3. The proportion was also substantially lower than that seen in the assemblage from [1715] which was an external deposit. At least some of the outdoor insects are likely to represent the importation of cut vegetation, such as *Conomelus anceps*, found on rushes. A tick nymph (*Ixodes ricinus*) could potentially have been imported with vegetation, or possibly turf, but equally might suggest the presence of domestic animals in the building or the processing of animal products such as skins or wool. Occasional *Trioza urticae* nymphs are probably more likely to have lived on nettles growing outside the building. Other plant-associated taxa that might have provided a clue as to whether the deposit was internal or external could not be identified closely. *Longitarsus* species which live on herbaceous plants, often in grassy places, were well represented but the genus is notoriously difficult to identify closely even with whole modern specimens. Several weevils (Curculionidae) and leaf beetles (Chrysomelidae) were represented only by highly fragmented cuticle.

On balance, based on comparisons with insect evidence from other samples associated with ST3, this deposit is more likely to be a damp, somewhat foul internal floor that was attractive to flies, rather than an external layer. However, it is also possible that it consists of disused flooring material dumped outside, which appears to have been the case with external layers [1715] and [1146]. If this was the case, the dumped material might simply not have lain exposed for long enough to acquire a greater number of outdoor insects representing habitats adjacent to the settlement.

### 4.2.14.34 [1715]

## Macroplant

This was described as a compact fibrous, greenish deposit. The composition of this waterlogged macroplant assemblage differed from the other floor surfaces associated with ST3 in the large quantities of sedge, some of which was identified as white sedge. Rush, wood rush and bracken were used rather than wood and bracken favoured elsewhere in ST3. Wood and buds were only a marginal inclusion. It is also possible that this material derived from the disposal of old flooring or stable waste

from another structure. Bran fragments were noted and these could be suggestive of the presence of faecal matter. Other evidence of food included many hazelnut shells, four charred emmer and two cereal caryopses.

### Insects

A good-sized assemblage of beetles and bugs was recorded from a 5-l sample (169 individuals of 85 taxa; 34 individuals l<sup>-1</sup>). Diversity was higher than in context [1714] indicating mixed origins and deposition in the open ( $\alpha = 68$ , SE =9). Fly puparia were common.

The dumping of moist, somewhat foul, floor litter onto adjacent ground was indicated. Decomposers (RT = 54%;  $\alpha$ RT =18, SE = 3), consisted of a similar range of taxa to context [1714], including a house fauna (5%) and several species indicative of foulness and moist, open-textured organic matter, including *Cercyon unipunctatus*, *C. haemorrhoidalis*, *C. nigriceps*, *Oxytelus sculptus*, and *Carpelimus bilineatus* group, the most numerous taxon.

Outdoor taxa were common (36%), probably including a combination of local background fauna and insects such as *Conomelus anceps* and *Livia junci* that may have been imported into buildings with rushes. *Ulopa reticulata*, a planthopper that lives exclusively on heathers (*Calluna* and *Erica*), might relate to the use of peat or moorland turf in buildings. *Stygnocoris sabulosus* (a ground bug) is also often associated with heathers and heath or moorland in western parts of Britain (Southwood & Leston 1958: 103). The most numerous plant-feeding insects were *Longitarsus* species. A tick nymph (*Ixodes ricinus*) could have been imported with vegetation or turf or might indicate the presence of domestic animals or animal products such as skins or wool within buildings. Limited numbers of water beetles may have formed part of the site background fauna but there is also a possibility of an origin in wastewater. They included *Oulimnius tuberculatus*, found in running water, and *Limnebius truncatellus*, which occurs in waterside mud.

#### 4.2.14.35 [1718]

### Macroplant

The charred macroplants incorporated into this deposit consisted of one bread/ club wheat caryopsis, six wheat caryopses and 56 hazelnut shell fragments that were partly carbonised.

#### 4.2.14.36 [1720]

### Macroplant

A rich assemblage of carbonised macroplant was recovered from this context. There were 913 cereal remains plus some fragments of straw. There were 860 cereal caryopses and 51 chaff fragments. The species were emmer (55%), six-row

hulled barley (32%), barley (2%), wheat (2%), two-row hulled barley (1.2%), bread/ club wheat (0.6%), oat (0.2%) and cereal (7%). There were also two hazel nuts and over 100 fragments that were only partly charred. This deposit consists almost entirely of food waste from both processing and cooking.

#### 4.2.14.37 [1725]

### Macroplant

This deposit consisted almost entirely of waterlogged hazelnuts and shell fragments, four of which were carbonised. The hazelnuts were found in the gaps and crevices on the NW edge of Hearth 5 and probably represent either storage or processing on this side of the hearth.

#### 4.2.14.38 [1728]

### Micromorphology

Floor [1728] was sampled in an attempt to distinguish floor layers associated with the Phase 4–5 occupation. Eleven sedimentary units were identified and the context was accordingly split into four sub-contexts, A, B, C and D according to their broad sedimentary characteristics and relative stratigraphic location. Deposits [1728A], [1728B] and [1728C] are the Phase 4 active floors whilst [1728D] is the Phase 5 floor (see below).

[1728A]: like the underlying floor layers, [1728A] was constructed using layers of compacted bracken intermixed with roundwood bark and some rushes/ sedge and thus is classified as a Type B organic banded floor. The lowest unit of this context (Unit 3, ST3/M9/K2) has a sharp discontinuity boundary with the underlying earlier phase flooring [1743A]. The boundary with the upper unit of [1728A] (Unit 4, ST3/M9/K2) is diffuse and the upper part of the context is distinguishable in thin section largely by the poorer level of preservation of organic matter and incorporation of anorthic sediment fragments trampled into the floor.

Unit 4 of ST3/M9/K2 also includes possible herbivore dung fragments which are identifiable as chopped segments of horizontal plant tissues embedded in a yellow phosphatic groundmass. The identification of possible herbivore dung is consistent with elevated faecal steroid signatures identified from the corresponding sample of [1728A] and may indicate some stabling of herbivores within ST3 during the earlier part of this phase. No calcareous dung spherulites occur, but they are usually dissolved in waterlogged deposits (Ismail-Meyer 2014). A reduction in overall pore space observed within Unit 4 of ST3/M9/K2 compared to Unit 3 may also indicate higher frequency/ heavier trampling which would also be consistent with stabling. Both units of [1728A] contain 80–95% organic material, with the lowermost unit (Unit 3 ST3/M9/K2) containing the highest proportions of bracken leaves and rhizomes of all contexts studied micromorphologically at BLoM.

The common presence of bracken rhizomes within [1728A] is indicative that the bracken was being dug rather than cut. Rhizomes are only rarely present in other contexts across the site and therefore it has been assumed that bracken was harvested by the more common and less labour-intensive method of cutting. Importing bracken with rhizomes and associated sediment adhering to the roots would have created a less clean floor covering than fronds and stems cut and dried for bedding. This accords with the other proxy evidence for stabling in Phase 4 (and also Phase 5) suggesting that in the area of ST3 cleanliness was of lesser concern. Although other indicators for stabling used to identify Type H floors elsewhere such as a yellow phosphatic groundmass is only identified within discrete areas of [1728A], the dominant organic matter and horizontal layering of material is not inconsistent with a Type H floor and thus stabling remains a viable interpretation for this deposit.

[1728B]: Unit 3 of sample ST3/M10/K2 is separated from the underlying Unit 2 [1743] by a clear horizontal boundary demarcated by [1729], a thin layer of roundwood fragments. The roundwood fragments have a strong horizontal orientation, being primarily cut in a lateral direction, and indicate deliberate laying down of a brushwood surface. Unlike the underlying [1743], [1728B] contains a relatively high proportion of anthropic indicators including approximately 10% charcoal and microlaminations of sediment interspersed between layers of coarse organic matter. The unit has a higher mineral content than underlying layers although coarse organic matter in the form of reddish-brown leaves and woody stems (mainly bracken), yellowish brown monocot reeds and disaggregated plant tissues dominate the unit and form the primary component of the floor. The coarse organic material is less well preserved upwards, and it is blackened towards the top of the unit where evidence for reworking of sediment is indicated by a gradual transformation from compacted platy prismatic microstructure to granular crumb and associated increase in porosity. The presence of possible faecal pellets and fungal mites also suggests soil decomposers have influenced the upper part of the unit, beginning the gradual processes of soil formation and suggest that the surface was left open for a period to allow for its partial reworking.

[1728C]: Unit 4 of sample ST3/M10/K2 is separated from the underlying deposit by a sharp undulating boundary which signifies a distinct change in activity and thus has been identified as a separate deposit [1728C]. The base of [1728C] comprises a reddened substrate with embedded charred plant material which is overlain by a thin (2 mm) layer of grey ash which contains small (<500 µm) rounded fragments of vesicular slag. The charred plant material is similar in composition to that contained within the underlying [1728B] and it thus seems likely that the boundary between the units has been formed by the

dumping of hot ash directly onto the underlying layer which has caused charring of the sediment and floor material directly beneath. The main body of Unit 4, overlying the ash layer, comprises a heterogenous mix of unoriented, randomly arranged burnt and unburnt plant remains characteristic of Type D floor. The unit has a weakly lenticular to massive microstructure and is compacted. The heterogenous mix of materials suggests that following an initial dump or overspill of hot ash material, this sediment was formed from trampled occupation debris intermixed with organic flooring material.

[1728D]: this comprises three sedimentary units (1–3) within sample ST3/M9/K3. The organic materials in all three units have a linear and parallel alignment and are strongly oriented to the basal boundary. All units show microlaminations, which have formed through the accumulation of organic material and [1728D] is classified as a Type H deposit.

As with the earlier Phase 4 floors ([1728A–C]), the units within [1728D] are distinguishable by varying levels of preservation of organic matter. The upper and lowermost units of [1728D] have excellent preservation indicative of rapid burial in saturated conditions whereas the middle unit is more humified with evidence for replacement of organic matter with amorphous iron oxides and hydroxides. Amorphous organic material is frequently yellow in colour and may be indicative of phosphatic accumulation. Plant materials, including the more robust wood fragments, are frequently blackened at the edges further indicating the process of oxidation. The plant material within Unit 2 has a low birefringence and is frequently not identifiable in terms of cell structure.

Although no definitive areas of herbivore coprolitic material were noted within Unit 2, numerous areas of chopped plant fragments were observed and may be indicative of the presence of herbivore coprolites. The underlying and overlying layer with their excellent preservation may have been laid down as basal floors and never exposed to oxidation or the same level of trampling processes.

#### Lipid biomarkers

*M9* [1728a] 15 & 30 cm: Faecal matter dominated by ruminants.

*M10* [1728a]: Faecal matter detected but origin could not be determined.

[1728b]: No faecal input detected.

#### Macroplant

This floor was constructed using layers of bracken intermixed with wood, roundwood, smaller pieces of bark, hazel buds and sedge which had become compacted due to trampling. There were a few fragments of emmer glumes and hazelnut shell. This floor contained the largest hoard of

puffballs with 17 whole examples and one fragment. Three were identified as brown puffball. As all these puffballs were mature it is highly unlikely they were collected for food and instead were intended to be used for medicine or perhaps as a fire starter.

The only carbonised finds were two six-row hulled barley caryopses. The small number of domestic debris present within this floor suggests the floor was built up rapidly, thus providing little opportunity for waste debris to become trapped within its surfaces.

#### **Bone**

There were nine fragments of bone (65.7 g) of which five had been burnt. There was one cattle metacarpal and one sheep/ goat mandible. The other identifiable fragments were one L/M vertebra and one M/M rib.

#### 4.2.14.39 [1730]

#### **Macroplant**

Many waterlogged worked wood offcuts were observed within this deposit along with fragments of wood. During excavation decayed branches laid in a rough grid-like pattern were observed and these wood fragments were probably part of this structure. The next most frequent component was common nettle and these were either collected deliberately for use as food or deposited accidentally alongside the wood and other small inclusions of weeds. There were also 36 charred hazelnut shells that were reworked into this deposit.

#### 4.2.14.40 [1731]

#### **Macroplant**

The carbonised assemblage consisted of 14 spikelets and 404 cereal caryopses. The cereal species were emmer (78%), six-row hulled barley (13%), barley (1%), wheat (1%) and cereal (7%). There were also 27 fragments of hazelnut shell which were partly carbonised.

#### **Bone**

There were 71 fragments of bone (208.2 g) of which 70 were burnt. The identifiable skeletal elements were one cattle molar and one L/M metapodial. The rest were recorded as L/M (1), M/M (1) and I/M (48).

#### 4.2.14.41 [1734]

#### **Micromorphology**

Deposit [1734] comprises an ashy deposit within Hearth 4 and was present in five units across sample ST3/K5. The four lowermost units are separated by sharp boundaries and represents distinct episodes of hearth use. The uppermost units appear to represent episodes of dumping/ hearth rake

out and do not represent *in situ* burning of material within the hearth.

The residues preserved and identified in thin section within Hearth 4 represent at least three distinct episodes of burning at different firing temperatures followed by two episodes of dumping/ sweeping. It is not possible to determine if the three burning episodes identified represent the last use of the hearth at abandonment or if they are what remained following numerous cleaning episodes. As noted elsewhere in relation to hearth materials, the preservation of bone and calcitic ash in this acidic and wetland environment means that the residue must have been rapidly covered over following their deposition in order for them to have survived.

#### **Macroplant**

The charred macroplants consisted of over 100 hazelnut shells, one six-row hulled barley caryopsis, one emmer glume and some bracken.

#### **Bone**

There were 232 fragments (71.2 g) of which only one was unburnt. Two sheep/ goat bones were identified as an ulna and a phalange. The remainder were noted as L/M (6), M/M (59) and I/M (165) and were loose teeth, ribs and scapula.

#### 4.2.14.42 [1735]

#### **Macroplant**

The three largest components of the waterlogged assemblage were hazelnut shells, wood fragments and weeds. The wood fragments were probably floor components, as was the small amount of sedge some of which were charred. The richest weeds within the assemblage were burdock, fat hen and common nettle. Burdock has multiple economic uses and has been collected for use as a tea, food and as a herbal medicine. Both fat hen and common nettle are edible and it is possible these species along with burdock were deliberately collected and stored for use in in this structure. Alternately they may just represent inclusions from plants that grew nearby that were accidentally trampled into the floors by the inhabitants. Food residues included the hazelnut shell and carbonised cereal remains, four cereal caryopses and five chaff fragments. There were five emmer, one two-row hulled barley, one bread/ club wheat, one wheat and one cereal.

#### **Bone**

50 fragments (108.2g) of which 33 were burnt. A single cattle molar bore little wear to the occlusal surface. Tooth eruption and wear affecting a single pig mandible suggested this individual died between the ages of 21-24 months. The rest of the assemblage was formed of L/M (4), M/M (11) and I/M (33) which were a mix of skull fragments, mandible, ribs and long bones.

#### 4.2.14.43 [1736]

##### Macroplant

The floor was built using mostly wood fragments along with smaller concentrations of sedge, rush and bracken. The weed species are like those recorded in [1735] in that significant numbers of burdock, fat hen and common nettle were noted. These could be intrusive or were plants that were deliberately collected for a specific purpose such as for food or perhaps medicine. A large quantity of hazelnut shell and some raspberry and blackberry were recovered. These represent food residues trampled into the floor, possibly with some faecal matter represented by the berry seeds.

#### 4.2.14.44 [1737]

##### Macroplant

This foundation layer was primarily constructed from a dump of roundwood, wood fragments, worked offcuts, buds and smaller numbers of bark, sedge and bracken. Some of the bracken was charred.

#### 4.2.14.45 [1739]

##### Macroplant

This deposit consisted of fragments of wood with smaller concentrations of sedge, rush, bracken, buds and leaves. Some of the sedge, rush and bracken stems were charred. The food remains consisted of blackthorn, raspberry and blackberry which might represent faecal matter.

There were six charred cereal caryopses and one chaff fragment. There were four six-row hulled barley, one emmer, one wheat and one cereal.

#### 4.2.14.46 [1740]

##### Bone

Of 214 fragments (80.0 g), 212 were burnt. The species were sheep/ goat (4), rodent (2), M/M (108) and I/M (100). The only unburnt fragments were the two rodent bones. The remainder of the skeletal elements were a mix of ribs, scapula, a long bone and phalanges.

#### 4.2.14.47 [1741]

##### Micromorphology

Deposit [1741] was a hearth deposit within Hearth 3. It was sampled within ST3/K4 and has a sharp horizontal boundary with the underlying [1165]. Deposit [1741] has a massive microstructure and low porosity and is distinguished from the underlying unit by a substantially higher proportion of charred residues including charcoal (25%), charred or burnt bone (20%) and fragmented internally amorphous charred

residues (10%). The charred fragments and aggregates are intermixed/ juxtaposed with no apparent pattern in their orientation. Rare nodules of reddish-brown sediment were observed. Given the compaction of the hearth residues and absence of evidence for sweeping it is possible that these sediment nodules were trampled into the hearth on the soles of feet during deliberate compaction of the hearth waste and that these residues are what remained after the last cleaning or use of the hearth during this phase.

##### Macroplant

There were 60 carbonised finds consisting of 22 cereal caryopses, 17 chaff fragments, 17 hazelnut shell and four weeds. The cereal species were emmer (43%), two-row hulled barley (18%), barley (18%), six-row hulled barley (8%), wheat (8%) and cereal (5%). The cereal and hazel are food debris associated with the hearth. The four weeds were a mix of hemp-nettle, knotweed, buttercup and common chickweed. These were probably reworked into the hearth feature and charred accidentally.

#### 4.2.14.48 [1743]

##### Micromorphology

Deposit [1743] comprised two distinct sedimentary units within the base of sample ST3/M9/K2, Units 1–3 of ST3/M10/K1 and Units 1–2 at the base of ST3/M10/K2. Within ST3/M9/K2 the units are distinguished by differences in the proportions and species of organic inclusions and separated by a sharp discontinuity boundary. The sharp boundary signifies a change in use or deliberate truncation/ dumping episode and is consistent with hypothesised episodes of removal of soiled floor layers and replacement with fresh plant matter. All three units have a laminar aspect giving rise to common, wide planar voids caused through desiccation and shrinkage of the organic matter. Despite a degree of humification, plant tissue fragments are well preserved and frequently highly birefringent in Cross Polarised Light (XPL). Approximately 25% of organic matter has excellent preservation of cellular structure with bracken leaves and rhizomes commonly identifiable. Both tangential and transverse cross-sections of roundwood were identified within the lower unit of ST3/M9/K2 and appear to be interleaved with the plant tissues, indicative of deliberate layering of different plant types within the floors. The upper unit of ST3/M9/K2, Units 1–3 of ST3/M10/K1 and Units 1–2 of ST3/M10/K2 contain fewer roundwood fragments and the distinct interleaving of different plant materials is absent. These units also have a higher proportion of disaggregated plant cells and tissues as well as phytoliths indicating breakdown of plant tissues. There is incomplete impregnation of organic matter with amorphous sesquioxides indicative of some, albeit limited, oxidation. The presence of

fungal mites within some woody fragments is indicative of decomposition. Anthropogenic indicators were not observed in either unit of ST3/M9/K2 and were limited to fragmentary charcoal in ST3/M10/K1 and the lower two units of ST3/M10/K2. Deposit [1743] has thus been classed as a Type B organic floor.

#### Lipid biomarkers

*M9* [1743a]: No faecal input detected.

*M10* [1743b] *14 & 21 cm*: No faecal input detected.

#### Macroplant

The macroplant assemblage from this floor was preserved entirely through waterlogging. The surface was built using layers of bracken, wood with smaller inclusions of sedge, rush, bark and hazel buds which later became compacted due to trampling. Peat, heather and moss were also observed which are probably the remains of turves and these two had become more compact due to the effects of trampling. These may have been used as an additional component of the flooring or alternatively, turves were stored in this location close to the hearths to be used as a fuel source.

There was a large concentration of emmer chaff fragments along with some bran and raspberry seeds. It is possible this area was used either for small scale processing of foodstuffs or that food debris was accidentally spilled. The presence of so much food refuse indicates that this part of ST3 was not regularly cleaned as other areas were.

#### Bone

There were 30 fragments (77.6 g) of which 17 had been burnt. The species were cattle (1), sheep/ goat (1), pig (2), L/M (9), M/M (6) and I/M (10). The skeletal elements were a mix of loose teeth, vertebrae, ribs, scapula, long bone shafts, pelvis and foot bones. One L/M vertebra bore cut marks.

#### 4.2.14.49 [1744]

#### Macroplant

This floor was constructed from a dump of waterlogged wood fragments, roundwood, worked offcuts, buds, bark and a small amount of bracken. Some heather and peat fragments were noted which could be evidence of decomposed turves. The waterlogged food remains were emmer chaff and blackthorn stones.

The carbonised finds numbered two cereal caryopses, 13 chaff fragments, two weeds and peat. The cereal was emmer (67%), wheat (27%) and cereal (6%). The cereal and peat represent food and fuel waste re-deposited within this surface.

#### Bone

There were eight fragments (46.3 g) of which three had been burnt. The only identifiable fragment was a sheep/ goat molar that had little wear to the tooth surface.

#### 4.2.14.50 [1746]

#### Macroplant

The waterlogged assemblage was composed of wood fragments, wild food resources and weeds. There were large fragments of wood, roundwood and bark. These could have formed part of the floor surface that bordered the hearth but more probably the wood was originally intended for fuel. Certainly, apart from a few small fragments of bracken, some of which were burnt, there was no other evidence of floor materials. The only waterlogged food debris present were hazelnut shell fragments. Amongst the more abundant weeds within this deposit was common nettle which is edible. Its presence within the hearth could indicate this plant was deliberately collected for use as a food source although there was no surviving evidence any had been cooked.

There were 21 carbonised cereal remains composed of five caryopses and 16 chaff fragments. The species were emmer (62%), barley (19%), two-row hulled barley (9%), wheat (5%) and cereal (5%).

#### Bone

Of 137 fragments (241.7 g), 112 had been burnt. There was a cattle calcaneum and one pig metatarsal. The rest of the assemblage was recorded as L/M (16), M/M (9) and I/M (110) which comprised a mix of skull fragments, vertebra, ribs, long bones, pelvis and a foot bone.

#### 4.2.14.51 [1749]

#### Bone

A well-preserved cattle scapula (44.3 g) was recovered from this surface. It seems unlikely that a single bone of this size (150 mm long) was accidentally dropped so it is possible that it was deliberately added to the sub-floor as a foundation deposit for example.

#### 4.2.14.52 [1751]

#### Bone

There were 214 fragments (173.6 g) of which 207 had been burnt. There was one cattle molar and one sheep/ goat metacarpal. The rest were described as L/M (5), M/M (13), I/M (194) and were a mix of ribs, scapula, long bones, pelvis and foot bones.

#### 4.2.14.53 [1752]

##### Macroplant

This deposit consisted of a small accumulation of charred cereal straw fragments. These are likely from processing and were dumped within the hollow to line it as precursor to the constructing the hearth.

#### 4.2.14.54 [1757]

##### Macroplant

The carbonised finds were dominated by cereal straw fragments and hazelnut shell fragments. These represent food processing waste which may have been discarded in this feature.

#### 4.2.14.55 [1761]

##### Micromorphology

The sediment was primarily comprised of laminar/horizontally organised, part humified organic matter. Plant cell tissue structure is frequently visible and bracken leaves and stems are commonly identifiable. Woody cellular tissue fragments with high birefringence are few (<10%). Rare transverse sections of roundwood were also observed. Rarely (<2%), there is some silty clay replacement of plant tissue. The pore space is predominantly irregular planar voids, occupying generally *circa* 20–30% of the fabric, but is occasionally as much as 50%. Anthropogenic indicators such as charcoal and bone were not observed. If this unit was in use as a floor, it was therefore located outwith the main area of occupation or represents the residual floor after the upper 'dirty' floor surface had been removed.

##### Lipid biomarkers

M9: No faecal input detected.

##### Macroplant M1

This floor was preserved through waterlogging. The surface was constructed using layers of mostly bracken, wood fragments and roundwood with much smaller inclusions of sedge, rush, hazel buds and bark. The weed assemblage was rich particularly in finds of fat hen and pale persicaria, but there is no evidence to suggest either weed species was collected deliberately. There was no evidence of food or fuel debris suggesting that this floor was constructed and sealed rapidly which prevented rubbish from being trampled into the surface.

#### 4.2.14.56 [1762]

##### Bone

There were 224 burnt fragments (160.8 g). These consisted of cattle (2), L/M (12), M/M (7) and I/M (200). The cattle

bones were a horn and premolar. The L/M and M/M fragments were a mix of skull fragments, mandibles, loose teeth, scapula, vertebrae, long bone shafts and foot bones. These finds have likely derived from both butchery waste and domestic food debris.

#### 4.2.14.57 [1763]

##### Micromorphology

Floor 1763 was sampled within the base of samples ST3/K2 and ST3/K3 adjacent to and S of the hearth stack and also within the top of sample ST3/M11/K1 located N of the hearth stack.

Units 1 and 2 at the base of ST3/K2 are broadly similar in character and are differentiated on the basis of relative proportions and preservation of organic matter which give rise to differences in colour. Within Unit 1, roundwood and elongated reddish brown curled leafy (parenchymatic and lignified) tissues (likely bracken) form equal proportions of the organic component, whereas in Unit 2 plant tissues and organic residues constitute the dominant component. The two units are separated by a clear horizontal boundary which likely divides two distinct episodes of importation of organic materials used to cover/ form the floor within the structure. Unit 1 of sample ST3/K3 is similarly dominated by organic matter; preservation of organic matter is exceptional and the palisade mesophyll, spongy mesophyll and sporangia of bracken leaves are frequently identifiable. The organic matter has a preferred horizontal orientation. The microstructure is spongy in places but broadly lenticular reflecting the banded nature of the organic matter. All three units are Type B floors in which anthropogenic indicators are absent.

Unit 5 of sample ST3/M11/K1 and Unit 1 of Sample ST3/M11/K2 are broadly similar, and both have a laminated microstructure commonly fragmented into fine lenticular aggregates of elongate plant material. The organic matter component dominates both units, although the coarse mineral component is higher than in samples ST3/K2 and ST3/K3 which were located closer to the hearth. In contrast to other units within this context, [1763] in sample ST3/M11/K1 contains abundant evidence for human activity in the form of charcoal (5%), burnt and unburnt bone (2–3%) and vesicular fuel ash slag (2–3%). Anthropogenic indicators are fewer within Unit 1 of Sample ST3/M11/K2, but the presence of charred bone, charred peat and charcoal provide evidence for human activity. Both units also have a weakly crystallitic birefringence fabric which indicates that fine calcitic-rich ash is distributed throughout the matrix albeit masked slightly by amorphous organic matter. The heterogenous nature of these units in combination with its compacted and lenticular microstructure and evidence for human activity indicates that these units are representative of a Type A occupation deposit.

The micromorphological evidence for [1763] indicates that it varies spatially and stratigraphically. In summary, adjacent to the hearth, it appears to represent a series of highly organic Type B floors constructed from imported roundwood and bracken. To the N of the hearth the floor surfaces preserve evidence for human activity and are classed as Type A occupation deposits.

Four distinct sedimentary units of [1764] were recorded at the base of Sample ST3/M11/K1. Following analysis and comparison with other samples these are considered more likely to be part of [1763]. All four units have characteristics typical of floor surfaces at BLoM including compressed lenticular to platy or massive microstructures, dominance of coarse organic plant tissue and organic residues with bracken leaves and stems commonly identified. The four units of [1764/1763] identified within sample ST3/M11/K1 thus appear to represent the remains of organic floor surfaces close to the central hearth and into which hearth residues and waste were either deliberately swept and/ or accidentally incorporated (though trampling). Unit 3 appears to represent a relatively 'sterile' resurfacing episode consistent with evidence elsewhere in ST3 that new and clean organic materials were repeatedly brought into the structure to resurface floors. The occurrence of relatively high proportions of ashy slag material (fuel ash) within Unit 2 is of interest in the context of ST3 and the wider site as it indicates changing use of the hearth and different firing temperatures. Smaller proportions (2–3%) of vesicular ashy slag material were also identified within Unit 4 as were two nodules of dark vesicular possible iron slag (<5 mm) and may be evidence of iron working, although further chemical and Scanning Electron Microscopy (SEM) work would be required to confirm their tentative identification.

#### 4.2.14.58 [1764]

##### **Micromorphology**

Deposit [1764] was sampled in thin section in two locations: the first (ST3/K1 and ST3/K2) was located within/ directly adjacent to Hearth 2 and was sampled to determine if different burning events/ use could be identified; the second (ST3/M11/K1) was located at a spatial remove from the hearth in an attempt to determine how the hearth deposits related to adjacent floor surfaces.

Within sample ST3/K1, seven distinct sedimentary units were identified. The six lowermost units were interpreted as representative of hearth waste whereas the uppermost was interpreted as the remains of a floor surface. The six hearth waste units are separated by horizontal boundaries; most are clear to sharp and indicate distinct changes in activity/ sweeping or raking episodes although boundaries between Units 1 and 2 and Unit 6 and the overlying floor (Unit 7) are diffuse and indicative of gradual accumulation of debris.

The distinct microstructures and varied proportions and arrangements of components within Units 1–6 of ST3/K1 [1764] evidence change in hearth use over time. Each of these layers/ units is only several millimetres thick and thus provide a limited picture of overall hearth use. It is not possible to tell from micromorphological evidence if these layers represent the use of the hearth over a defined and short period (perhaps only a day or so), whereby the primary function changed according to requirements for light, warmth or food, or if they represent the basal remains of thicker layers removed during cleaning and thus potentially evidence a more fundamental change in use of the hearth over time. Sharp or clear discontinuity boundaries between each layer suggest deliberate cleaning and scraping back of hearth residues and thus it is probable that the bulk of hearth waste has been removed. Again, we cannot tell from the micromorphological evidence if the sharp boundaries signify routine hearth clearing or if they represent a more substantial hearth clearance (akin to an annual spring clean) or relate to refurbishment and/ or repurposing of the hearth.

Unit 7 of [1764] within ST3/K1 is of sufficiently different character that it is distinguished here from the underlying hearth waste deposits and indeed may be part of the overlying [1763A] (see below). The coarse organic components account for approximately 70% of the unit and are comprised of a combination of elongate leaf and stem fragments with woody stems and roundwood. The roundwood is typically distorted and lozenge shaped which may suggest that it has been squashed or trampled. The coarse organic component is well preserved and has a high birefringence. Anthropogenic residues are limited to trace amounts of microcharcoal distributed throughout the matrix. The coarse organic components have a strong orientation parallel to the base of the slide and are also moderately banded. The micromorphological characteristics of Unit 7 are typical of prepared floor surfaces observed elsewhere across ST3 (eg [15018]) and also more widely across BLoM. It seems likely that Unit 7 represents a deliberate attempt to cover the hearth with imported organic materials as a prelude to the next phase of occupation.

##### **Macroplant**

The richest component of this waterlogged assemblage were wood fragments and roundwood which had probably been used as flooring and were discarded on the hearth. Additional flooring materials present were sedge, bracken, buds and bark but in much smaller quantities. Some of the sedge and rush stems had been charred; they could have been burnt *in situ* or after discard in the hearth. Peat, heather and moss were noted, and it is possible these components of turf. Background traces of food including emmer chaff, wheat chaff and hazelnut were present and there were also some fragments of charred peat which could have been fuel debris from the hearth. It appears that old

floor surfaces were disposed of within this hearth but were not fully charred.

#### 4.2.14.59 [1767]

##### Macroplant

This deposit sealed Hearth 1 and formed the surface on which Hearth 2 was built. It consisted mostly of fragments of waterlogged wood, roundwood and bracken with smaller inclusions of sedge, rush and hazel buds. There was evidence of some wheat caryopses and chaff fragments that were probably reworked into the flooring material along with the weeds and moss.

There were 12 cereal caryopses, five chaff fragments and some sedge and rush stems which were all burnt. The cereal was emmer (47%), barley (23%), oat (6%) and two-row hulled barley (6%) and cereal (18%).

##### Bone

There were 78 fragments (34.0 g) of which 73 had been burnt. One pig canine was identified. The remainder consisted of 77 M/M fragments, a mixture of skull fragments, mandibles, vertebrae, scapula, long bone shafts and foot bones. It is possible these remains have derived from a single individual such as a pig that had been roasted and later disposed of within this area.

#### 4.2.14.60 [1771]

##### Micromorphology

Like the underlying [1763], [1771] was sampled within and around the hearth to determine relationships between floor surfaces and the hearth as well as any spatial differences. It was present within the top (Unit 4) of sample ST3/K2 and Units 3–4 of ST3/K3 and within the top of sample ST3/M11/K2. It is interpreted as a Type A occupation deposit with relatively abundant evidence of anthropogenic activity in the form of charcoal (10%) and patches of ash within ST3/K2 and ST3/M11/K2. Organic material is the primary component and is dominated by reddish brown to black plant tissues. Coarse organic matter is better preserved ST3/M11/K2 and is comprised of plant stems and bracken rhizomes and reddish brown chopped and fragmented organic residues. The two identified units of [1771] within sample ST3/M11/K2 are very similar and only distinguishable when viewed in XPL when the uppermost unit can be seen to have a moderately crystallitic birefringence fabric. Deposit [1771] within ST3/K2 was observed to be broadly similar but with a wider range of anthropogenic residues including burnt bone and vesicular fatty char as well as a larger proportion of roundwood fragments. The relative absence of anthropogenic indicators in ST3/K3 likely reflects the position of this sample further away from the hearth,

making the accidental incorporation of food and fuel residues into the floor surface less likely.

#### 4.2.14.61 [15005]

##### Macroplant

The carbonised assemblage consisted of 156 cereal and four hazelnut shell fragments. The cereal species were emmer (73%), barley (12%) and wheat (3%). The remaining cereal (12%) could not be identified further. This assemblage represents food waste trampled into the surface.

#### 4.2.14.62 [15012]

##### Macroplant

There were 53 charred cereal caryopses, 10 hazelnut shells, a small quantity of sedge and rush stems and one weed seed. The cereal species were emmer (43%), barley (28%), wheat (6%) and cereal (23%). This assemblage represents food debris which has spilled out of Hearth 6 onto this wickerwork floor surface. The rush and sedge plant stems formed part of the wickerwork floor layers which appears to have been burnt *in situ*.

##### Bone

There were 39 fragments of bone (12.3 g) of which 37 were burnt. Three bones were identified as one cattle molar, an L/M tooth fragment and an M/M radius.

#### 4.2.14.63 [15014]

##### Macroplant

This surface was predominantly constructed from wood with plant litter such as bark, buds, bracken, sedge, hard/ soft/ compact rush and wood rush only having a minor role. The weeds and moss were accidental inclusions from plants either brought to site as inclusions within the building materials or were growing in this vicinity. There was a large quantity of decayed peaty type material which had partly dried out. The only evidence for the possible disposal of food remains was a small number of raspberry seeds, and two barley caryopses and one emmer glume, all carbonised.

#### 4.2.14.64 [15015]

##### Micromorphology

Deposit [15015] comprised a compacted Type A deposit with a complex massive microstructure (with rare vughs) and crystallitic birefringence fabric. Coarse mineral material comprised approximately 50% of the unit and was composed of a mix of greywacke and sandstone rock fragments (30%). The coarse organic component was dominated by reddish brown plant tissue fragments (25%). Anthropogenic indicators were relatively high and comprised heavily degraded and

fragmented burnt bone, burnt sediment aggregates and blackened rock fragments. Pedofeatures comprised rare clay and dusty silt coatings to voids and are indicative of some upper sediment profile disturbance. Coarse components have a weak horizontal orientation. Cumulatively the features observed in thin section within [15015] evidence a floor surface that has been subject to raking or sweeping processes to align the coarse material and subsequently trampled. These features would be consistent with an occupation floor in close proximity to a hearth which incorporated ashy debris and food and fuel remains and result in the management of overspill.

#### Lipid biomarkers

*Samples A & B:* Faecal matter dominated by human/horse in A. Low concentrations of faecal matter present in B (source undetermined).

#### Macroplant M2

The waterlogged plant assemblage consisted mostly of flooring material constructed from layers of bracken and wood fragments that formed compacted and laminated layers which peeled apart easily. There were also small inclusions of sedge, rush and buds. Some of the sedge and rush stems were charred. Small concentrations of cereal caryopses and hazelnut shell had been trampled into this floor. A large quantity of decayed peat type material was observed; these are probably part of the older underlying floors which have decomposed *in situ* before new flooring material was placed directly above.

Charred macroplants had also been trampled into this floor. The assemblage consisted of 14 cereal caryopses and six chaff fragments. The species were emmer (30%), barley (25%), two-row hulled barley (15%), oat (10%), six-row hulled barley (5%), and cereal (15%). The fuel remains included large quantities of charred peat. The small quantities of domestic waste suggest that this floor was either constructed rapidly or was kept relatively clean.

#### Insects

Insect remains were more poorly preserved than in any of the other samples associated with ST3, most of the material being very soft, fragile and with various degrees of colour loss. Fragmentation was high. Heads of various species were over-represented relative to other body parts, perhaps indicating that some material had been lost due to the poor preservation or possibly that the heads were more easily spotted amongst the fine plant material forming the bulk of the paraffin flot.

A moderately diverse assemblage consisting of 84 individuals of 44 taxa was recorded from a 5 l sample (17 individuals  $I^1$ :  $\alpha = 36$ ,  $SE = 7$ ). Decomposers were the dominant ecological group (RT 62%;  $\alpha RT = 10$ ,  $SE = 2$ ). *Carpelimus bilineatus* group, the most abundant beetle,

probably bred in a generally damp floor. A house fauna associated with relatively dry organic litter was very poorly represented (1%), and foul decomposers consisted only of scarabaeoid dung beetles (5%). Lipid biomarkers indicate an element of human/ horse faecal matter. Insects from outdoor habitats were relatively common (24%) suggesting the importation of materials from natural habitats, either in the form of cut vegetation or peat. Wetland taxa included *Notaris acridulus* which is primarily associated with reed sweet-grass (*Glyceria*). *Nedyus quadrimaculatus* found on nettles might be more likely to represent vegetation external to the structure.

#### 4.2.14.65 [15016]

#### Micromorphology

Deposit [15016] is represented within Units 3 and 4 of Sample ST3/M5/K2 and Units 1–4 of Sample ST3/M5/K1. The lower part of the context as represented by Unit 3 and 4 of ST3/M5/K1 and Units 1–2 of ST3/M5/K2 shows rather regular sub horizontal layers, in parts slightly deformed. Strong involutions and convoluted structures are absent. Besides wood, the main components are fragmented fibrous plant remains with one or several cell layers (epidermis, leaf fragments, bark). Porosity is between 15% and 20%, characterised by irregular spongy voids. Anthropogenic indicators include relatively large quantities of heavily fragmented bone (5%) as well as fuel residues of charcoal (10%) and burnt peat (1%). The lower layers appear to represent the remains of a floor surface. A diffuse horizontal boundary between Units 2 and 3 within Sample ST3/M5/K2 marks a change from a floor surface dominated by high quantities of organic plant tissue to a more mineral surface with higher quantities of fuel residues representative of inputs from the nearby Hearth 6 likely in the form of sweeping and trampling of food and fuel debris.

The boundary between Units 3 and 4 within ST3/M5/K1 is sharply horizontal and marked by a stark change in sedimentary character. Unit 4 is dominated by densely packed clay with a massive microstructure and porosity of less than 5%. Burnt peat residues occur in higher quantities than charcoal and may indicate a change in dominant fuel use in the hearth. The charred cereal and bone are food refuse which was accidentally trampled into this surface during cleaning of the hearth. The upper levels of [15016] thus comprise the remnants of an occupation horizon.

#### Lipid biomarkers

Faecal matter dominated by human/horse.

#### Macroplant M2

This deposit was analysed in Monolith 2 and was somewhat dried out which would explain the poor preservation and recovery of waterlogged ecofacts. A further explanation for

the poor preservation of this assemblage is that the deposit was high up in the stratigraphy of the site and was formed largely of shattered stone and ashy debris. This probably explains why small quantities of poorly preserved and decomposed waterlogged bracken were observed some of which were charred, although this material broke apart during processing. The bracken could have formed part of a floor surrounding the hearth which was accidentally burnt. The carbonised finds were two cereal caryopses identified as emmer and wheat.

#### 4.2.14.66 [15018A]

##### Micromorphology

Deposit [15018A] is comprised of large quantities of compressed bracken representative of Type B organic floors which are interspersed with Type A occupation deposits. Sample ST3/M7/K2, which includes the boundary with the underlying [15023], contains most evidence for anthropogenic activity and includes two anthropogenic Type A floor layers (Units 2 and 4) rich in fuel and food residues interleaved between layers of Type B organic floor (Units 3 and 5). Within ST3/M6/K3, a Type A layer floor (Unit 1) was identified at the base of the slide over which was a Type B organic floor (Unit 2) which in turn was overlain by a Type A deposit (Unit 3).

All units of [15018A] have a lenticular laminated microstructure and organic and anthropic components have a strong horizontal orientation. Food residues are particularly high within Unit 2 of Sample ST3/M7/K2 where burnt bone accounts for 10% of the overall unit. Unit 2 also contains a high proportion of anorthic sediment patches which have originated outside of the unit and are characteristic of natural mineral-rich soils likely trampled into the structure from outside on the soles of feet. Given its location at the base of [15018A], Unit 2 probably represents early Phase 2 occupation. Unit 2 has a clear horizontal boundary with the overlying Unit 3 which is comprised of a mix of strongly oriented mineral and organic material with reddish brown plant tissues (identifiable as bracken during sub-sampling). The unit is very compressed with a porosity of less than 10% comprised of lenticular horizontal pseudomorphic voids marking/ mirroring the locations of former plant inclusions. Units 3 and 5 of ST3/M7/K2 and Unit 2 of ST3/M6/K3 are interpreted as representative of the deliberate importation and deposition of plant material (primarily bracken) as a means of covering and insulating the floor surface during Phase 2. It is assumed that some level of cleaning took place between each of these recovering and resurfacing episodes but, as demonstrated by the residual anthropic indicators within Units 2 and 4 of ST3/M7/K2 and Units 1 and 3 of ST3/M6/K3, the old dirty floors were not removed or replaced in their entirety and some residual waste materials were left behind. Whilst it

is not possible to identify the period of time represented by each floor resurfacing episode, the identification of multiple active Type A floor surfaces within this single context of Phase 2 indicates that these deposits represent replacement and renewal over a short period of months or perhaps weeks.

##### Lipid biomarkers

*M8* [15018A] *Sample F*: No faecal input detected in F.

*M7* [15018A] *Samples A–D*: No faecal input detected in A, B & C. Mixed faecal matter dominated by human/ horse in D.

*M8* [15018A] *Sample E*: Mixed faecal source dominated by human/ horse in E.

##### Macroplant M2, M3, M4 & M8

The macroplants were preserved entirely through waterlogging. The bulk sample [15018] consists of the build-up of large quantities of bracken at a very rapid rate which created the laminated and compressed layers. The weeds were likely plants which were inclusions within the bracken or were growing on site and were covered by the bracken floor. The cereal remains are domestic refuse from food processing which were trampled into this surface possibly from overspill from context [15038]. Given how relatively clean this floor is, it appears that some older floor surfaces were probably removed prior to a new layer of bracken being laid.

There was evidence of food remains in the form of emmer, cereal caryopses and chaff fragments but these were a minor inclusion within the floor. Heather was noted and this could be evidence of turf material. The weeds and moss were accidental.

Analysis of the monolith samples revealed the plant matter formed highly compressed layers. These were peeled apart during processing and the dominant find within was bracken. The only other floor material noted was very small quantities of sedge, wood fragments, hazel buds and bark.

#### 4.2.14.67 [15018B]

##### Micromorphology

The upper layers of [15018] found within Unit 1 of ST3/M5/K2, Units 1 and 3 of ST3/M5/K3, Unit of ST3/M6/K1 have been classified as Type E peat deposits. The coarse mineral fraction of these units is typically 10–15% and comprises a mix of sand-sized quartz and feldspar minerals with <5% subrounded sandstone fragments. The coarse organic fragments typically account for 60–70% of each unit and a combination of elongate leaf and stem fragments with woody stems and fragmented plant tissues making up the majority of the rest of the component. The coarse components have a weak horizontal orientation and are also typically weakly banded. Anthropic residues are typically sparse and limited to charcoal. Interspersed

between two Type E deposits within ST3/M6/K2 is a deposit more consistent with an active floor surface which may be representative of Phase 4 or Phase 5 occupation but evidence for anthropic input remains limited.

These deposits appear to have been subject to varying degrees of reworking as indicated by faecal pellets and patchy rugose crumb microstructure. These pedofeatures indicate an open environment in which soil fauna have been active and are thus likely to be inherited features from a deposit originally formed in an open environment and transported into the structure and subsequently buried between layers of occupation. The units of [15018B] also appear to have undergone shrink swell processes as indicated by the many horizontal cracks and fissures which reflect numerous phases of drying out and alteration of the overall sediment structure. These cracks and fissures dissect the voids created by soil micro fauna providing evidence that the drying out occurred after the soil fauna activity. It is hypothesised that these deposits represent peaty turves deliberately imported into the building and used as a means of covering and/ or insulating the floor.

#### Lipid biomarkers

*M5* [15018B] *Sample A*: Faecal matter dominated by human/horse.

*M6* [15018B] *Samples A – E*: Faecal matter detected in all samples but dominated by different sources; A = human/horse. B = ruminant. C = low concentrations (source undetermined) D = pigs. E = human/horse.

*M8* [15018B] *Sample A*: No faecal input detected.

#### 4.2.14.68 [15020]

##### Macroplant

The waterlogged assemblage was very small and consisted of floor material and weeds. The floor materials were wood fragments and smaller quantities of bracken and sedge.

The carbonised macroplant assemblage was a mix of cereal caryopses, chaff, nuts, fruit, bracken and plant stems. There were 17 cereal remains identified as barley (53%), emmer (17.5%), wheat (17.5%) and two bread club wheat (12%). Wild food resources were represented by three fragments of hazelnut shell and four blackthorn stones. There was also a small quantity of burnt peat. However, the largest component of this assemblage was the plant stems. This assemblage probably represents the overspill of food and fuel debris from Hearth 4 onto the surrounding floor surface which became charred.

##### Bone

There were four fragments of burnt bone (7.8 g) of which one was identified as a second cattle phalanx. The cattle phalanx was fused indicating that this animal was older than 1.5 years at time of death.

#### 4.2.14.69 [15026]

##### Macroplant

The waterlogged macroplant assemblage consisted of a substantial concentration of hazelnut shell, woodchips and weeds. There were 26 charred macroplants consisting of one six-row hulled barley, one emmer caryopsis and 24 hazelnut shell fragments. The concentration of hazelnuts suggests that food processing took place on this side of the hearth.

##### Bone

Of 66 fragments of bone (149.6 g), 18 were burnt. The species were cattle (1), sheep/ goat (4), pig (2), L/M (14), M/M (21) and I/M (24). The cattle phalanx was fused and belonged to an animal older than 1.5 years at time of death. One of the sheep/ goat fragments was an unfused pelvis from an animal younger than 10 months. There were also three sheep/ goat molars which displayed little wear. There were two pig phalanges at different stages of fusion. The first phalange of the proximal epiphysis was unfused and the distal epiphysis was just fused which means that this bone belonged to an individual which probably died shortly after birth. The second phalange was completely fused so this animal was older than one year at time of death. An M/M vertebra had been cut in two. The bone is an accumulation of cooking and butchery waste.

#### 4.2.14.70 [15030]

##### Macroplant

This sub-floor was constructed using bundles of brushwood and consequently very little sediment was present. The waterlogged assemblage consisted mostly of bracken, roundwood, wood, wood offcuts, buds and bark. Rush was noted but was a very minor component. Other inclusions were food residue, weeds and moss. The large number of cereal chaff fragments suggests that the occupants were either processing cereal remains on the newly built surface or were discarding their processing waste before laying down the active floor surfaces.

#### 4.2.14.71 [15031]

##### Macroplant

The waterlogged plant assemblage included large concentrations of food remains, flooring, moss and a small number of weeds. The floor was constructed primarily from layers of waterlogged bracken with smaller quantities of wood and hazel buds. Hard/ soft/ compact rush was noted but were marginal inclusions within the formation of this floor. Heather was present and could represent the remains of turves. There was also a large concentration of moss, some identifiable as *Sphagnum* sp. There were many emmer caryopses and glumes along with fragments of cereal bran,

culm nodes and straw. The presence of cereal bran could indicate that faecal matter was trampled into this surface although the presence of chaff suggests this area was more likely used for processing foodstuffs and, as such, would have been expected to be kept relatively clean.

There were four charred cereal remains and a small quantity of plant stems. There were three emmer chaff fragments and one cereal caryopsis. A small number of burnt plant stems were noted.

#### 4.2.14.72 [15033]

##### Insects

A moderately-sized beetle and bug assemblage from a 5 l sample (120 individuals of 65 taxa; concentration 24 l<sup>-1</sup>;  $\alpha = 58$ , SE = 9) was indicative of a naturally-lain peat, probably formed at the mossy edges of shallow, still or slowly flowing water with running water close by. Water beetles were common (38% of the assemblage), the most numerous being *Hydraena nigrita* which is usually associated with moss at the edges of running water, often in partially shaded or wooded sites (Foster et al 2020: 30). The riffle beetles *Elmis aenea* and *Oulimnius ?tuberculatus* are also characteristic of running water. *Hydraena testacea*, on the other hand, occurs in still or slowly flowing water, often in woodland (Foster et al 2020: 46). Wet waterside mud was indicated by *Dryops*, whilst *Contacyphon* species are typical of well-vegetated places with shallow pools of standing water. Ground beetles *Pterostichus minor* and *Agonum fuliginosum* are typical of damp wetland ground, with *P. minor* especially associated with damp woodland and fens. *Notaris acridulus* primarily occurs on reed sweet-grass (*Glyceria maxima*) but may also be associated with other semi-aquatic grasses, and *Euaesthetus bipunctatus* is typically found in grass tussocks (Lott & Anderson 2011: 82). The outdoor assemblage as a whole indicates the presence of woodland or shrubby vegetation on the site when the peat was forming and *Baeopelma forsteri*, a jumping plant louse (Psylloidea) represented by shed nymphal skins, is found exclusively on alder (*Alnus*). Grassland on drier ground further afield was suggested by *Phyllopertha horticola*, a small chafer with turf-feeding larvae.

Decomposers accounted for 13% of the insect fauna, a low proportion typical of natural deposits. Numbers of synanthropes were also low (5%) and all were facultative species that are common in natural habitats. Small numbers of *Atomaria*, which elsewhere on site is typically part of the house fauna, might provide a hint of the incorporation of occupation litter, although it might simply have lived amongst relatively dry tussocks. Scarabaeoid dung beetles made up 3% of the fauna.

#### 4.2.14.73 [15037]

##### Macroplant

This deposit was described as natural peat and there were inclusions of heather and weeds which were probably growing in this area prior to the construction of the roundhouse. Other additions within the waterlogged and charred plant assemblage included food remains and building materials. A possible dump of building material on top of this surface composed of waterlogged roundwood, wood fragments, bracken, hazel buds, bark, leaves, sedge and rush were recovered alongside cereal bran fragments and blackberry seeds. The bran and blackberry could suggest faecal matter was also disposed of within this locality at some point. The charred finds were one barley and one wheat caryopsis which demonstrate that some domestic refuse may have been disposed of into this surface again prior to the construction of ST3.

##### Insects

A large beetle and bug assemblage was recorded from a 5-litre sample (345 individuals of 141 taxa; concentration 69 individuals litre<sup>-1</sup>;  $\alpha = 89$ , SE 8), its diversity suggesting mixed origins, with insects derived from both the original natural ground surface and other materials deposited before construction. Aquatics (9% of the assemblage) included an *Oulimnius* species and *Ochthebius bicolon*, the latter typically found in mud by running water. Outdoor insects made up a third of the fauna (34%) and included a range of taxa suggesting the existence of damp shaded ground and woodland on the site before ST3 was built. Amongst these were the ground beetles (Carabidae) *Elaphrus cupreus*, *Ocys harpaloides*, *Pterostichus niger*, *Oxypselaphus obscurus*, and *Agonum fuliginosum*. Some of these species can be found under bark, as is *Cerylon* which preys on bark beetles (Scolytinae), whilst the larvae of *Grynobius planus* (a member of the woodworm family) bore into the dry dead wood of deciduous trees. *Crepidodera* species are associated with the foliage of willows and poplars, and *Baeopelma foesteri* occurs on alder. Grassland in the wider environment was suggested by *Dascillus cervinus* and *Phyllopertha horticola*.

In addition to the evidence for natural conditions, there was a significant insect component that appears to have been derived from pre-existing buildings, specifically including floor litter. A house fauna (*Latridius minutus* group, *Cryptophagus* spp., *Atomaria*; 7%) and various other taxa that were common elements in floor deposits elsewhere on the site were well-represented. Human flea (*Pulex irritans*) was also recorded. The planthopper *Conomelus anceps* and the jumping plant louse *Livia junci*, both found on rushes, could have been imported with materials into buildings from which the litter was originally derived, but equally might represent vegetation in the natural pre-building

environment. A range of insects associated with 'weedy' vegetation may suggest that the discarded floor litter, perhaps together with other forms of occupation waste, had been accumulated as a midden-type deposit prior to being used in preconstruction. *Gastrophysa viridula* is found on docks (*Rumex*), *Chaetocnema concinna* or *picipes* on Polygonaceae, typically on knotweed (*Polygonum*) but also on docks, *Phyllotreta nemorum* group and *Meligethes* are associated with various wild and cultivated Brassicaceae, and *Trioxa urtica* nymphs with nettles.

#### 4.2.14.74 [15038]

##### Lipid biomarkers

M8 [15038] Samples B, C & D: No faecal input detected in B. Low concentrations of faecal matter present in C & D (source cannot be determined).

##### Macroplant

The macroplant assemblage was preserved entirely through waterlogging. It consisted of large quantities of cereals, floor litter and some weed species. The cereal remains included both barley and emmer caryopses, chaff and straw fragments although emmer was clearly the more dominant species within this deposit. The floor litter consisted of bracken, wood fragments and roundwood, with small amounts of sedge and buds. There was also a large quantity of heather and decayed peat type material that may be evidence of decomposed turves.

Deposit [15038] is the fill of a stake-lined hollow [15032] located within the active floor deposit [15018]. During excavation [15018] and [15038] could not be distinguished but analysis has highlighted differences in the composition of these two contexts. The most obvious difference is the presence of cereal caryopses, chaff and straw fragments in [15038] which suggests that the hollow was used for the disposal of food remains. It is also possible this area was used to process or perhaps even store cereal although this last interpretation is speculative. The presence of roundwood and possible peat turves in [15038] also distinguishes it from [15018].

##### Insects

A small assemblage of 51 beetles and bugs of 40 taxa was recorded from a 0.75 litre sample (68 individuals litre<sup>-1</sup>;  $\alpha = 84$ , SE = 28). Diversity was unexpectedly high in comparison to other samples from internal deposits in ST3 suggesting mixed origins or possibly original deposition in the open (for example as peat), although this is a cautious interpretation due to the limited size of the assemblage. A house fauna was represented only by single individuals of *Latridius minutus* group and *Cryptophagus*. Material within the hollow may have been less damp and foul than typical floors within the structure: oxyteline rove beetles were less common (6%),

whilst decomposers accounted for just under a third of the assemblage (31%), a low proportion compared to floors within the structure, and there were no obligate foul matter species. Some insects, such as *Conomelus anceps* and *Livia junci* found on rushes, may have come from material used in the associated floor surface, with the flea weevil *Isochnus cf foliorum*, whose larvae mine the leaves of willows, potentially introduced with twigs that retained their leaves although willows growing locally were suggested in a number of other samples. A few taxa such as *Dascillus cervinus* which has turf-living larvae, and perhaps *Othius ?subuliformis*, provide slight hints of the presence of peat or turf for use as fuel, but without other evidence these could be associated with the floor surface rather than the hollow itself.

#### 4.2.14.75 [15049]

##### Macroplant

This deposit is the same surface as [15037] above. The waterlogged macroplant assemblage was formed mostly of building materials, weeds and food remains. The plant litter consisted of roundwood, wood fragments, bracken, buds, leaves and bark along with a small number of glaucous sedge and rush presumably dumped here to form a waterproof and stable surface for the construction of ST3.

The weed seeds and moss probably grew in this area. The food remains were cereal caryopses, bran fragments and raspberry seeds which may represent a small accumulation of faecal matter being deposited in this vicinity.

The charred macroplant assemblage was three barley, one wheat, one cereal caryopsis and a small amount of bracken. These finds are domestic food waste and possible remnants of old burnt floors that were discarded in this area prior to building ST3.

### 4.3 Structure 4 (ST4)

#### 4.3.1 Introduction

ST4 was a lightweight timber building with organic flooring, similar in construction style (and probably in size) to ST3. The building was investigated over two seasons of work, in Trenches 10 and 19. Trench 10 had been placed over what appeared to be a stony bank visible on the surface of the site prior to excavation, but in the course of excavation it became clear that this feature bore no relation to the timber structure beneath and, as such, the layout and extent of Trench 10 were not ideal for the purposes of clarifying the layout of ST4 (Figure 4.41). The structure contained organic flooring and a series of hearths very similar in character to the other buildings on the site, but the depth of the deposits was much shallower and the number of sequential hearths fewer than in ST3 (see Figures 4.42 & 4.43).

### 4.3.2 Chronological evidence

ST4 was built directly over the slighted remains of the Episode 1 Palisade 1, placing it in Episode 2; a minimum separation of  $15 \pm 2.5$  years has been used as the interval between the palisade and the construction of ST4 in the modelled C14 chronology (see Chapter 8.3.4). Only two radiocarbon dates were obtained for deposits within the building, but with the relative stratigraphic position of ST4 in relation to the palisade the construction date can be placed in the range 425–395 cal BCE at 95% probability. The duration of use is less certain because of the limited dating evidence, but the chronological model suggests this was probably less than a century. On the

basis of comparison with the number of refurbishments of the better-dated ST3, which dendro and C14 evidence suggests was probably in use for less than half a century, it is possible that ST4 was in use for much less time than this.

### 4.3.3 Phase 1

#### 4.3.3.1 Sub-floor structure

The primary phase of ST4 was a relatively lightweight building; like ST3, no evidence for substantial structural posts was uncovered. It was built directly overlying the posts of the Episode 1 Palisade 1, presumably following

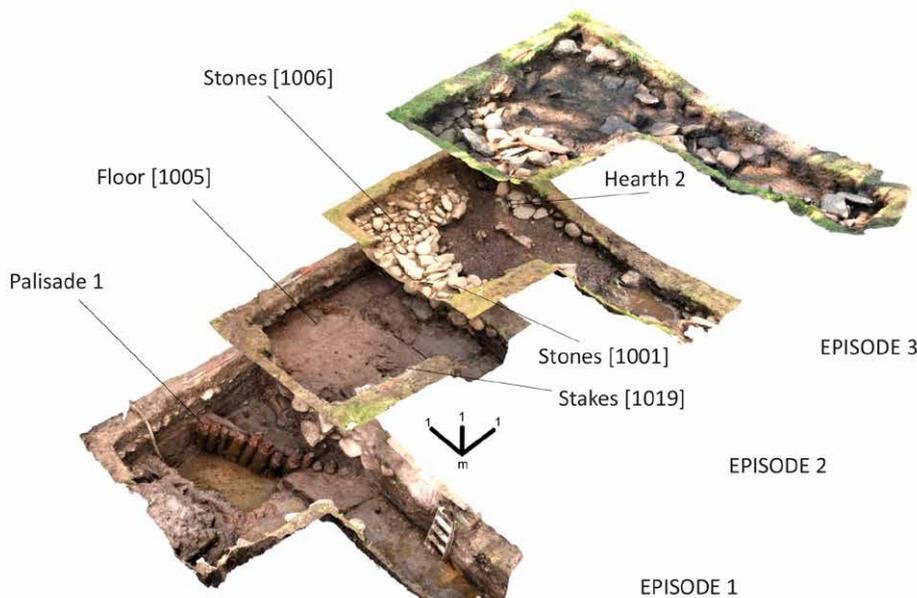


Figure 4.41. Axonometric model of TR10 showing Palisade 1 overlain by ST4.

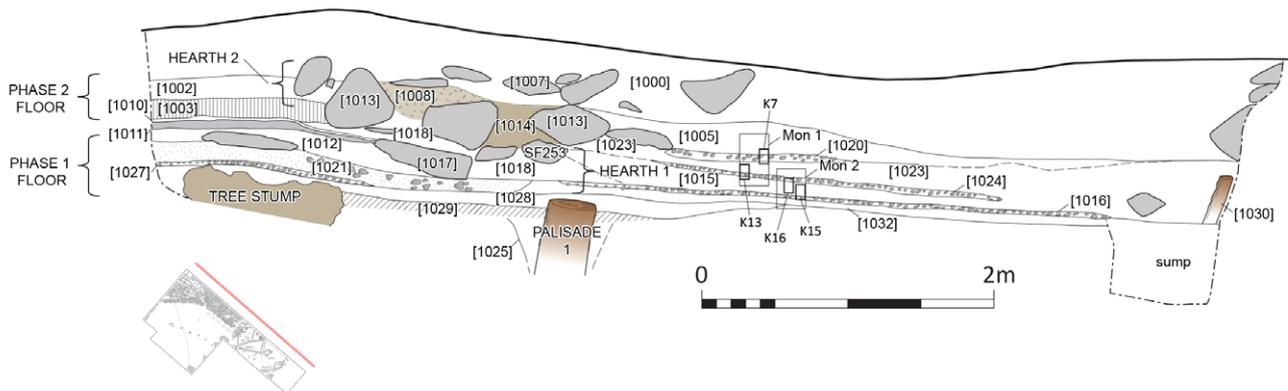


Figure 4.42. SW-facing section through flooring deposits of ST4.

their rotting or – more likely – deliberate destruction (Figure 4.44). A primary sub-floor layer of thin roundwood [1016] and [1027] was laid down, E and W of the hearth respectively; Figures 4.43–4.46). These roundwoods were between 0.01 m to 0.05 m in diameter and were predominantly alder with some hazel and willow. They were for the most part deposited as irregular brushwood spreads, though in a few areas they were laid straighter and may have been deposited in bundles. This sub-floor surface was the basis for the occupation levels of ST4, though several refurbishments of the flooring material were evident. The building had evidently slumped into an area of softer peat in the E half of the structure and, as a result, the deposits on the E side of the hearth were much better preserved, and generally thicker, than those to the W.

#### 4.3.3.2 Active floor surfaces

An occupation deposit, similar to those encountered in other structures on the site and comprising a compact peaty deposit containing fragments of charcoal and compressed sedges, bracken and reedy debris ([1021] and [1015], W and E of the hearth respectively) was laid down immediately above the sub-floor timbers. This deposit was highly compressed, laminar and contained silty lenses suggesting that it contained several refurbishment layers within. This floor layer was drier and less compact in the upper levels to the W of the hearth and for this reason was described as a separate context [1012], though it is more likely that this change indicates a refurbishment or separate dump of material within one continuous deposit. Strong trampling indicators were observed in MM analysis and an amorphous yellow material, likely phosphatic in nature, and chopped plant segments are indicative of plant material that has been semi-digested by a herbivore; they are thus probably indicative of the presence of herbivore coprolites.

Differing levels of preservation and varying plants species (MA) compositions observed within this flooring deposit (MM) are indicative that it represents a series of distinct trampled floor surfaces using locally and seasonally available plant matter to construct and replenish floors. Anthropoc indicators in all samples suggest a generally low level of background human activity and there is insufficient evidence in any of the sub-layers within [1015]/[1021] to suggest that these floors were actively used as occupation surfaces; this may suggest that upper floor surfaces had been removed during cleaning or refurbishment. However, given the observed evidence for trampling, probable herbivore coprolites and evidence for thousands of fly puparia recovered from wash-over samples, it would seem likely that [1015] comprises the remains of floor layers that have been trampled by stabled animals. Fly puparia were extremely abundant, indicating foul conditions (IN).

#### 4.3.3.3 Hearth 1

Despite the evidence for stabling, the building contained hearths. Hearth 1 was a circular structure built of slabs of greywacke [1017], only half of which was located within the trench, but which must have been *circa* 2 m across (Figure 4.42). Hearth 1 was surrounded by an ashy, charcoal-rich deposit [1018] containing burnt roundwood charcoal (primarily hazel (65%) with some alder (25%) and birch (20%)) and bone, probably representing waste from the primary hearth. Cereal remains (barley, emmer and bread wheat) and blackberry seeds were recovered from this deposit, suggesting it incorporated cooking/ food debris (MA), though abundant fly puparia indicated that the surface had become foul before it was refurbished (IN).

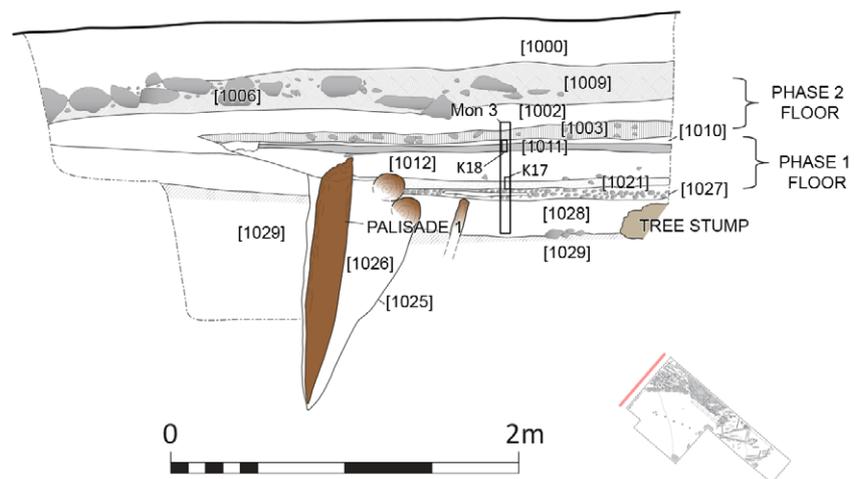


Figure 4.43. SE-facing section through flooring deposits of ST4, showing Palisade 1 beneath.



Figure 4.44. Section through ST4, showing Hearths 1 and 2, with associated floor deposits. The Episode 1 Palisade 1 is visible in the foreground, running beneath the structure.

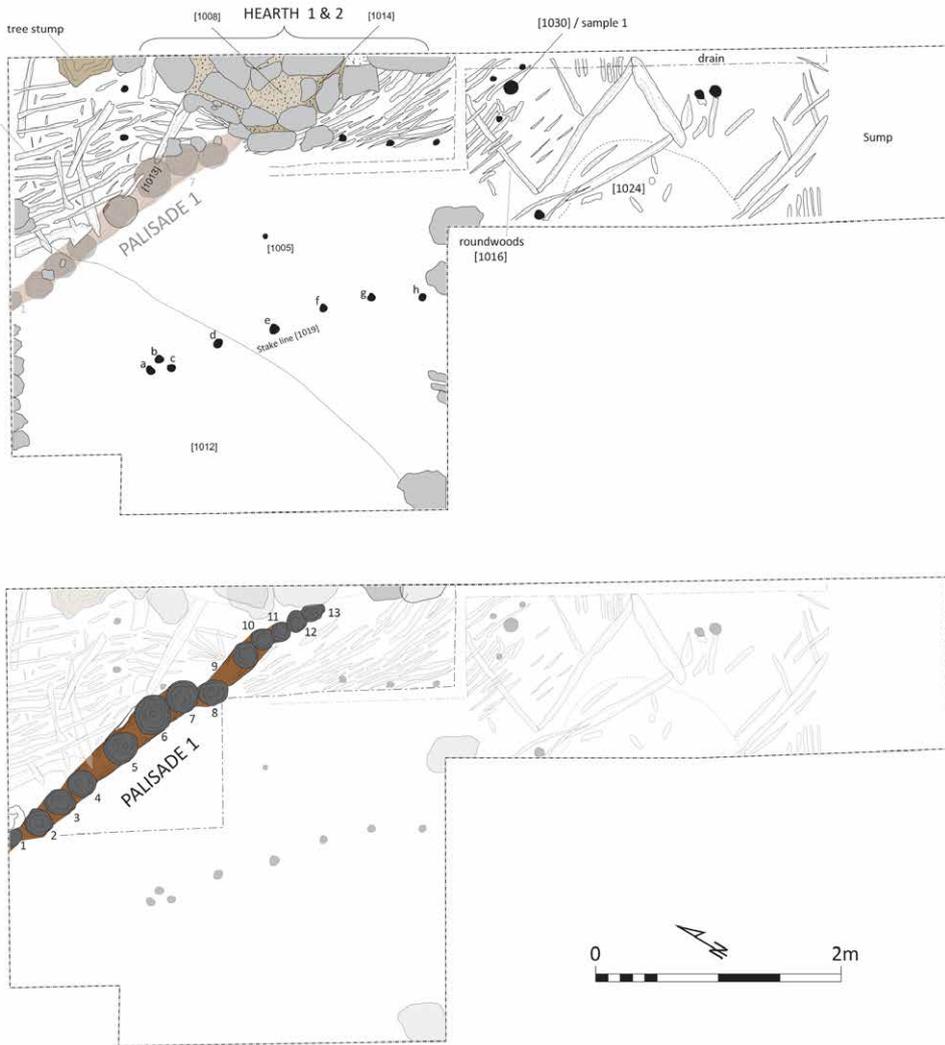


Figure 4.45. Plan of ST4 showing Hearth 1 overlying Palisade 1, and the associated flooring wickerwork.



Figure 4.46. Wicker sub floor [1016] in ST4. The Episode 1 Palisade 1 is visible to the top of the images.



Figure 4.47. Hearth 2.

#### 4.3.4 Phase 2

##### 4.3.4.1 Active floor surfaces

Floor level [1012]/[1021]/[1015] was refurbished with a new layer of roundwood subflooring surviving organically to the east of the hearth [1024] but only as a layer of roundwood charcoal and carbonised reed material to the west of the hearth [1011]. A fine organic clay-like deposit [1010] had formed on top of this carbonised roundwood layer to the W of the hearth, though to the E the flooring comprised a thick, compact laminar reedy floor, and there was no evidence for burning. MM showed [1010] to be comprised predominantly of coarse organic matter which included a mix of compacted elongate reddish-brown leaves and stems, compressed roundwood and disaggregated plant tissues. As with the Phase 1 floors, the presence of chopped fragments of plant tissues as well as the predominance of elongate plant tissues (MM) suggests that these deposits comprised trampled stabling or bedding deposits. To the E

of the hearth, this deposit was better preserved, visible as a compact laminar organic deposit [1023] similar to earlier floors. The flooring material was dominated by wood along with smaller inclusions of roundwood, birch buds, hazel buds, buds, leaf, bark, bracken, glaucous sedge, sedge and sedge/ rush plant stems (MA).

##### 4.3.4.2 Hearth 2

It is likely that this refurbished floor [1023]/[1010] was associated with the second phase of the hearth which was defined by large granitic and greywacke boulders (Figures 4.41, 4.42, 4.45 & 4.47).

Hearth 2 contained two deposits: [1014], a grey/ black ashy deposit containing charcoal (primarily hazel (75%), birch (15%) and alder (10%)) and burnt bone, and [1008], an orange plastic clay packed around the hearth stones, particularly near its centre. This deposit contained similar debris to [1018], including cereal remains and burnt bone, again suggesting food preparation took place on or around

the hearth (MA). The burnt bone included sheep/ goat and fish, though not identifiable to species.

#### 4.3.5 Phase 3

A third refurbishment of the flooring in ST4 was evidenced by a third layer of roundwoods [1020] located to the E of the hearth, overlain by a thick deposit containing large quantities of heat-shattered stones [1005]. A third refurbishment of the hearth may also have occurred, though the stones of this possible third hearth [1007] were displaced and surrounded by topsoil. The uppermost floor layer [1003] was poorly preserved and may have been burnt, surviving only as a dark grey-black silt containing large quantities of roundwood charcoal, as well as burnt bone including pig molars. The roundwood was predominantly hazel (88%) with a little birch, the composition of which suggests that hurdle panels may have been used for flooring. Several cobble tools were recovered during the excavation of [1003].

##### 4.3.5.1 Superstructure

It was not possible to determine the nature of the superstructure of ST4; no large posts were found, and the full extents of the floors were not established in the limited area excavated. A line of stakes running E–W across the trench [1019] (Figure 4.45) may relate to an internal partition within the building; they partially protruded through the sub-floor deposits [1016] but the short length uncovered makes it difficult to suggest an internal layout. It is possible that the line of somewhat heavier stakes encountered at the E end of Trench 10 [1030] indicate the outer wall of ST4, since these seemed to contain the floor deposits to the W, but again the small area exposed meant that little could be deduced of the form or layout of the building. Although the hearth design and sub-floor/ floor sequences are very reminiscent of those found in ST1, ST2 and ST3, suggesting ST4 was another roundhouse, no evidence was found for internal posts that might be interpreted as a post-ring supporting the roof. Timber species were dominated by alder, although hazel, willow and ash were all used in flooring and structural timbers.

#### 4.3.6 Interaction with the trackway

The limited extent of the excavations in ST4 precludes a reliable reconstruction of the building's layout. Trench 19 was excavated in an attempt to identify the entrance to the structure and was placed at the projected intersection between the building's outer wall and the log trackway running through the centre of the settlement. Trench 19 clipped the outer wall of ST4, with the vertical stakes [19008] corresponding to the outer walling stakes [1030]. However, no evidence for an entrance into ST4 was uncovered in Trench 19, either because the excavated area was too small to identify this, or because ST4 differed

in layout to ST3, and the entrance was not located at the closest point to the trackway.

The upper levels of Trench 19 contained several short lengths of parallel timbers, apparently forming a surface or rough track [19004]; these included several very decayed fast-grown oak planks and an alder log which were overlain by patches of hearth debris [19002]. This surface overlay the outer wall of ST4 and therefore likely post-dates the abandonment of the building and was on a different alignment to the central Episode 1 trackway. It is likely that this debris relates to a late use of the settlement, perhaps in Episode 3. An unusual, notched willow timber (SF310) was lying face-down in this surface, its purpose unclear (see Chapter 15.4.6).

#### 4.3.7 Summary

Although only a small proportion of ST4 was excavated, and little can be said of the superstructure or even the layout of the building, some valuable evidence that contributes to the overall understanding of the settlement was recovered. Firstly, despite sharing similarities in the flooring construction and furnishing with ST1 and ST2, the building was apparently much more lightweight and appeared to lack any substantial vertical posts. In this regard it shares many similarities with ST3, which was similarly lightweight. Whilst the central hearths of both buildings were stone-built and multiphase, none of the excavated fireplaces were on the scale of the massive settings in ST1 and ST2, with their cobble foundations and monolithic hearthstones. In most respects, ST3 and ST4 seem more modest in scale and complexity than the Episode 1 structures.

As described above, ST4 produced good evidence for the presence of animals, at least in the form of their dung and highly compressed, trampled flooring. Whilst animal dung may have been used for fuel on the hearth, the abundant availability of both peat and timber, both of which were certainly used as fuel, might hint that this was not the reason for the presence of animal dung in the building, and stabling of livestock seems probable. Taken together, however, the evidence from the plant macrofossil remains, insects and soil micromorphology present a variable picture: the repeated removal of foul flooring and refurbishment with new materials seems to have resulted in the variable preservation of indicators that might have presented one clear signal of the types of activity occurring within the building. It is possible that the apparent change in character from animal stabling to a more domestic signal between the primary and secondary uses of ST4 represents a wholesale change in the building's function, but it is equally plausible that the interior space could simply have been rearranged during a refurbishment or rebuilding, with an area previously demarcated for penning animals now used for more domestic tasks. Again, too little of the structure

was investigated to be certain of either interpretation. It is, however, tempting to postulate that ST4 was a multi-purpose building, with animals penned but with cooking and perhaps craft activities also taking place inside, and that the interior layout simply varied through the history of the structure's use.

#### 4.3.8 ST4 ecofact summaries

Table 4.3 summarises the type of ecofact analysis undertaken for each of the contexts described below.

##### 4.3.8.1 [1005]

###### Micromorphology

Deposit [1005] is a dense heterogeneous deposit containing frequent randomly oriented and distributed charred residues (charcoal, bone, charred plant material) intermixed with unburnt reddish brown plant tissue remains, disarticulated fragments, single cells and phytoliths. The porosity is variable but frequently less than 10%. The unit has a complex microstructure ranging from locally massive to very weakly developed sub angular blocky with occasional channels and chambers. Deposit [1005] does not appear to be directly associated with burning or hearth material. The features observed within these units are indicative of general accumulation of occupation debris with organic matter as a frequent component and thus are characteristic of a Type A living floor. It is a compacted deposit and trampling was likely one of the main processes responsible for the formation of the deposit. The random orientation and distribution of both organic and coarse material in Unit 8 of sample ST4/K11 may in part be a result of the partial post-depositional pedoturbation to which this part of the context has been subject. Observed pedofeatures and the general relatively poor level of preservation of organic matter are indicative that this context was generally not saturated at the point of deposition allowing for its partial decomposition.

###### Macroplant

There were eight carbonised emmer/ spelt caryopses, of which one had germinated. This represents food debris trampled into this occupation surface.

##### 4.3.8.2 [1008]

###### Macroplant

Deposit [1008] was a plastic clay that was packed around the hearth stones and the only finds were 10 charred cereal remains and some plant stems. These comprised one six-row hulled barley, one two-row hulled barley, six emmer and two wheat caryopses. The cereal likely represents burnt food refuse reworked into the hearth lining, whilst the plant stems could have been used as fuel or are the

CONTEXT	MM	LP	MA	BO	INS
1003				x	
1005	*		*	x	
1008			*	x	
1012	*		*	x	
1014			*	x	
1015	*		*		
1016	*		*		*
1018			*	x	*
1020	*		*	x	
1021	*		*	x	*
1023	*		*	*	*
1024	*		*	x	*
1027	*		*		
1032	*				
19005					
19006					

Table 4.3. Summary of ecofact analyses for ST4 contexts. X = present but too small for entry (see summary in Chapter 12.1).

remnants of old floor layers that bordered the hearth and were accidentally charred.

##### 4.3.8.3 [1012]

###### Micromorphology

Deposit [1012] was predominantly organic in nature with coarse mineral material accounting for only 5% of each unit. Coarse organic matter accounted for 55–65% of the context and was comprised of a mix of elongate yellowish brown plant leaf and stem fragments, roundwood, disaggregated individual cells and cell clusters, all of which have a weak horizontal alignment. Anthropogenic indicators are more common in sample K17 where 2–3% charcoal, 5% angular black fragments and 2–3% phytoliths were observed. These anthropogenic indicators are all present in sample K18 but in lower quantities, <2% in each case. Amorphous fine yellow organic material is common in both units. Observed pedofeatures are limited to indicators of biological reworking and plant decay such as fungal mites, faecal pellets and disappeared plant interiors.

The laminated structure of this deposit and its composition of elongate plant materials is consistent with other deposits sampled within ST4. The presence of porous, loosely packed plant fragments embedded within a dark brown amorphous groundmass is consistent with the presence of herbivore excrement. Evidence for reworking in the form of faecal pellets and rounded ellipsoid mites and patches of granular crumb structure

increasing upwards is indicative of reworking of this context and its partial exposure to aerobic conditions. Plant matter with part 'disappeared' interiors associated with fungal mites provides further evidence of the breakdown and decomposition of soil organic matter by soil fauna. Anthropogenic indicators suggest a general human influence in the vicinity and trampling of debris from nearby hearths. Although partially reworked this context has retained a laminated compacted structure similar to other Type B floor surfaces within the structure. The deposit has been left partially exposed above the water table allowing for its reworking.

#### **Macroplant**

This deposit was interpreted as a refurbished floor, being one of the mixed flooring deposits within ST4 alongside [1015] and [1021]. The deposit contained 367 charred macroplants of which 356 were recorded as cereal remains along with 11 fragments of hazelnut shell. The cereal was emmer (57%), six-row hulled barley (12%), wheat (10%), two-row hulled barley (3%), barley (2%), bread/ club wheat (2%), and cereal (14%). A small number of the emmer caryopses had a noticeable drop shape which made separating these from the bread/ club wheat more difficult. Both emmer and two-row barley spikelets were noted.

The presence of spikelets and chaff fragments indicates that some of the cereals had not been fully threshed and winnowed prior to charring. It is likely some of these crops were awaiting processing and were charred accidentally during the drying process. There is no evidence of disease or insect infestation which would have rendered them inedible and required their destruction. Instead, it is more likely these remains were burnt accidentally when they were being dried and were subsequently trampled into the floor as overspill from the hearth.

#### **4.3.8.4 [1014]**

#### **Macroplant**

Context [1014] was an ashy deposit containing domestic debris. The plant assemblage was small and was composed of both waterlogged and carbonised finds of building materials, food and weeds. The waterlogged flooring had been constructed using roundwood, wood, bark and leaves. There was also some raspberry seeds, moss and weeds. The carbonised finds were two charred six-row hulled barley, one wheat caryopsis and two hazelnut shell fragments. These finds represent part of a decomposed floor and food debris from the hearth.

#### **4.3.8.5 [1015]**

#### **Micromorphology**

Context [1015] was a variable context comprising layers of plant materials with varying concentrations of plant species. Within ST4/K6 the dominant plants were roundwoods and mostly seen in transverse cross section indicative of deliberate laying of roundwood material to form a sub-floor deposit. The roundwood is heavily distorted and compressed which is indicative of trampling. Anthropogenic indicators within ST4/K6 were rare and as such it is unlikely that this was ever an exposed occupation floor surface. The incorporation of aggregates of crumb-like sediment between roundwood fragments and oriented in relation to the roundwood within Unit 1 of ST4/K6 may be indicative of trampling of topsoil sediment from outside of the structure. Context [1015] as represented in ST4/K6 can thus be interpreted as a sub-floor layer subject to heavy trampling and incorporation of reworked topsoil material. Unit 3 of ST4/K8 also exhibits strong trampling indicators as well as a laminated lenticular microstructure consistent with a trampled floor surface. Unit 2 of ST4/K9 showed evidence for greater decomposition of plant matter and also included large quantities of chopped and fragmented plant remains embedded within fine yellow amorphous organic matter making this a Type H deposit.

Differing levels of preservation and varying plant species compositions observed within this context are indicative that it represents a series of distinct trampled floor surfaces using locally and seasonally available plant matter to construct and replenish floors. Anthropogenic indicators in all samples suggest a general low level of background human activity and there is insufficient evidence in any unit to suggest that these floors were actively used as occupation surfaces and may suggest that upper floor surfaces had been removed. However, given the observed evidence for trampling, likely herbivore coprolites and evidence for thousands of fly puparia recovered from wash-over samples (Chapter 13) it would seem likely that [1015] comprises the remains of floor layers that have been trampled by stabled animals.

#### **Macroplant**

The macroplant assemblage was composed entirely of waterlogged building materials and weeds. The floor had been constructed using wood, bracken along with some sedge, hard/ soft/ compact rush and bark. This sample was also analysed as part of Monolith 2 and it was observed that sedge, rush and bracken formed distinct laminated layers which had been sealed with a layer of wood, most of which was squashed. This floor formed distinct but highly compressed layers which peeled apart during processing but did not completely break down. This indicates that the flooring had experienced repeated and

rapid refurbishment, and that it was continually trampled. As soon as the underlying surface became affected, extra layers of plant material were evidently thrown down, creating a new surface; for this reason [1015] is referred to as an occupation deposit rather than a 'floor', since the deposit comprises multiple refurbished surfaces. The weed inclusions and moss were small in both quantity and variety and were likely accidental inclusions within the plants selected for use in floor refurbishments.

The absence of any food remains could either be because these floor layers were rapidly constructed, which limited the opportunity for debris to become included, or that domestic activities did not occur within this part of the structure. This is not to suggest, however, that these floor layers were kept clean, as thousands of fly puparia were present within this area. Given how many insect cases were present it is obvious that this floor would have been foul and the repeated refurbishment of new plant litter may have been an attempt to keep the insect population and smell under some control.

#### 4.3.8.6 [1016]

##### Micromorphology

Evidence observed from [1016] in thin section ST4/K8 is indicative of deliberate laying of roundwood material to form a foundation floor deposit. The roundwood is heavily distorted and compressed which is indicative of trampling. Anthropogenic indicators were rare and as such it is unlikely that this was ever an exposed occupation floor surface, thus consistent with the interpretation of this deposit as a sub-floor. This deposit has been observed to be variable in terms of organic matter composition and in its upper layer in sample K16 is dominated by fragmented plant issue remains interspersed with rugose porous crumb aggregates. The upper layers of [1016] are thus consistent with the laminated Type H organic deposits observed in ST4 and are indicative of trampling and probable stabling of herbivores. There is no evidence for burning in either of these floor layers, with anthropogenic indicators limited to small quantities of charcoal and charred fragments. The very dark brown to, in places, black appearance of the unit is a consequence of the humification of the organic matter.

##### Macroplant M2

This plant assemblage from this layer was waterlogged and was dominated by flooring material followed by smaller quantities of food and weeds. Deposit [1016] is interpreted as a sub-floor surface, constructed using layers of roundwood within a peaty matrix containing wood fragments, white sedge, hard/ soft/ compact rush and bracken. Food remains were emmer and wheat glumes along with hazelnut shell fragments which were trampled into the floor surface. The other finds were

weed species, *Sphagnum* sp. and moss which are likely accidental inclusions of the materials deliberately collected to refurbish the floors.

##### Insects

A moderately sized assemblage of very poorly preserved beetles and bugs was recorded (73 individuals of 34 taxa; concentration 24 l<sup>-1</sup>;  $\alpha = 25$ , SE = 5; RT 37%;  $\alpha$ RT = 14, SE = 5). The range of identified taxa was consistent with a floor deposit. Fly puparia, predominantly Muscidae, were extremely abundant indicating foul conditions.

#### 4.3.8.7 [1018]

##### Macroplant

Both the waterlogged and charred plant assemblage were dominated by building material with smaller numbers of food and weeds. The deposit contained charred flooring materials, similar in character to other floor deposits in the building in that wood and bracken remained the more significant find but there were also noticeable inclusions of suspected sedge and rush stems. Given the presence of burnt floor material it is probable either that old surfaces were burnt as fuel within the hearths or that a small burning event had destroyed part of the surrounding floor.

The food remains were identified as waterlogged emmer glumes, blackberry seeds and carbonised cereal caryopses and chaff fragments. These were identified as emmer (50%), six-row hulled barley (21.5%), bread/ club wheat (7%) and three cereal caryopses (21.5%). The other finds were waterlogged weeds, *Sphagnum* sp. and moss which were probably invasive. There was also a large quantity of burnt peat which probably represents fuel debris trampled into this surface.

##### Insects

Preservation of beetle remains was moderate to poor. The assemblage was consistent with a floor deposit, containing a very similar range of taxa to those seen in other samples from within buildings (67 individuals of 39 taxa; concentration 22 individuals l<sup>-1</sup>;  $\alpha = 39$ , SE = 9). Fly puparia, predominantly Muscidae, were very abundant suggesting foulness. None of the remains were burnt.

#### 4.3.8.8 [1020]

##### Micromorphology

Context [1020] comprises a compressed laminated deposit. Anthropogenic indicators are relatively rare and lower than would be expected for an occupied floor surface. However, the presence of some anthropogenic fuel residues is indicative of anthropogenic alteration of the deposit and their periodic accumulation. The platy microstructure is consistent with those observed in floor layers (Courty et al 1989;

Milek 2012). Void spaces identified within plant species are indicative of partial desiccation followed by saturation (ie wetting and drying) indicating perhaps that this surface was left exposed following deposition. The OM is very dark brown in colour, indicative of compaction due to loss of porosity and fragmentation of detritus (dopplerite) and is also suggestive of exposure to oxygen and drying out. Analysis of wash-over samples from this deposit revealed numerous food species indicators as well as weed seed species (internal ref) which would be consistent with a deposit that has been subject to trampling of material into the structure from outside by both animals and humans.

#### Macroplant M1

The largest component of the waterlogged assemblage was bracken and wood fragments, used alongside minor inclusions of sedge and rush to construct the floor. During analysis of this context, it was apparent that the lower layers were better preserved and more organic than the upper section contained within the monolith tin. The food remains present were hazelnut shell and raspberry seeds, evidently trampled into this surface. The weed species are invasive and were likely growing in this area prior to the creation of the floor or were introduced as a by-product of the building material. There was one charred emmer glume.

#### 4.3.8.9 [1021]

##### Micromorphology

Deposit [1021] is a sub-floor constructed of roundwoods. Coarse mineral material consists of fine sand-sized quartz minerals and comprises 20% of the deposit. The organic component accounts for 40% of the unit and is dominated by horizontal bands of leaves and plant stems, some of which are fragmented into short lengths. The plant tissue fragments were relatively decomposed largely preventing species identification although where parenchymatic tissue did survive it was indicative of bracken species. Observed anthropic indicators were limited to 5% cellular charcoal and 5% angular internally amorphous charred fragments which are likely to have been trampled into the floor from the nearby hearth. The deposit also exhibits strong trampling indicators as well as a laminated lenticular microstructure consistent with a trampled Type B floor surface.

##### Macroplant

The plant assemblage was preserved entirely through waterlogging and included building materials along with smaller quantities of food, weeds and moss. The floor was built using layers of bracken, round wood and wood fragments alongside smaller inclusions of sedge, rush, wood club-rush, buds and bark. Small fragments of heather were recorded which could be evidence of

decomposed turfs. The food remains were emmer and hazelnut shell fragments trampled into this surface. The weed seeds are invasive and accidental inclusions within the flooring material.

##### Insects

The insect assemblage was consistent with the interpretation of the deposit as flooring. A minimum of 198 beetles and bugs of 66 taxa were recovered (concentration  $66 \text{ l}^{-1}$ ;  $\alpha = 35$ ;  $\text{SE} = 4$ ). Just over half the assemblage were decomposers, their low diversity suggesting breeding within the deposit (RT 51%;  $\alpha\text{RT} = 9$ ,  $\text{SE} = 1$ ). There was micromorphological evidence for both dung and trampling from this deposit (Roy, micromorphology report). A house fauna consisting of *Latridius minutus* group, *Cryptophagus* spp., and *Atomaria* accounted for 6% of the assemblage. Other decomposers were predominantly generalists associated with a wide range of organic matter in various states of decay which in some cases is likely to have included dung. *Bovicola bovis*, a biting louse that lives on cattle, was recorded, and some scarabaeid dung beetles (2% of terrestrial taxa) and *Cryptopleurum minutum* would probably have been attracted to fresh dung and similarly foul organic floor litter.

A limited range of outdoor taxa included single individuals of four water beetles (*Hydraena*, *Ochthebius* cf *minimus*, *Ochthebius bicolon*, *Oulimnius*). *Oulimnius* species are found in clean, clear running water or at the stony margins of lakes, and *O. bicolon* in damp mud by running water (Holland 1972; Duff 2012: 326). It is possible that these were brought into the building with water for animals. *Conomelus anceps*, found on rushes, and perhaps other delphacid planthoppers and *Contacyphon*, would probably have been imported with vegetation used as flooring material, with diaspidid scale insects almost certainly arriving on twigs or brushwood. Apart from *Perapion curtirostre* found on docks (*Rumex*), the few remaining plant-associated taxa could not be identified closely.

#### 4.3.8.10 [1023]

##### Micromorphology

Deposit [1023] is predominantly organic with a predominance of reddish brown disaggregated and compressed plant tissue remains. Preservation across the context is variable but generally moderate with occasional preservation of internal organ residues. The compaction of the context is evidenced by the compressed nature of the elongate plant material which is frequently convoluted and wavy in appearance and has a preferred horizontal orientation. Anthropic indicators comprise 10% cellular charcoal, 5% angular internally amorphous charred fragments, 2–3% burnt bone, 2–3% charred peat and <1% charred seeds. The proportion of coarse mineral material varies between 20–25% of the context and is largely

randomly oriented and distributed. The mineral content of this context was substantially higher than in other units from ST4. Evidence of post-depositional mixing by soil biota was observed within Unit 1 of Sample ST4/K1.

The heterogeneous nature of this deposit and evidence for anthropogenic input in the form of charcoal and charred food and fuel remains is indicative that this context is part of a general Type A occupation horizon. Preservation of weak banding of material and polyconcave voids within the centre of the deposit hint at gradual build-up of layers of plant material similar to the layers of occupation and plant material observed elsewhere within ST4. The high occurrence of anthropic indicators in this deposit in comparison with the underlying Type H deposits indicates a change in the use of space within the structure. The incorporation of domestic fuel and food waste and its more mineral nature suggests that it may represent a change from stabling of animals to one for domestic occupation and food preparation.

### Macroplant

The largest component of this assemblage was building material preserved through both waterlogging and burning. The major waterlogged floor component used was wood, alongside much smaller quantities of glaucous sedge, rush, bracken, birch buds, hazel buds, leaves and bark. The composition of the carbonised floor material was similar, in that wood continued as the dominant find but larger quantities of bracken and plant stems were noted. The weed species and moss were probably accidental inclusions of this flooring material.

The waterlogged food remains were varied and cereal, nuts and fruits were present. The species were two-row hulled barley, hazelnut shell and raspberry. Two fragments of puffball were noted and, given the repeated occurrence of this species in other deposits at BLoM, it is probable that it was deliberately collected.

The carbonised food remains totalled 11 cereal remains and one fragment of hazelnut shell. The species were emmer (64%), six-row hulled barley (9%), two-row hulled barley (9%), barley (9%), and wheat (9%). The other charred finds were one fat hen seed and peat. The domestic food refuse and peat were reworked and trampled into this floor during general cleaning of ST4.

### Bone

There were 41 fragments (12.1 g) of which 27 had been burnt. Two fragments were identified; one was part of a sheep/ goat pelvis and the other a fish bone.

### Insects

Micromorphological work suggests a change from stabling animals to domestic occupation and food preparation at this stage in the life of the building (Roy, micromorphology

report). The insect assemblage was very similar to those recorded from the earlier floor [1024], however, perhaps because insect samples do not permit such close resolution. A minimum of 196 beetles and bugs of 57 taxa were recorded (concentration 65 l<sup>-1</sup>;  $\alpha = 27$ , SE = 3) and almost three-quarters of the assemblage consisted of decomposers, their low diversity suggesting a breeding community (RT 74%;  $\alpha RT = 7$ , SE = 1). *Carpelimus bilineatus* group was particularly numerous suggesting damp conditions. Although there were relatively few obligate foul decomposers, several other species are typical of open-textured nutrient-rich organic matter such as stable litter and dung heaps (*Oxytelus sculptus*, *Acritus nigricornis*, *Leptacinus batychnus*, *Leptacinus pusillus*). Single individuals of *Latridius minutus* group and *Atomaria* provided the only suggestions of drier mouldering habitats favoured by the house fauna.

Outdoor insects (14% of the fauna) included a single *Oulimnius* found in clear running water or stony lake shores that might perhaps have been imported with water provided for animals. *Conomelus anceps* and diaspidid scale insects likely arrived in the building with rushes and small roundwood respectively. The chafer *Phyllopertha horticola* was also recorded; its larvae feed at turf roots and in archaeological contexts it is sometimes suspected of having been imported onto sites with turves or in cut vegetation such as hay (Kenward 2009: 292) but the species was recorded from many samples from the site and may simply have formed part of the background fauna. Other plant feeding taxa were *Brachypterus* found on nettles (*Urtica*) and *Meligethes* which is generally associated with various wild and cultivated Brassicaceae, both perhaps growing outside the structure.

### 4.3.8.11 [1024]

#### Micromorphology

Deposit [1024] was found to be a highly organic Type B or Type H deposit composed almost entirely of compressed laminated plant matter. Reddish brown leaf tissue fragments dominate the organic components and are moderately well preserved with outer lignin, vascular tissues and internal parenchymatic cells structures frequently visible. The context has a lenticular microstructure with patches of rugose crumb structure interleaved between plant matter. The coarse mineral element of this deposit accounts for less than 10% and is comprised of medium to fine sand-sized quartz with a banded distribution. Evidence for build-up of sesquioxides is indicated by iron/ manganese staining of voids and mineral grains. Anthropic indicators are rare and include rare phytoliths and angular internally amorphous charred remains distributed randomly throughout the matrix.

The layers observed within this context thus appear to represent sequential episodes of deposition of plant

material probably as a means of raising the floor level or recovering floor surfaces within the structure which in general led to an anthropogenically driven high sedimentation rate. Anthropogenic indicators are rare and thus the deposit is largely consistent with a Type H stabling deposit. The embedded patches of rugose crumb soil clasts and loam material are consistent with a trampled floor deposit. Patches of chopped disaggregated plant materials similar to those observed in [1015] are indicative of herbivore coprolites. Thin section evidence thus suggests that [1024] represents the remains of compacted layers of animal bedding and stabling waste.

### Macroplant M2

The largest find within the waterlogged assemblage was flooring material. This floor was primarily constructed from layers of roundwood and wood fragments, some of which had become squashed through either trampling or from the weight of the overlying surfaces pressing down on this wood surface from above. Bracken, sedge, hard/ soft/ compact rush, bark and leaf were all minor components within the floor. The only other finds were weeds and moss which were intrusive.

### Insects

Micromorphological evidence from this deposit indicates sequential episodes of deposition of plant material and evidence of herbivore dung and trampling (Roy, micromorphology report). The insect assemblage consisting of 130 individuals of 34 taxa was consistent with a floor deposit, its low diversity suggesting dominance by breeding taxa (concentration 43 individuals l<sup>-1</sup>;  $\alpha = 15$ , SE = 2). Decomposers were also of low diversity (RT 53%;  $\alpha RT = 6$ , SE = 1) and dominated by generalists that favour somewhat damp conditions, notably *Carpelimus* species and *Neobisnius ?villosulus*. The size of the decomposer component is almost certainly an underestimate since the most abundant beetle was a small *Carpelimus* that was not identified closely and is therefore uncoded. A small house fauna typical of relatively dry conditions was recorded (2%) and there were relatively few obligate foul matter species, *Cercyon haemorrhoidalis* and *Nimbus contaminatus* (a scarabaeid dung beetle) together making up only 2% of the assemblage. *Oxytelus sculptus* was relatively common, however (6% of the assemblage), suggesting nutrient-rich open-textured litter which is consistent with the interpretation of the deposit as stable litter. A tick nymph (*Ixodes ricinus*) could relate either to the keeping of animals in the building or the importation of cut vegetation. A limited range of outdoor taxa included *Conomelus anceps*, *Livia junci* and diaspidid scale insects that likely arrived in the building with rushes and small roundwood respectively, whilst *Lema/Oulema*, usually associated with grasses or cereals, might perhaps have arrived with bedding material or fodder.

### 4.3.8.12 [1027]

#### Micromorphology

Deposit [1027] can be broadly characterised as a predominantly organic homogenous deposit with some weak banding of plant tissues. The relative absence of anthropic indicators suggest that this was not part of an occupied floor surface and likely lay outwith the main occupation area of the structure. Fragmentation of plant tissue fragments and high frequency of amorphous yellow phosphatic material are characteristic of Type H stabling deposits although the distinctive strong banding is markedly absent. It is concluded that this deposit may represent heavily decomposed stabling material which has been reworked and subsequently compacted creating a massive microstructure.

#### Macroplant

The waterlogged assemblage was formed mostly of flooring materials with smaller numbers of wild fruits and weed species recorded. This floor layer was constructed using layers of glaucous sedge, hard/ soft/ compact rush and wood with bracken, leaves and buds having a much more minor role. The fruit remains were blackthorn, raspberry and blackberry and these could have derived from food residue or inclusions within faecal matter trampled into this layer. The weed species, *Sphagnum* sp. and moss are intrusive or contaminants.

### 4.3.8.13 [1032]

#### Micromorphology

Deposit [1032] is a dense heterogeneous deposit containing frequent randomly oriented and distributed charred residues (charcoal (5%), charred peat (2–3%)) intermixed with disarticulated plant tissue fragments, single cells and phytoliths. The coarse mineral content is quite high in comparison to other deposits from ST4 and comprises 25% of the overall deposit. The porosity is less than 10%. The unit has a complex microstructure ranging from locally massive to very weakly developed sub angular blocky with occasional channels and chambers. Observed pedofeatures include 1–2% partial dusty clay coatings to voids.

Deposit [1032] is typical of a Type A deposit which has formed under wet conditions. Key indicators of trample include massive microstructures, polyconcave voids, low porosity <10% and fragmented and micro charcoal (Ismail-Meyer et al 2013: 333). The formation of dusty impure clay and silt coatings can also be indicative of dumping under wet conditions and the rotational movement of sediment caused by trampling (Courty et al 1989).

## 4.4 Structure 6 (ST6)

### 4.4.1 Introduction

ST6 is the label given to a building (or buildings) that must have stood in the southern area of the settlement, outside the primary Episode 1 palisade but within the Episode 2 Palisade 2, and prior to the construction of the Episode 3.2 defences. That ST6 stood within the Episode 2 enclosure is demonstrated by the stratigraphic position of the burnt remains of the building's primary floor [645], which overlay the turf-built bank associated with the Episode 2 Palisade 2.

ST6 was a new construction, in that over most of its footprint it was built directly onto the natural peat and represents part of the expansion of the settlement that took place in Episode 2. The most notable aspect of the structure was that it contained a sequence of two clay ovens, one overlying the remains of the other; there is little doubt that both were used for food preparation. Too little of ST6 was excavated to be confident of its size or the manner of its construction, but the floors were very similar to those encountered in other buildings, and so it is reasonable to suggest that the structure was a roundhouse similar to ST3.

### 4.4.2 Chronological evidence

The chronological evidence for ST6 comes from radiocarbon dating, which was refined using Bayesian modelling based on the secure stratigraphic sequence for the dated elements. Construction of the building likely began in 420–375 cal BCE (95% probability) or 400–380 cal BCE (68% probability) and ceased within 70 years (95% probability), or perhaps within 30 years (68% probability). The oak posts [651/2], [651/4] and [636], as well as the ash post [651/4] and alder post [626] were analysed but could not be dated by dendrochronology.

### 4.4.3 Phase 1

The evidence for this phase consists of Oven 1 and a wickerwork floor surface. Oven 1 was built directly onto the natural peat and so is presumably a primary feature of ST6 (Figure 4.48).

The arrangement of the structural elements of Oven 1 was puzzling. The first component was the insertion of four long posts over 2 m deep into the natural peat (Figure 4.49).

These posts were set in a square arrangement, *circa* 0.5 m apart and using different species: [651/2] and [651/4] were oak, whilst [651/1] was willow and [651/3] was ash. Their diameter varied between 0.08 m and 0.155 m but their insertion depths were very similar, at around 2.2 m below the peat surface and there is little doubt that they were intended to work together as a setting or support for another structure. The posts were probably partly dug into the peat; a cut was not visible during excavation but

the recovery of a single woodchip from the space between the posts at a depth of around 0.3 m suggests that a pit may have been dug prior to the insertion of the posts and was backfilled using the upcast; this fill [659] was otherwise indistinguishable from the surrounding peat. The purpose of the posts is difficult to determine. It is possible that they were intended to prevent the base of the oven from sinking into the soft peat under the weight of the heavy stones and clay which would in turn, presumably, cause the clay dome to distort and fracture, destroying the oven. It is interesting that three different species were selected for the task, but this may be nothing more than coincidence and a result of using whatever was immediately to hand.

One of the oak piles [651/4] was buckled and broken around halfway down its length (Figure 4.50), suggesting that it had received considerable pressure from above, probably whilst the above-ground length was still in good condition, ie shortly after its insertion into the peat.

It is possible that this weight was applied by the heavy stones [648] which were closely-set, horizontally laid slabs forming the circular base of the oven. The tops of two of the piles [651/1] and [651/2] were charred and burnt, indicating that the stones [648] were heated to very high temperatures (Figure 4.51), supporting the interpretation that these formed the base and probably the cooking surface of the oven structure.

The central stone in [648] was a large, flat greywacke slab 1.3 m across and 0.2 m thick, placed directly onto the tops of three of the four posts (Figures 4.48 & 4.52).

Between this stone and the natural peat surface was a thin deposit of pink clay [652] containing ashy, charcoal-rich material, beneath which was a deposit of charred roundwoods [653] averaging 0.06 m in diameter (see Figure 4.51), resting on a charcoal-rich clayey deposit [658]. An explanation for these charred timbers beneath the base of the oven is not easy to identify, but one possibility might be that the large slab that rested on the posts [651] was elevated above the peat surface, allowing hot charred timbers and ash to be shovelled into this space, thereby heating the base of the oven from below. The charcoal-rich deposit [658] contained cereal caryopses and hazelnut shell fragments, supporting the interpretation that foodstuffs were processed in the oven (MA).

The superstructure of the oven was probably formed by a circular wicker dome, the remains of which were only preserved below the level of stones [648]. The wicker structure [656] survived to a height of about 0.15 m, in about three or four courses of withies. There were 17 sails in the area excavated, all hazel with a single ash exception; these were roundwood rods averaging 0.04 m in diameter and ranging in the depth of their insertion into the natural peat from around 0.05 m to over 0.80 m. The lower ends of some (though not all)

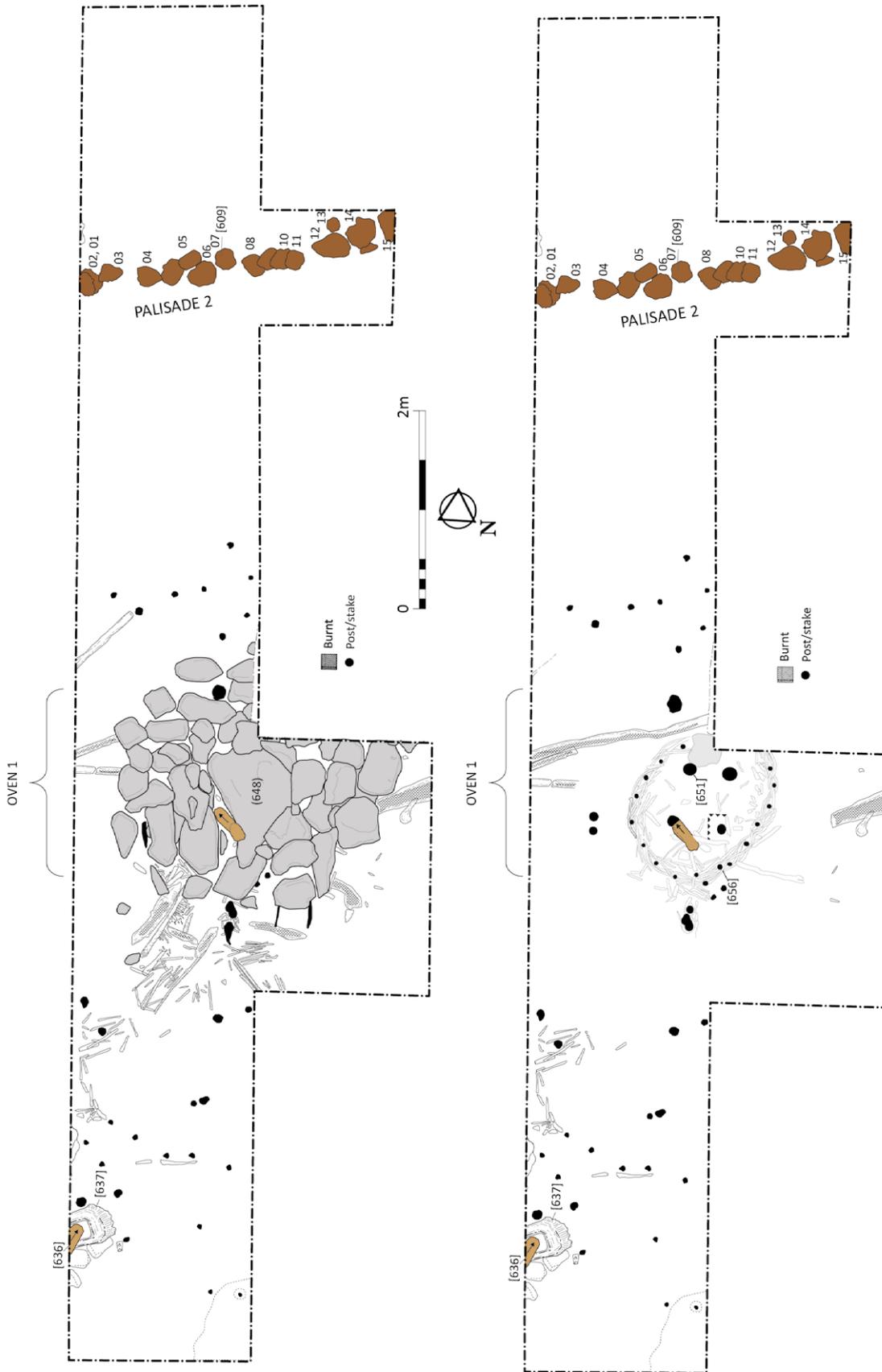


Figure 4.48. Plan of ST6 at level of Oven 1 basal stones (above) and the wicker substructure beneath (below).



Figure 4.49. The four sub-structural posts [651] of Oven 1, surrounded by the wicker framework [656].

were cut to points with one or two coarse axe blows. The withies were mostly around 0.01 m in diameter and woven in and out of the sails to create a basket-like structure. The uppermost withies were charred, suggesting that the upper parts of the basket were close to the heat of the cooking structure. It seems probable that the basket structure was protected from the heat of the oven interior by a thick layer of baked orange/ pink clay [641], which was found overlying the basal stones (Figure 4.53).

A dark, sooty soil deposit was encountered beneath the clay [647]; the deposit contained a large quantity of charred cereal caryopses and spikelets, as well as hazelnut shell fragments (MA).

The clayey deposits surrounding the wickerwork of Oven 1 were also rich in food remains (MA). These were dominated by 1,082 cereal fragments which included caryopses, spikelets and chaff fragments. The other food remains were 18 hazelnut shell fragments and one raspberry seed, whilst the burnt and unburnt bone contents included pig molars and other large mammal mandible fragments.

It is likely that Oven 1 fell into disuse and was deliberately flattened or slighted and covered by flooring material, probably during the refurbishment of the building or the construction of a successor to the original structure; again, too little of the building's superstructure was investigated to clarify this. However, it is clear that Oven 1 was built indoors, this interpretation supported by deposit [645], a layer of roundwood charcoal probably representing carbonised hurdle flooring material similar to that associated with Oven 2 (below), which was unburnt. It is possible that this earlier floor was burnt, either



Figure 4.50. Oak post [651/4], buckled and broken at around halfway up its length.



Figure 4.51. Charred timbers beneath the base of Oven 1.



Figure 4.52. The stone base of Oven 1.

purposefully or accidentally, prior to the construction of a successive structure, which contained Oven 2, and in any case must mark a break in the building's occupation in the interim between the construction of the two ovens. A mortised post-shoe [637] containing a vertical oak post [636] (Figure 4.54), located 4.1 m north of Oven 1 and resting on the natural peat surface, may relate to the superstructure of the building, but again, this could not be demonstrated conclusively.

#### 4.4.4 Phase 2

Following the abandonment of Oven 1 a second very similar structure, Oven 2, was built over its remains (Figure 4.55).

It is very likely that this second oven was also located within a building, which was floored with woven hurdle panels [634] laid flat over the remains of Oven 1 (Figure 4.56, 4.57 & 4.58).

The hurdles that made up the hurdle flooring [634] were panels or mats, two of which were identifiable in the excavated area (Table 14.2). These were laid flat and covered by soft flooring materials incorporating reeds and



Figure 4.53. Burnt clay [641] forming the superstructure of Oven 1.

twigs, and compacted laminar plant matter [635], very similar in character to the flooring deposits encountered in the other BLoM structures. The flooring was constructed using distinctive layers of sedges, rushes and bracken with very minor inclusions of wood fragments and buds (MA). This material had to be teased apart during processing and it was obvious that a decayed midden-type material had become intermixed within the bracken and plant stems. Concentrations of fly puparia were noted in [635] and the other insect fauna included foul decomposers, suggesting that regular trampling resulted in somewhat damp conditions under foot (IN). Within this flooring material, a mixed deposit containing a large proportion of heat-shattered stones and clay lumps was encountered; this deposit also contained a whetstone (SF143) and a saddle quern or grinding block (SF144), suggesting that food processing activities may have taken place in this area.

Oven 2 was first identified as a circular mound of pink-orange clay [638] (Figure 4.56). The clay was half-sectioned, showing that the mound was probably a collapsed dome, an interpretation confirmed by MM. Two grey-blue lenses were identified within [638], labelled A and B in Figure 4.55, which in thin section were visible as burning surfaces overlain by additional sterile clay, suggesting repair or re-lining of the oven (MM). The upper surface of [638] was baked hard, whilst the lower parts of the clay mound were similarly hard-baked and contained ashy debris [642]. Above this base an ashy, charcoal-rich grey clay layer [639] was sealed within [638] (Figure 4.59).

This deposit contained large quantities of hazelnut shell, burnt bone and burnt limpet shell amongst other indeterminate burnt organic remains. Beneath the baked clay [642], the clay mound rested on a circular setting



Figure 4.54. Oak post [363] and post-shoe [637], perhaps the threshold of ST6.

of flat greywacke slabs, averaging 0.3 to 0.4 m across and 0.05 m thick [643]. These slabs formed the base of the oven structure and were placed directly onto the Phase 1 flooring deposits.

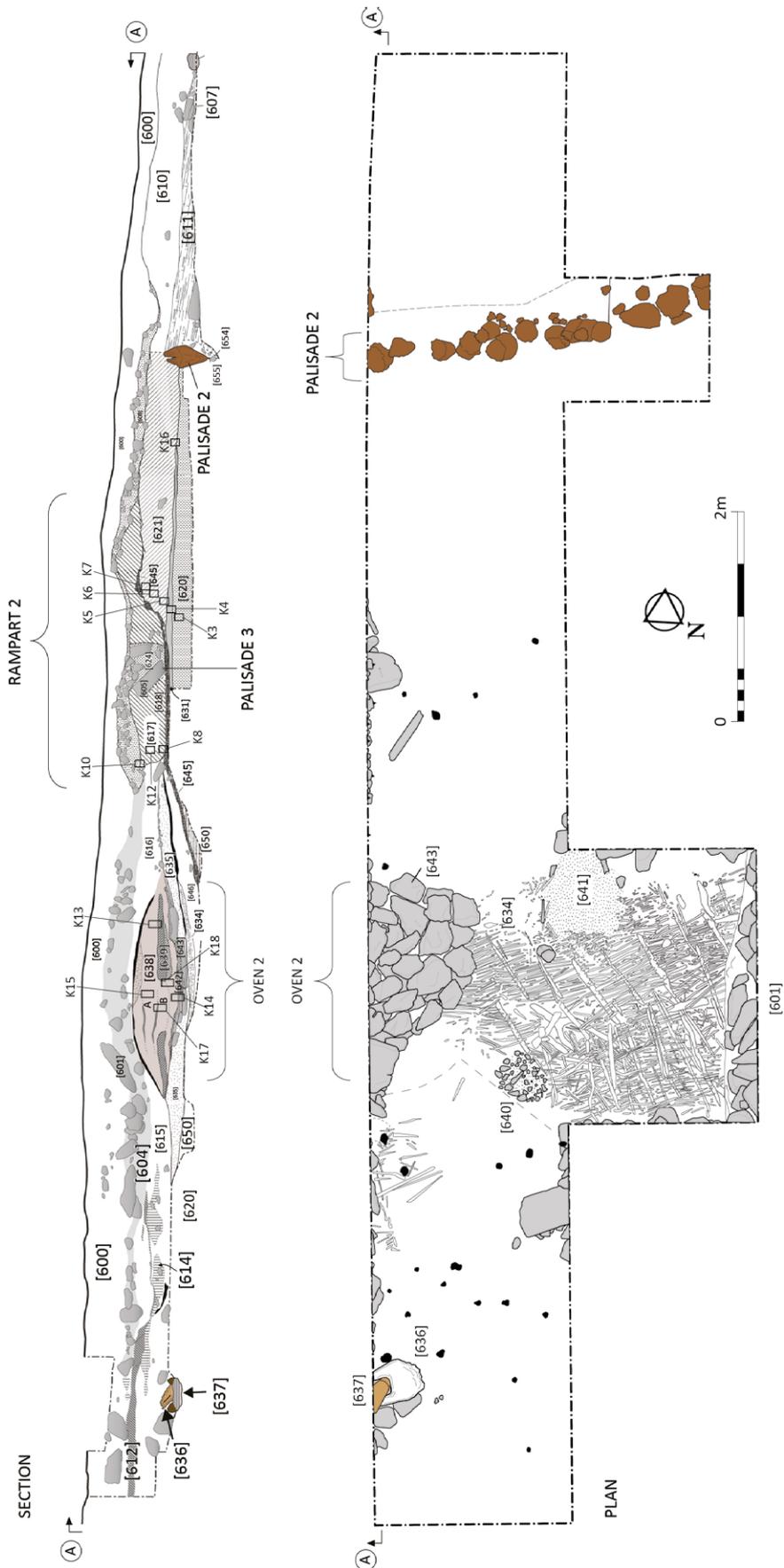


Figure 4.55. Section through deposits in Trench 6 showing Oven 1 and floor deposits of ST6; plan of Oven 2 and associated flooring.



Figure 4.56. The clay dome of Oven 2 during excavation, showing the charred food remains [639].

#### 4.4.5 Summary

The limited excavation area over ST6 means that very little can be said about the nature of the building itself. Few of the stakes encountered seemed substantial enough to be weight-bearing (although one exception was in stake group [626], at 0.170 m in diameter), so that the building was most probably similar in construction to ST3 in having few internal posts, and with the roof presumably supported by the external wall, and/or non-earth-fast props. The proxy evidence from IN and MM demonstrates that the floors were located indoors, but it must be acknowledged that the suggestion that ST6 was a ‘roundhouse’ similar to the other more fully investigated buildings is based on probability rather than directly observed evidence. Nevertheless, it seems reasonable to speculate that the post-shoe [637] was inserted in support of the more substantial oak post [636] as part of a threshold or door frame structure, suggesting that the entrance was therefore located on the N of the building.

There can be little doubt that the features described above are related to food preparation, with oven-like structures apparently the most plausible interpretation. The deposits sealed within both Oven 1 and Oven 2, [639] and [647], comprise cooking debris and were rich with cooking waste, including cereals, bone, marine shell and hazelnuts. A small patch of heat-shattered cobbles [640], located to the N of Oven 2 and on the floor [635] might indicate that pot-boilers were in use in this area, whilst a polished slab of granitic stone, probably a quern or rubbing/ chopping surface (SF144) provides further evidence for food preparation. Whether the structure/s containing Ovens 1 and 2 were domestic, in the sense that people lived, ie slept in them, cannot be easily determined from these excavations, but no evidence of



Figure 4.57. Oven 2 after the removal of the clay dome. The wickerwork flooring [634] is visible in the foreground with the dome of Oven 1 beginning to show below it.



Figure 4.58. Detail of wicker panel flooring [634] in ST6 Phase 2.



Figure 4.59. Oven 2 after half-sectioning. The greywacke slab base [643] is exposed in the foreground and the clay dome [638] sealing layers of burnt organic remains can be seen in section.

similar ‘oven-like’ structures has been recovered from the other roundhouses excavated at BLoM. It is possible, therefore, that this area of the settlement was designated for cooking and food preparation.

#### 4.4.6 ST6 ecofact summaries

Table 4.4 summarises the type of ecofact analysis undertaken for each of the contexts described below.

##### 4.4.6.1 [614]

###### Macroplant

The carbonised macroplant assemblage was composed of two barley caryopses, one cereal and three hazelnut shell fragments. There was also a large quantity of fragile plant stems that were probably sedge and rush. The ecofacts from this deposit suggest that the floor was partially burnt and that domestic food waste composed of cereal and hazelnut shell became intermixed within this surface.

#### 4.4.6.2 [628]

##### Macroplant

Deposit [628] comprised a burning layer overlying Oven 1. A large quantity of carbonised hazelnut shells was noted in this deposit with a minimum of 100 shell fragments counted. Other finds were five cereal caryopses identified as two emmer spelt, one wheat and two cereal. This context was described as a burning event possibly associated with an oven feature. The cereal and hazelnut shell are a mix of food and possible kindling material.

#### 4.4.6.3 [630]

##### Macroplant

Deposit [630] comprises burnt roundwoods, possibly hurdling or matting, probably relating to a late use of ST6 or to its destruction. There was a small waterlogged assemblage of bracken, wood fragments and sedge which was probably used to construct matting for the hurdle. It was noted that the bracken formed compressed layers, some of which were charred and had begun to vitrify suggesting the hurdle material was destroyed at a high temperature. The only carbonised find was peat.

#### 4.4.6.4 [633]

##### Macroplant

Deposit [633] was a mix of clay, charcoal and heat affected stone over flooring [634]. A small assemblage of waterlogged plant remains were identified as sedge, hard/ soft/ compact rush, bracken and some invasive weeds. The charred finds were two emmer/ spelt, two cereal and 53 hazelnut shells which were domestic food trampled into this floor.

#### 4.4.6.5 [635]

##### Macroplant

A large waterlogged macroplant assemblage was recovered from this deposit and the dominant find was building material. The flooring was constructed using distinctive layers of laminated white sedge, glaucous sedge, hairy sedge, jointed rush, hard/ soft/ compact rush, bracken with very minor inclusions of wood fragments and buds. This material had to be teased apart during processing and it was obvious that a decayed midden-type material had become intermixed within the bracken and plant stems. There was also a large quantity of weeds that were invasive. The only waterlogged food remains were a small number of raspberry seeds. Small quantities of *Sphagnum* sp. moss were also noted.

CONTEXT	MM	LP	MA	BO	INS
614			*		
628			*		
630			*		
633			*		
635			*		*
638	*		*		
639	*		*		*
641			*		
642	*				
645	*				
647			*		
657			*		*
658			*		
659					*

Table 4.4. Summary of ecofact analyses for ST6 contexts.

In comparison, the charred macroplant assemblage was significantly smaller and consisted of one two-row barley caryopsis, one cereal and one pale persicaria.

This floor had been repeatedly resurfaced, probably when the underlying layer became dirty, waterlogged or foul. This may explain why the bracken, sedge and rush were intermixed with layers of compact plant material that was in various stages of decay. The recovery of only a small quantity of food debris demonstrates that this floor was rapidly built up preventing domestic waste from becoming a regular inclusion. It is obvious that domestic food and fuel waste were not deliberately disposed of in this locality, nor is there any evidence to indicate that food was stored in this area. Instead, the presence of both raspberry seeds and *Sphagnum* sp. moss could perhaps indicate slight traces of faecal matter. Raspberry seeds are often found as an inclusion within faeces and moss was commonly used as toilet paper for hygiene purposes. The presence of raspberry and moss was slight so it may be that foul matter was accidentally trampled or infrequently disposed of in this location within the structure. This may explain why the floor was regularly replaced to neutralise and deal with unpleasant waste and its associated odours.

##### Insects

The assemblage was recorded by scanning. Fly puparia and beetle sclerites were common and generally well-preserved. The beetle assemblage was dominated by decomposers, with the most obvious ecological group consisting of species associated with open-textured nutrient-rich litter and foul matter (*Oxytelus sculptus*,

*Cryptopleurum minutum*, *Cercyon haemorrhoidalis*, *C. nigriceps*). A smaller component of beetles characteristic of relatively dry mouldering organic litter were also present (*Latridius minutus* group, *Atomaria*). The general implication is that rather foul, stable-like conditions developed within the flooring material, providing an attractive substrate for flies to breed. Regular resurfacing of the floor would have been necessary to maintain a clean living surface. Few taxa from outdoor habitats were represented, although the planthopper *Conomelus anceps* was probably imported with rushes.

#### 4.4.6.6 [638]

##### Micromorphology

The clay mound was half sectioned, showing that it was probably a collapsed dome. Two lenses of grey-blue clay were identified within [638] labelled A and B and were interpreted as possibly representing the decayed remains of an internal wicker structure similar to Oven 1 (not sampled). The upper surface of [638] was described as 'baked hard'. Deposit [638] is present within Units 1–2 of sample ST6/K1, Units 2 and 3 of sample ST6/K2 Units 1–3 of sample ST6/K4 and within Units 1, 2 and 4 of sample ST6/K5. Samples ST6/K2, ST6/K4 and ST6/K5 were taken through the centre of the oven whereas sample ST6/K1 was removed from the southern part of the oven structure.

The lower parts of [638] likely represent the initial collapse of the clay oven lining/ wall or upper dome onto the burning layer [642] below. Collapse rather than repair or resurfacing is suggested by the near vertical boundaries observed between localised parts of [642] and [638]. This collapse evidently allowed for some mixing of deposits and sharp boundaries between elements of [642] within [638] were observed as well as elements of [642] within channel voids mixed in post-deposition. Apart from the incorporation of charred material from the underlying layers, the lower parts of [638] have a massive microstructure and are representative of the oven structure. The incorporation of unburnt fibrous plant tissue within the dense matrix possibly represents accidental or natural occurrence within the silt from which this deposit was derived. Owing to its probable original location within the centre of the oven deposit (ie within the wall or roof of the oven dome) this material has not been burnt and is thus consistent with the interpretation that the lower parts of [638] represents the collapse of the oven. This contrasts with Units 1 and 2 of Sample, ST6/K1 which was removed from the southern part of the oven. These units appear to incorporate charred material and broken bone fragments into the silt deposit and may represent the sweeping of charred material out from the centre of the oven and its subsequent mixing and incorporation into deposits adjacent to the outer wall.

The lower part of Sample ST6/K5 (Units 1 and 2) was identified during excavation as a layer of grey clay and hypothesised as part of a possible wicker structure similar to that observed in Oven 1. In thin section [638A] was found to comprise a distinctive lower layer indicative of *in situ* burning (possibly re-deposited) overlain by a dense compacted near sterile silt with a massive microstructure. No evidence was observed in thin section for sufficient organic remains (either burnt or unburnt) that would represent a wicker structure. Unit 2 of sample ST6/K5 is considered analogous to Unit 2 of ST6/K2 and Unit 2 of ST6/K1 and appears to represent part of the dense silt/ clay oven lining or wall with minimal evidence for burning and thus possibly associated with oven collapse/ repair.

##### Macroplant

The largest find within this context was hazelnut shells, preserved through charring, but a smaller number were either waterlogged or only partially carbonised. The large quantity of hazelnut shell is probably food preparation waste, but this material could have been recycled for fuel or kindling within the oven.

#### 4.4.6.7 [639]

##### Micromorphology

Deposit [639] comprised a mixed heterogenous deposit with a very weakly developed sub angular block microstructure. The coarse mineral component accounts for approximately 30% of the unit and comprises a mix of randomly oriented and distributed rock fragments and minerals with a few burnt bones. The coarse organic matter comprises 20–30% charred organic material *circa* 50% of which is charcoal. A single large (10–15 mm diameter) charred roundwood fragment dominates the unit. The groundmass has a moderate crystallitic b-fabric and is dominated by a grey fine ash deposit. Observed pedofeatures are limited to nodules and patches of iron/ manganese.

The bone is grey to orange in colour and suggests varying intensities of burning although all at relatively low intensity and indicative of domestic fires. Preservation of charcoal and burnt seed material from within the oven deposits is consistent with domestic food production and in particular with low temperatures and reducing conditions known from within clay ovens (see Boardman & Jones 1990). This context does not contain any evidence for fresh unburnt organic material, and it is deemed likely therefore to be representative of *in situ* burning to a relatively low temperature which has allowed for the survival of charcoal and burnt bone. The preservation of probable ash crystals within this context is also of note; possibly a consequence of the location within a stratigraphic profile dominated by clays which has perhaps prevented the water saturation which has likely dissolved any residual ash throughout the rest of the sediment profile.

### Macroplant

Context [639] had the single largest concentration of both waterlogged and carbonised hazelnut shell fragments recovered from ST6, with over 500 noted. Other waterlogged plant remains included a small quantity of wood fragments and fat hen. Context [639] was interpreted as a burning layer on the base of the oven, perhaps representing the fire used to heat the structure. The large concentration of charred hazelnut shell coupled with a mixture of wood species suggests that these were used for kindling and fuel. It is also possible that hazelnuts were roasted on mass within this feature with the shells left *in situ*. It is of note that there is no evidence for any cereal remains within this Oven 2 context. This is either because cereal was not prepared in this location or that these remains were regularly cleaned and disposed of. Given the presence of charcoal waste it is unlikely the inhabitants would have gone to the effort to clean one source of waste whilst leaving another behind; as such it is more likely that cereals were not prepared within this deposit.

### Bone

There were 99 burnt bone fragments (15.4 g) of which 12 fragments belonged to an M/M long bone shaft.

#### 4.4.6.8 [641]

### Macroplant

The carbonised cereal assemblage numbered 34 and the species were emmer/ spelt (82%), wheat (6%), barley (3%) and cereal (9%). This deposit was interpreted as a thick layer of clay used to protect a basket structure from the heat. The cereal is therefore likely to represent food waste from the oven that was subsequently reworked into the surrounding clay.

#### 4.4.6.9 [642]

### Micromorphology

Deposit [642] is dominated by charred remains of domestic food preparation, specifically the preparation of meat suggesting perhaps that the oven was used for cooking, smoking or drying meat. The observed variation in colour and optical properties of the burnt bone reflects variation in the degree of burning to which they have been subjected which in turn relies on the properties of the bone itself and their exact location within the oven but is generally indicative of relatively low temperature conditions. The occurrence of amorphous black, porous and opaque residues featuring small cracks and fissures is likely char derived from animal fat, the drop-like morphology indicating that it was once a fluid that subsequently cooled (see Mallol et al 2017: 302). Rubified aggregates may have been incorporated through use as fuel or perhaps adhering to plant roots or other fuel products. The remains of cellular charcoal and patches of probable ash associated with phytoliths is indicative that

the oven was primarily fuelled by wood. Preservation of ash deposits within this context is better than observed elsewhere across the site where acidic and damp conditions have allowed only the inference of ash through associated phytoliths and is indicative of its rapid sealing by the overlying clay which has prevented its complete dissolution and therefore allowed for its identification in thin section. The incorporation of dark reddish brown to red lath-shaped fragments may be representative of charred peat and thus may indicate that peat was also used as a fuel.

Deposit [642] thus appears to comprise the remains of a domestic burning episode within the oven. The fact that the wood ash and burnt bone fragments have not been cleared from the oven suggest that this represents the last burning episode prior to its collapse, abandonment or re-conditioning for later use.

The sequence of deposits analysed from within the oven structure thus document a complex series of site formation processes which appear to represent at least two broad deposit types; burning residues and construction material. These deposit types in turn appear to represent at least two phases of oven 're-use' as well as collapse of the oven structure, possible repair and subsequent post-depositional mixing. Where layers of possible *in situ* burning or re-use of the structure have been identified, it remains unclear as to whether the layers of charred material represent the last use of the oven prior to abandonment or if they are dumping events. Micromorphological studies of Iron Age ovens undertaken in comparison to modern anthropological analogies in Israel has shown that closed oven structures are frequently re-used as repositories (bins) for disposal of hearth waste following their abandonment (Gur-Arieh et al 2014: 63). The possibility that the sequence of oven deposits represented by [638] includes episodes of waste dumping cannot be discounted on the basis of the micromorphological evidence.

#### 4.4.6.10 [645]

### Micromorphology

Deposit [645] is located directly above the upper part of the turf bank [621] (see below) with which it has a diffuse boundary. The unit contains frequent large charred roundwood fragments and few to common burnt bone fragments. Preservation of the charcoal material is excellent, and alder, hazel and birch species can be identified. There is a general absence of the fresh organic material that characterised the lower units within the bank although frequent, in places dominant, yellow to orange amorphous organic material was observed. In contrast with the underlying layers, this layer was found to contain a much higher proportion of coarse mineral material. The unit has a moderately developed sub-angular blocky microstructure with moderately separated peds although

in places the structure is somewhat rugose with evidence for faunal activity.

The dominance of charred material is consistent with the interpretation that it likely represents remains of a burning episode. The reduced volume of fresh organic material in marked contrast to the underlying layers is indicative that any fresh material formerly present within this unit may have been burnt away leaving only charred plant material, specifically charcoal. However, the underlying substrate is not reddened, and some unburnt organic material does occur within the context. In some instances, the unburnt material was observed to be directly juxtaposed with the charred material indicating that this context is not representative of *in situ* burning but is likely to represent the dumped or swept remains of a burning episode which have incorporated unburnt elements from elsewhere. The incorporation of few to common rounded anorthic dark earth nodules may be indicative of hearth rakeout or trampling which would see soil material incorporated into the layer possibly post-deposition or as a means of extinguishing the fire through trampling. The hypothesis that this represents the remains of a burnt floor layer may still be maintained with the caveat that the burnt remains of the floor are no longer *in situ*.

#### 4.4.6.11 [647]

##### Macroplant

There was a large quantity of carbonised cereal caryopses and spikelet with 105 identified to species. These remains were dominated by emmer/ spelt (95%) followed by barley (2%) and emmer (1%). The rest were described as cereal (2%). The only other plant remains were 20 hazelnut shell fragments. The large quantity of cereal remains is indicative of food waste associated with Oven 1.

#### 4.4.6.12 [657]

##### Macroplant

The waterlogged plant assemblage was large, varied and dominated by cereal remains. The species were dominated by emmer with a smaller number of spelt that included both caryopses and chaff fragments. Other food remains included a large quantity of hazelnut shells, some of which were still intact. The building materials used were sedge, hard/ soft/ compact rush, wood rush, bracken, bark, wood and worked offcuts. Other finds were weed species and moss which were accidental inclusions.

The charred macroplant assemblage from this context was particularly rich, with over 1,303 remains noted. These were dominated by 1 082 cereal remains which included caryopses, spikelets and chaff fragments. The dominant species was emmer/ spelt (93%) followed by emmer (6%), barley (0.5%) and bread/ club wheat (0.5%). There was also

a single caryopsis of six-row hulled barley, two-row barley, spelt and one bread wheat chaff fragment. The presence of crops within this deposit in Oven 2 contrasts with the results from [639] which is perhaps an indicator that this feature was used for a variety of domestic tasks. The other food remains were 18 hazelnut shell fragments and one raspberry seed. There was evidence of large quantities of burnt bracken and plant stems along with a single black bindweed and sedge.

The large concentration of cereal and hazelnuts remains in this deposit is consistent with its interpretation as part of a food preparation oven. The recovery of spikelets and chaff fragments which were still attached to the caryopses demonstrates that some of the grain was stored whilst still attached to the ear and had not been fully processed. Preservation of these remains was generally good to excellent and there was no evidence of any insect attacks or fungal infections. The bracken, plant stems and moss present could have been used as a packing material to protect the cereal from dampness or accidental damage until processing was finalised. The weeds were probably agricultural contaminants of the cereal crop or packing material introduced to the site accidentally.

##### Bone

The 35 burnt fragments (13.0 g) included two fragmented pig molars along with an M/M mandible and three long bone shafts. It is possible that the loose pig teeth and M/M fragments are the remnants of a pig roasted within the oven.

#### 4.4.6.13 [658]

##### Macroplant

This was the only sample from Oven 1 from which waterlogged macroplant finds were recovered. These were clearly dominated by wood and roundwood fragments along with a few fragments of bracken that may have formed part of the floor which was in the process of decomposing. Only two weed species were noted, annual nettle and nodding bur-marigold, and these are invasive.

The charred plant assemblage totalled 35. There were four cereal caryopses two emmer/ spelt, one barley, one cereal caryopsis, 28 hazelnut shell fragments, three weeds and small fragments of burnt peat. The charred cereal and hazelnut shell are domestic food waste from Oven 1.

#### 4.4.6.14 [659]

##### Insects

The assemblage was recorded by scanning. Insect remains were abundant and in a good to moderate state of preservation. The fauna chiefly indicated a natural accumulation on well-vegetated wet ground where

there was shallow standing water. Few synanthropic decomposers were noted which is consistent with the interpretation that this is re-deposited natural peat that did not contain dumped occupation waste. Scarabaeoid dung beetles were common suggesting that grazing animals were a significant presence locally at the time the peat deposit formed, and various plant-associated taxa are suggestive of grassland (eg *Phyllopertha horticola*, *Dascillus cervinus*), nettles (*Brachypterus*) and willows (*Isochnus*).



## Post-ST2 activity

### 5.1 Introduction

All the features described below are either stratigraphically later than ST2 or have returned radiocarbon dates in the late 5th to 4th centuries BCE (Table 2.2). These include Hearth 1, the final hearth in the central hearth stack, and a further two hearths, Hearths 5 and 6, as well as a scatter of small stone features (Figures 5.1 & 5.2).

The modelling of the radiocarbon dates suggests that the post-ST2 activity began between 415–390 cal BCE and finished by 400–330 cal BCE (95% probability). This suggests that there was little to no break between the demise of ST2 and the beginning of the activity over its footprint.

#### 5.1.1 Hearth 1

Hearth 1 survived as a mound of large stones [206] roughly 3 m in diameter which was visible immediately under the turf (Figure 5.2). The mound consisted of a mixture of large slabs, large rounded boulders and smaller stones with a small core of cobbles, but there was no overall structure to the mound, presumably because it had been much disturbed (Figure 5.3). A horseshoe-shaped halo of medium-sized rounded and sub-angular stones over 1 m wide [227] had been laid down around the S and E sides of the hearth, behind the inner kerb of the earlier Hearth 2. It was not found on the N or W sides of the hearth and may have been laid down as a foundation for Hearth 1 because of subsidence on the S and E sides. Forming a halo up to 0.6 m wide around the mound was an ashy, charcoal-rich soil [205] and a grey-black sand clay [211] which contained burnt bone (BO), charcoal, fire-shattered stone and flecks of pinky-grey clay. Both these deposits contained charred cereal remains (MA) and are interpreted as hearth debris and overspill from Hearth 1.

Around the hearth mound on all sides and lying directly over [219], the final occupation deposits in ST2, were patches of an orange sandy clay [214] up to 0.10 m thick in places which contained fragments of burnt bone (BO). Over this was an extensive but discontinuous layer of charcoal-rich yellow clay [209] which was found mainly to the S of the hearth mound, where small but distinct areas of parallel-aligned carbonised twigs [209A] as well as discrete lenses of charcoal [220] were identified. Further N in the trench [209] became interspersed with [210]/[213], a very mottled grey/ brown clay, rich in small, angular stones with patches of clay, charcoal and burnt bone, including one displaying evidence of butchery (BO). Above these layers was another discontinuous layer, [204], a yellow/ brown, charcoal flecked clayey soil which contained a quantity of burnt bone (BO). This spread of very mixed deposits contains a lot of anthropic material and probably relates to occupation and use associated with Hearth 1. Both [209] and [220] contained the remains of decomposed flooring materials, sedge, rush, bracken and wood, as well as charred food debris (MA) suggesting that these deposits represented an active floor surface.

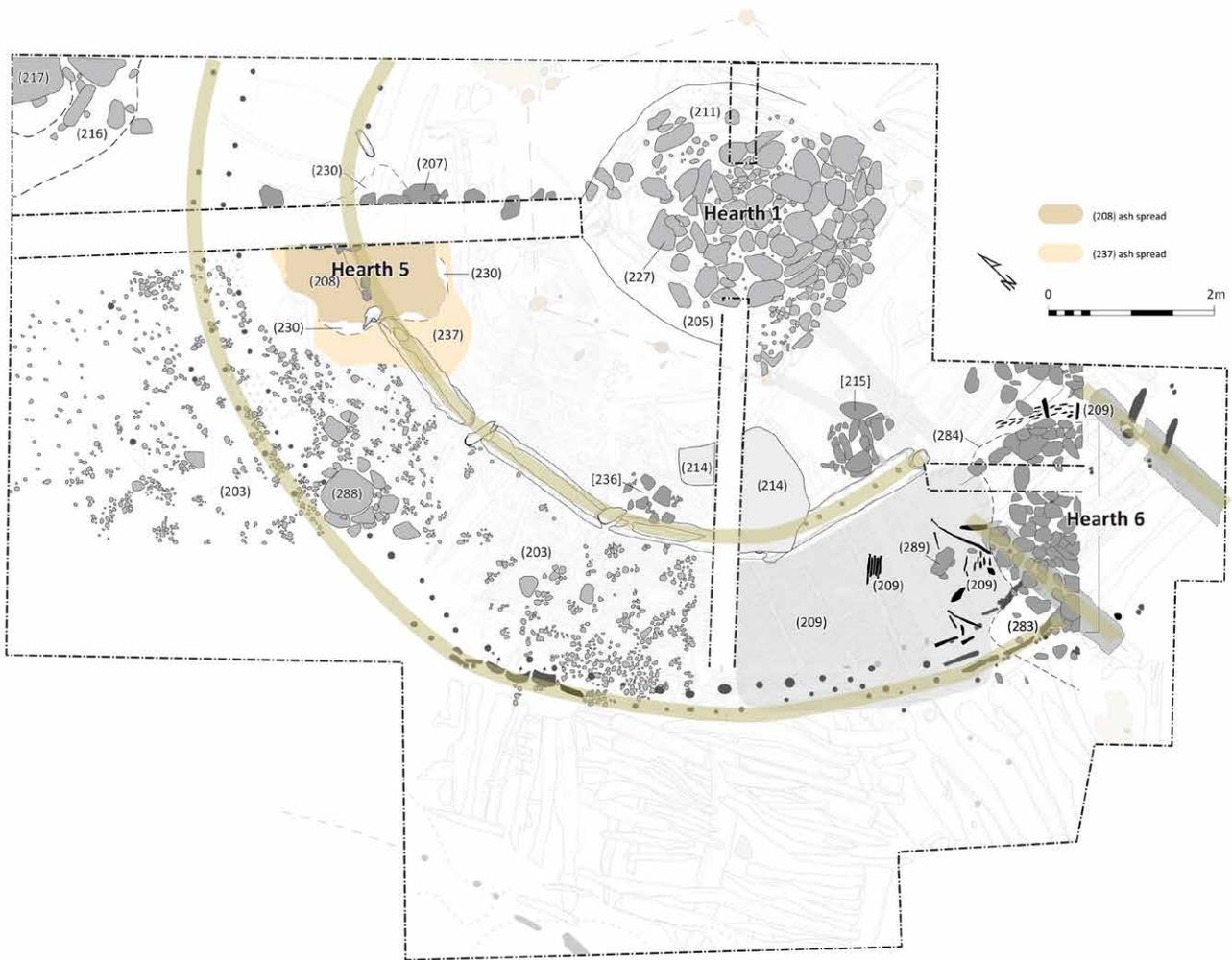


Figure 5.1. Post-ST2 activity.



Figure 5.2. Trench 2 after removal of the turf. Hearth 1 and Hearth 5 are both visible. In the foreground is stone feature [288].



Figure 5.3. Hearth 1. The halo of stones [277] lies to the right of the ranging rod and the charcoal-rich soil [205] is visible in the background on either side of the baulk.

### 5.1.2 Hearth 5

Hearth 5 was built in the N half of ST2 over the old post-ring [225] so it must necessarily post-date the abandonment of the structure. In this area a large spread of charcoal [241] lay over the post-ring but was contained within the inner stakeline [232] indicating that the outer wall was still standing, a fact reinforced by the surviving height of the oak façade timbers in the entrance area of the house to the present day (Chapter 3.2.3.2). Deposit [241] contained decomposed flooring material as well as burnt food remains (MA) so it may represent the last floor surfaces but it also contained large quantities of carbonised oak (627 g) so it is possible that it also relates to the burning event that signalled the end of ST2 (Chapter 3.2.7). The thumb pot, SF79, was found within this charcoal spread.

Long, thin timbers [287] were laid down over this spread in a W/E alignment and a loose mound of medium-sized boulders and angular slabs [207] covering an area roughly 1.9 m square were piled up to two high between them. An ashy clay [208] containing charcoal, burnt bone (BO) and charred cereal grains (MA) lay over the stones and a creamy white clay [230] was packed around the edges of the stone mound. An orange clay [237] containing charcoal, burnt bone and fire-cracked stone lay over the white clay packing and formed a spread around the W side of the mound; this is interpreted as hearth debris.

### 5.1.3 Hearth 6

Hearth 6 was built in the area over the old ST2 entrance. The ST2/ Phase 3 entrance surfaces were sealed by a thin layer of brown clayey peat [290] and over this was a discontinuous layer of charcoal [X286] which may relate to the controlled burning event that signalled the end of

ST2. Hearth 6 was built directly over the charcoal layer; discrete patches of charcoal had survived under the deep impressions of the hearth stones. The hearth consisted of a semi-circular spread of medium-sized stones, never more than a single stone deep, some 3.3 m across W to E and at least 2.1 m across N to S, but its full extent was never exposed in this direction (Figure 5.4).

Although it had a distinct, kerb-like edge the stone spread was quite vacuous and a loose clayey soil [285] had naturally built up within the spaces. The stone spread initially appeared as a halo of stones, within which there was a mound of hard-packed pink-grey clay with gravel inclusions [283], interpreted as the hearth surface (Figure 5.5).

Around the edges was a halo of a hard, compacted pinky-orange clay [X284] up to 0.25 m thick in places, packed in around the hearth stones; it contained charred cereal remains and bone (MA). This hearth construction is very similar to that seen in ST1 and ST2.

The charcoal-rich yellow clay [209] seen around the edges of Hearth 1 also extended over [x284] where more carbonised withies were visible. It became evident that [209] represented a carbonised hurdle screen which had been laid around the hearth, the sails of the screen radiating out from the hearth (Figure 5.6). It seems most likely that the carbonised wood found throughout this deposit represents the same hurdle screen flooring. Clusters of quartz stones were found (ie SF128, SF130, SF131 & SF141) deposited around the edges of Hearth 6, and a decorated spindle whorl SF132 was also found in this deposit.

On the E side of Hearth 6 a thin deposit of smooth brown clayey peat [327] lay over [209]; this may represent the active floor surface of the occupation around the



Figure 5.4.  
Hearth 6 looking S.



Figure 5.5. Hearth 6 as it first appeared, with a rough kerb of stones. Post-setting [289] is the cluster of edge-set stones visible just in front of the wooden post.

hearth. Above this, and only glimpsed in the very E corner of Trench 2X, was a sequence of deposits which hint at continuing activity. A thin layer of charcoal [292], rich in charred food remains (MA), lay over [327] and this was sealed below a pile of stones [291] which extended roughly 1 m into the trench. Very little can be said about its structure but its stratigraphic position means that it post-dates Hearth 6. It is possible that it is the remains of a similar hearth.

#### 5.1.4 Other post-ST2 stone features

Just off the NW edge of Hearth 6 was a post-setting [289] (Figure 5.5 and see also Figure 3.21). It lay within the spread of mixed deposits [209], [210] and [213] so is likely to be

associated with the use of the two hearths. It consisted of a roughly circular arrangement of thin orthostats which had collapsed outwards forming a cluster nearly 1 m across, so it may have supported a relatively large post.

Lying almost equidistant between Hearth 1 and Hearth 6 was another post-setting [215], consisting of a roughly rectangular arrangement of orthostats around a flat stone (Figure 5.7). It also lay within the spread of mixed deposits [209], [210] and [213].

A discrete cluster of large boulders [236] lay approximately 2 m to the W of [215] directly over the ST2/ Phase 3 surfaces and within the post-ring of the old structure (Figure 5.8). It is possible that it relates to the final phase of activity in ST2 but its function is ambiguous. The

Figure 5.6. Carbonised withy screen [209]. The stakes are indicated by the arrows and in between the remains of charred withies can be traced.



Figure 5.7. Post-setting [215].



spread was roughly 1.20 m across in all directions but it did not display any overall structure.

Further to the N was [288], a feature which consisted of a roughly circular flat slab, some 0.37–0.43 m across, with a number of largish angular stones clustered around it. It is feasible that this was also a post-setting relating to late activity in this area (Figure 5.2).

In the very north corner of Trench 2 was a cluster of flat slab-like stones [217], the exposed area of which was some 0.9 m x 1.20 m across. Context [216], a grey/black ashy clay containing charcoal, burnt bone (BO) and charred food remains (MA) lay over the stones. Context

[216] lay over a mixed organic deposit [231] which contained numerous wood fragments, small stones and charcoal, and [231] in turn lay directly over the natural peat surface. In amongst the small, poorly preserved horizontal timbers were two *in situ* stakes [259]. As none of these features were fully exposed their nature remains unknown but it seems probable that [217] and [216] represent a hearth which has been used for food preparation. A distinct spread of angular stones [203] containing food debris (BO) also lay over the N half of Trench 2 and this cluster of features must relate to activity in the area between ST1 and ST2; given their position



Figure 5.8. The cluster of large boulders [236] lying within the post-ring of ST2. Their presence contrasts with the absence of other stone features in the trench, other than the hearth stack, visible to the right.

immediately under the topsoil it is most likely that they post-date both buildings. SF02, a fleck from a blue glass bead, was also retrieved from [203].

## 5.2 Discussion: post-ST2 activity

The stone features excavated in the upper levels of Trenches 2 and 2X, overlying the roundhouse, present some problems for interpretation. There is no doubt that Hearths 5 and 6 post-date the building: the former directly overlay the internal post-ring of the roundhouse and the latter overlay the entrance structure. Clearly neither hearth is compatible with the original building, and they must represent later activity but the nature of that activity is unclear. Nothing that could be confidently identified as a groundplan for a superstructure over the hearths was detected during the excavation; if these buildings involved earth-fast posts dug into the earlier floors of ST2, we might have anticipated that the lower portions of these posts would survive within the footprint of the roundhouse. The isolated stone settings described above might account for some structural supports relating to later buildings; indeed it is difficult to account for them otherwise, but there is no obvious pattern to their distribution. One possible explanation is that these later structures were as flimsy as the other contemporary buildings on the settlement and that the lightweight stake-built walls and internal divisions such as those used to build ST3 had not survived above the water-table.

One other possible explanation for these features is that they represent open activity areas not associated with buildings. While there was no evidence that the late hearths represent industrial or other specifically non-domestic activity, the lack of associated structures might point towards their having some other function, or that they were open air activity foci. There is evidence for a surrounding floor surface associated with Hearth 6 in

the form of carbonised hurdling, but this need not mean that the hearth was indoors, and hurdle matting could have been used to provide dry footing outside as well as indoors, as can be seen over the trackway in places (Chapters 3.1.2.2 & 4.1.2). The possibility that the hearths relate to activities associated with the formal abandonment of ST2 is discussed in Chapter 18.5.1. This in turn raises interesting questions over the layout of the settlement in Episode 2, when ST1 and ST2 were out of use but ST3, ST4, and ST6 were occupied; as noted above, the remains of the earlier buildings must have been visible during the later Episodes, but they were not in use.

### 5.2.1 Post-ST2 ecofact summaries

The micromorphology, lipid, macroplant, bone and insect ecofacts for Post-ST2 are shown in Table 5.1.

#### 5.2.1.1 [204]

##### Bone

There were 67 bone fragments (23.9 g) of which 53 had been burnt. The only unburnt remains were a fragmented cattle molar and three I/M fragments. Other identifiable skeletal elements were an L/M rib and an M/M rib, six fragments of a long bone and a metapodial.

#### 5.2.1.2 [205]

##### Macroplant

There were 46 cereal caryopses along with one hazelnut shell fragment. The cereal species were emmer/ spelt (29%), wheat (18%), barley (15%), six-row hulled barley (2%), and cereal (37%). These finds are food overspill from Hearth 1.

##### Bone

Of 110 burnt fragments (32.4 g) five fragments were identified as an M/M long bone shaft.

CONTEXT	MM	LP	MA	BO	INS
204				*	
205			*	*	
208			*	*	
209			*	*	
210				*	
211			*	*	
214			*	*	
216			*	*	
220			*	*	
237			*		
241			*		
284			*	*	
292			*		

Table 5.1 Summary of Post-ST2 ecofacts.

### 5.2.1.3 [208]

#### Macroplant

There was a total of eight cereal caryopses and nine hazelnuts, all carbonised. The cereal species were wheat (50%), barley (38%) and cereal (12%). These finds are food residue which is overspill from the hearth.

#### Bone

The 236 burnt bone fragments (37.3 g) included an M/M femur shaft and M/M long bone shaft.

### 5.2.1.4 [209]

#### Macroplant

The waterlogged finds from this context were a small quantity of poorly preserved leaf, wood and moss fragments that were likely inclusions within a decomposed floor. The charred remains consisted of 78 carbonised cereal, three hazel shell fragments and one weed. The cereal was emmer/ spelt (31%), wheat (23%), barley (13%), six-row hulled barley (3%), emmer (1%), naked barley (1%) and cereal (28%). The charred macroplant are food refuse from Hearth 1 which spilled over onto this surface.

#### Bone

There were 28 burnt fragments (16.9 g). There were seven fragments of L/M long bone of which one had evidence of a chop mark along the shaft. Other skeletal elements included two ribs, one tibia and long bone shaft all from an M/M.

### 5.2.1.5 [210]

#### Bone

Of 257 fragments (52.2g), 249 had been burnt. The unburnt fragments were from a poorly preserved cattle molar. There was also a sheep/ goat phalanx as well as eight M/M bones identified as a piece of a skull and seven long bone shaft fragments.

### 5.2.1.6 [211]

#### Macroplant

There were 20 charred cereal caryopses and nine hazelnut shells. The species identified were emmer/ spelt (30%), six-row hulled barley (30%), barley (30%), naked barley (5%) and wheat (5%). The mix of cereal caryopses and hazelnut shell represent overspill from Hearth 1.

#### Bone

Of 92 fragments (37.6 g), 87 had been burnt. Those identified were an unburnt fragmented cattle molar and seven pieces of burnt M/M long bone shaft fragments.

### 5.2.1.7 [214]

#### Macroplant

The charred macroplant assemblage was made up of 15 cereal, one fruit endocarp fragment and two weeds. The cereal species were emmer/ spelt (33%), wheat (27%), barley (7%) and cereal (33%). This deposit represents overspill from the hearth.

#### Bone

There were 21 burnt fragments (10.0 g) of which one was an M/M pelvis.

### 5.2.1.8 [216]

#### Macroplant

There were 13 charred macroplants of which eight were cereal. The cereal caryopses were barley (12.5%), emmer/ spelt (12.5%), wheat (12.5%) and cereal (62.5%). There were also five hazelnut shells.

#### Bone

There were 189 burnt fragments (51.2 g). A cattle molar, a sheep/ goat phalanx, foot bone and a pig premolar were identified. There was also one L/M rib, six pieces of L/M long bone shafts and one M/M long bone shaft.

#### 5.2.1.9 [220]

##### **Macroplant**

There was a very small, waterlogged assemblage composed of flooring material such as sedge, rush, bracken and wood fragments. The remainder were weeds. The presence of waterlogged material indicates that this deposit was damp enough to allow for the survival of a small quantity of decomposed floor layers.

There were 14 charred macroplants of which 11 were cereal. The cereal species were emmer (46%), emmer/ spelt (27%), barley (9%) and cereal (18%). There was also a charred hazelnut shell, bud and a single weed.

#### 5.2.1.10 [237]

##### **Macroplant**

The waterlogged plants from this deposit were composed of small quantities of building material such as wood fragments, buds, bark, sedge and heath grass along with some weeds. There were also five charred hazelnut shells. This material is part of a decomposed floor located close to the hearth which allowed debris to become trampled within the surface.

#### 5.2.1.11 [241]

##### **Macroplant**

The waterlogged remains were small and were made up of bark, wood and sedge which were probably part of a decomposed floor. The weed plants were accidental inclusions. There were six carbonised cereal caryopses of which three were emmer/ spelt and the remaining three were indeterminate. These finds are food refuse re-deposited within this context.

#### 5.2.1.12 [284]

##### **Macroplant**

The carbonised plant assemblage from [284] consisted of 38 items and were dominated by 34 cereal remains, some of which still had chaff attached. These were emmer (38%), emmer/ spelt (17%), wheat (15%), barley (6%), oat (2%), naked barley (2%), bread/ club wheat (2%) and cereal (18%). It was not possible to identify the oat as either the cultivated or wild variety. There were also three hazelnut shells.

##### **Bone**

A total of 27 fragments of burnt bone (63.1 g) were identified as a mix of one L/M vertebra, one L/M radius/ ulna shaft, 16 fragments of L/M long bone shafts along with an M/M humerus. The bone is representative of domestic food refuse. This material was probably spilled during cleaning of the hearth and subsequently trampled into the surrounding surfaces.

#### 5.2.1.13 [292]

##### **Macroplant**

The charred macroplant from [292] consisted of 123 items, of which 84 were cereal remains, 37 hazelnut shell, one blackthorn stone and one weed. The cereal species were wheat (24%), emmer/ spelt (23%), emmer (18%), barley (3.5%), bread/ club wheat (3%), six-row hulled barley (1%) and cereal (27%).

## Episode 3



Figure 6.1. Reconstruction of what the settlement may have looked like in Episode 3. The evidence for occupation within the defences is slight, hence the mist obscuring the interior.

### 6.1 Introduction

The only concrete evidence for this episode comes from the entrance area on the S edge of the island, at the junction where the natural causeway joins island to shore, and the defensive structures around the perimeter of the island (Figure 6.1 & see Figure 1.11). The conditions in the entrance area during occupation in the latter half of the 1st millennium BCE were probably the same as those which have made excavation so challenging in the 21st century. The entrance lay in the littoral zone around the island so that, as well as having to build over an unstable sodden substrate, the occupants had to contend with fluctuating water tables and occasional flooding events. Consequently, refurbishment may well have been almost continuous, with rebuilding as well as re-modelling of existing structures creating a palimpsest of structural elements which have proved very challenging to disentangle on stratigraphic grounds alone. The concentration of footfall through a narrow, restricted entrance has resulted in the compression and conflation of organic surfaces, which has further compounded

the difficulties in disentangling a phased sequence of building activity in the entrance. Dendrochronology has helped to identify at least two distinct phases of activity in the entrance during this episode but there are many stakes and posts which cannot be assigned to an episode. Around the perimeter the defensive perimeters appear to have braided in and out of each other, re-using elements and sections of earlier constructions.

There is little evidence for occupation within the interior of the settlement. Stone structures and surfaces were uncovered in the SW corner of the island which clearly post-date the Episode 2 activity but they did not produce any dating evidence. As there is no evidence to suggest activity on the island later than Episode 3 these stone features are placed in this episode. A poorly preserved surface or track of planks and logs [19004] that overlay the outer wall of the Episode 2 ST4 may belong to Episode 3 (see Chapter 4.3.6).

## 6.2 Episode 3.1: 278–276 BCE (Figure 6.1)

The episode has been defined almost entirely by dendrochronological dates on oak posts around the entrance.

### 6.2.1 The entrance and track

Posts [795], [797], [707/4], [757/1] and [757/2] all produced felling dates in 278 BCE. Posts [795] and [797] lie along the W side of the track, [707/4] on the E side and the [757] posts lie behind the Episode 2 Bank 1. This suggests that the Episode 2 entrance structure was still visible a century later because posts [707] continue the line of posts [774] while the [757] posts appear to respect the line of the Episode 2 Bank 1 (Chapter 4.1.3). As described above the upper levels of the bank were rich in orange sand and charcoal so it is possible that this deposit represents refurbishment of the still-visible bank in Episode 3.1. Post [730/1], another post along the E side of the track, was felled two years later in 276 BCE, so redevelopment of the entranceway may have been a continuous process.

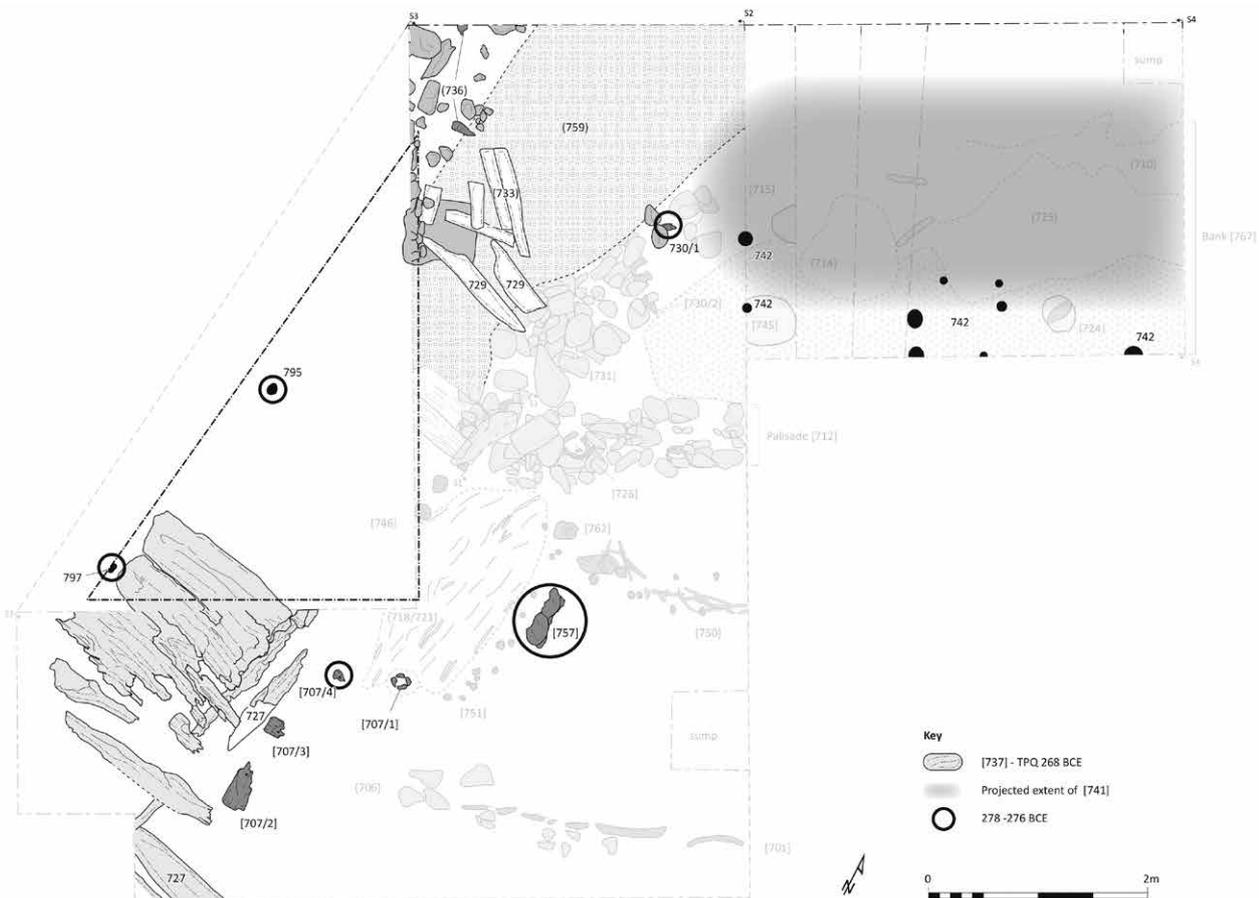


Figure 6.2. Episode 3.1 entrance.

A large flat stone, 0.55 m x 0.75 m lay in the middle of the track and directly over the brushwood surface. Its purpose is not clear but it lay some 0.6 m to the N of [775], the Episode 2 threshold timber (although this would have no longer been visible), and lying immediately over it were the two fragments of oak plank [729], aligned tangentially across the track. The most likely interpretation of this arrangement is that this was a threshold for the Episode 3.1 entrance.

Immediately to the north of plank [729] was a spread of carbonised material [733] which contained fragments of at least five burnt plank-like timbers. The timbers consisted of alder (x3), birch (x1) and ash (x1), and the charcoal around them contained alder and oak. This may be the remains of a trackway surface that was destroyed by fire. Another fragment of re-used oak plank, [727], lay further out towards the causeway and may be a displaced section of the track.



Figure 6.3. Plank mat [737]. The longitudinal timber and cobbles [752] are visible under the left-hand edge of the planks. To the right of these lie the alignment of oak posts [707].



Figure 6.4. Plank mat [737] is visible just beyond the blue plastic sheet. It appears to continue on the same alignment as the earlier Episode 2 trackway surfaces, ie hurdle screen [777] which is still *in situ* in this photograph. The large stone visible just beyond the Episode 2 threshold timber and just in front of the baulk oak post 707/1 has been left *in situ* showing how much Palisade 3 encroached over the original trackway.

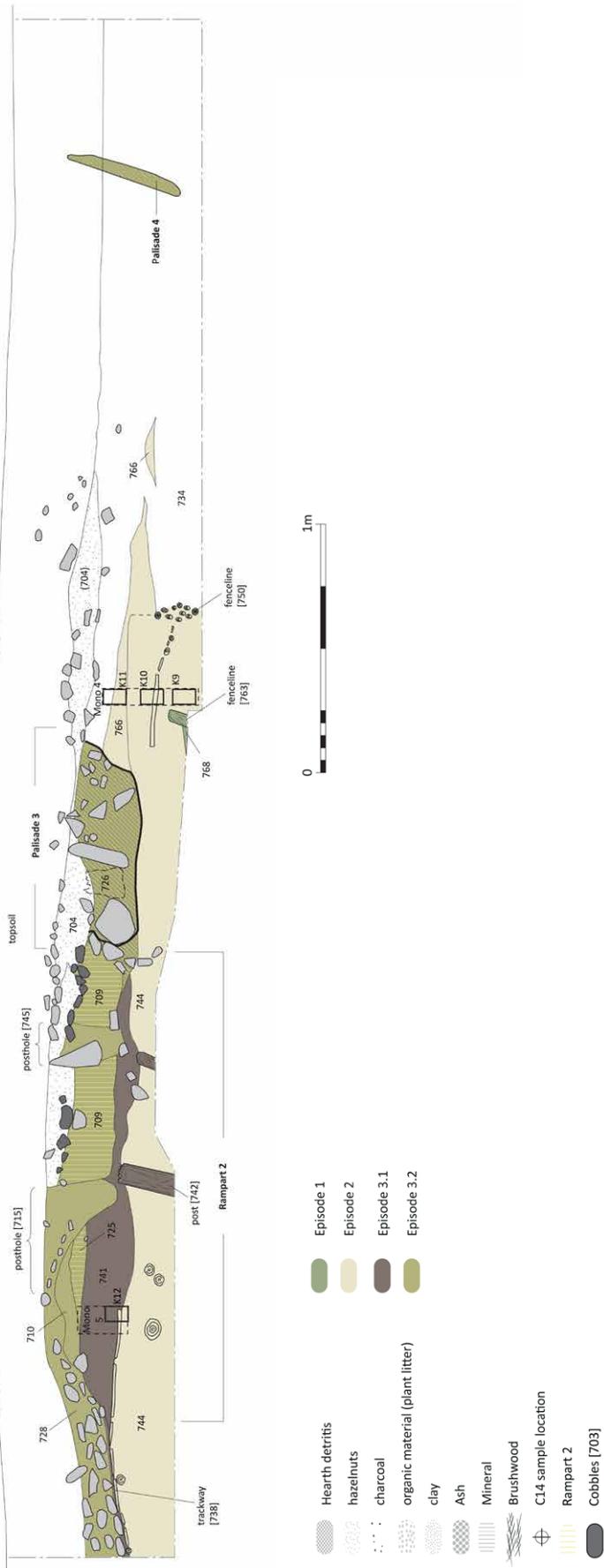


Figure 6.5. The entrance area; W facing section.

Planks [727] and [729] have produced dendro dates of *tpq* 427 BCE and *tpq* 410 BCE respectively (Table 7.2) so these are likely to have been Episode 2 timbers re-used in Episode 3.

A mat of very degraded oak planks, [737], was laid tangentially across the track. There may only have been three planks; the southernmost section was very badly decayed (Figure 6.3) but the two most northerly planks were *circa* 0.6 m wide.

They were tangentially cleft planks between 0.05–0.08 m thick and the upper surfaces were charred. The planks are 1.9 wide and cover a *circa* 2 m length of the track. They were supported on either edge by longitudinal runners, both very decayed, and along the E edge by a line of cobbles [752], possibly to aid drainage. The E longitudinal appears to continue the line of the alder logs [776] and to respect the S edge of hurdle screen [777] (Figure 6.4) both of which were laid down in Episode 2 but both must already have been covered by brushwood layer [738] so would not have been visible.

The [737] planks have a dendro date of *tpq* 268 BCE so must represent a building event as much as several decades later than the re-modelling of the walling on either side of the track represented by the dendro-dated posts above. However, the major change in alignment seen in the following Episode 3.2 (below) means that the plank mat must have been laid down in this Episode 3.1 as it lay on the same alignment as previous tracklines. This suggests that remedial work on the track and entrance may have been a constant over the decades until the next episode of re-modelling.

### 6.2.2 The perimeter enclosure

Given the re-modelling of the entrance described above we would assume that the perimeter enclosure around the island was also rebuilt during this episode but the evidence for this is slight and ambiguous. To the E of the entrance [741], a spread of sterile grey-brown soil 2.4 m wide and surviving to a height of *circa* 0.3 m in places might represent the remains of an earthen rampart, while some of the scatter of alder and ash posts [742] seen in Trench 7 could be the remains of a palisade (Figure 6.5).

However, [741] was not recorded to the W of the entrance (although the trench there only just clipped the terminus of the Episode 3.2 rampart so it remains possible that it did survive further to the W) nor was it recorded extending E over the earlier ST3, although the later Episode 3.2 Rampart 2 was recorded there. MM confirmed the sterility of [741]; it contained no anthropic materials and was a deposit undergoing natural soil formation processes. Given the limited extent of [741] one possible interpretation is that it was a primary deposit in the construction of the Episode 3.2 rampart.

## 6.3 Episode 3.2: 243 BCE (Figure 6.6)

This episode saw a major change in the nature of the defensive perimeter around the settlement in which the entrance into the interior was re-aligned and shifted E. An earthen rampart (Rampart 2) retained by an external palisade (Palisade 3) of oak posts was constructed which lay over the W edge of and cut through the earlier trackway. Further out into the littoral zone Palisade 4, a palisade of massive oak planks, was constructed. The oaks used to build the palisade were felled in 243 BCE, so this episode took place some 33 years after the beginning of the previous episode. Some of the structures attributed to this episode have only produced *tpq* dendro dates and while it is quite feasible that they were all built in 243 BCE it remains possible that earlier episodes of building activity have been subsumed within this episode (see Chapter 7.2.4.2).

### 6.3.1 Palisade 3

To the E of the old track a trench [712] running W–E and nearly 0.9 m wide had been cut. Two flat-based oak posts [726/1] and [726/2] had been inserted *circa* 0.8 m apart into a slot, 0.4 m wide and 0.4 m deep, along the N edge of the trench and packed around with massive edge-set slabs and boulders while the rest of the trench was packed with small stones (Figures 6.5 & 6.7).

The trench was exposed for a length of 1.8 m and terminated just E of the old track. To the W there was no evidence of the trench, but only a short 0.8 m length of the palisade on this side was exposed. Two flat-based oak posts [770/1] and [770/2] were inserted into a slot 0.35 m wide and 0.4 m deep and packed around tightly with edge-set stones (Figures 6.8 & 6.9).

The posts were set very closely together and were deeper and better preserved than the [726] posts in the E slot. The centre of [726/1] had rotted away while [726/2] survived only as splinters. It is therefore possible that there had been more closely-set posts on this side too, but neither posts nor settings had survived. Posts [770/1] and [770/2] provided *tpq* dates of 262 BCE and 265 BCE, respectively, so they could have been felled at the same time as the palisade planks, in 243 BCE (Chapter 7.2.4.2).

The palisade slot on the W cut into the underlying track deposits and extended at least 0.8 m across the old trackline (Figure 6.4). Thus, the entrance into the settlement had been shifted to the E, away from the old trackline and aligned on a more northwesterly axis. The distance between the terminal posts [770/1] to the W and [726/1] to the E would have created an entrance 3 m across. The E terminal post [726/1] is aligned on the western end of Palisade 4 (see below) and the area to the E of the projected line between these points is loch sediment, relatively clear of stone, suggesting that there could have been some sort of barrier along the projected line.

In Trench 6 Palisade 3 survived as a slot [618], *circa* 0.4 m wide and *circa* 0.4 m deep and packed with

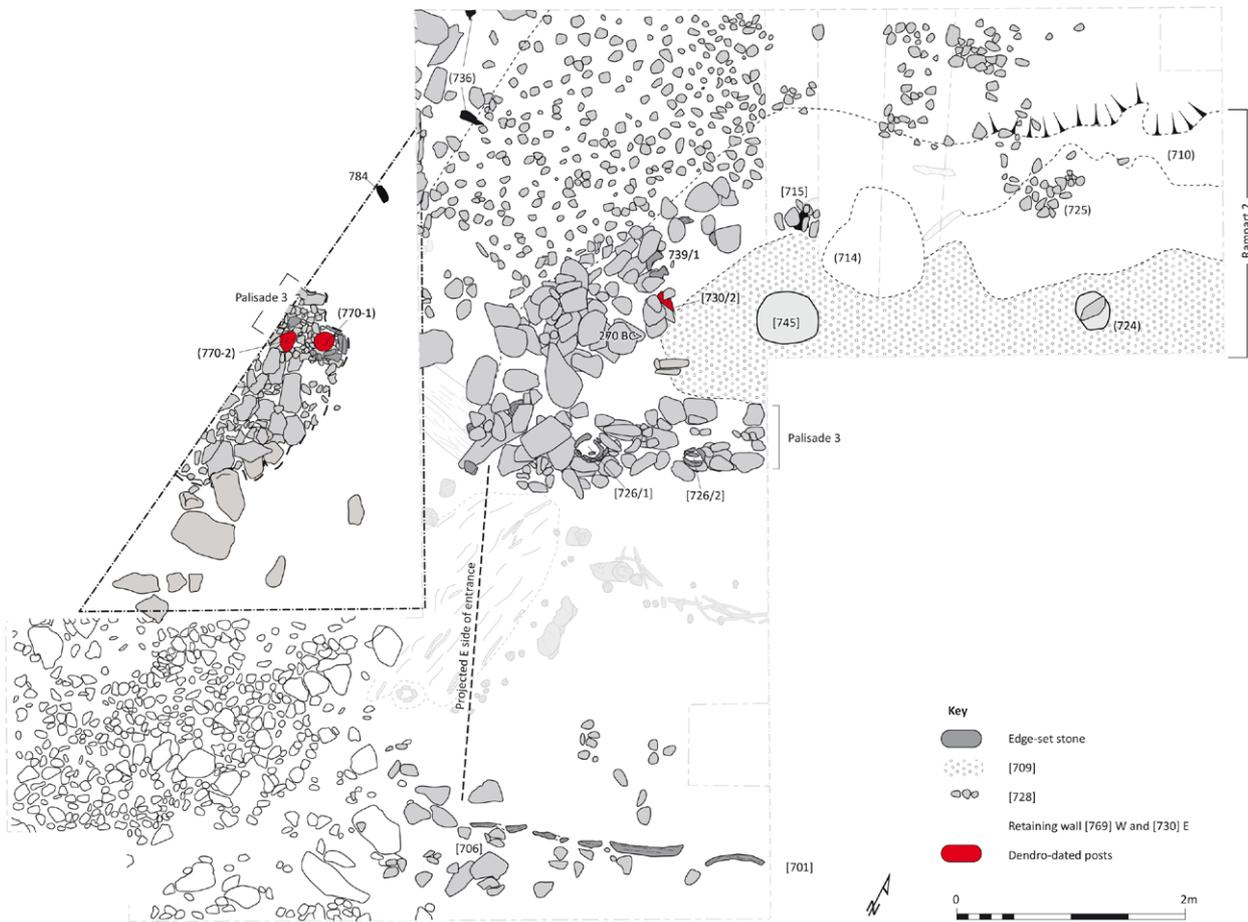


Figure 6.6. Episode 3.2 entrance.



Figure 6.7. Palisade 3. The eastern terminal lies at the left end of the stone-packed slot. Oak posts [726/1] and [726/2] are *in situ* packed around with edge-set stones.





Figure 6.9. Palisade 3 – the western terminal. The oak posts [770]/1 and [770]/2 are just visible within their stone-packed settings.

large edge-set stones [605] (Figure 4.55). The sediment in the slot contained hearth debris (MM) which may have originated in the earlier Episode 2 ST6 nearby and become accidentally incorporated. Other stone settings associated with the palisade include [619] and [625], the latter a post-hole packed with edge-set stones. None of the posts had survived in Trench 6. Along this section, the palisade slot appears to have been cut into Rampart 2 rather than revetting it along its external face, as it is in Trench 7.

### 6.3.2 Rampart 2 (Figures 6.5, 6.8 & 6.10)

The section through Rampart 617/767 is shown in Figure 6.10.

The rampart was uncovered for a distance of 10 m to the E of the terminal, lying directly over the sterile deposit [741] (see above). Rampart 2 was 1.9 m wide and 0.3 m high at its maximum. It consisted of dumps of material, the first being [725]/[773], a charcoal-rich ashy deposit with lenses of orange sand and carbonised logs, which formed a ridge defining the N edge of the rampart. The space between this ridge and the palisade was filled with [709], a bright orange sand which was one of the most distinctive deposits on the site (Figures 6.11 & 6.12).

(MM) suggests that this sequence, the reworked sediments in [725] which include evidence of anthropic activity, and the relatively unworked sediments represented by [709], reflects a former topsoil [725] and underlying B horizon [709] which was dug locally and inverted (deposited upside down) to create the rampart. Other dumps of material included an orange clay [710], an orange-brown gravelly sand [714] and [705]/[723], a charcoal-rich orange ash which formed the uppermost

deposit on the rampart. In Trench 11 finds SF177, 180 and 182 were retrieved from this layer. Almost all the deposits that made up the rampart contained small amounts of burnt bone (BO) suggesting that they had been brought from a location where domestic debris had been dumped.

The terminals of the earthen rampart were retained by a stone wall on either side of the entrance which had mainly survived as tumble (Figure 6.12). To the W of the track large boulders and slabs [735] had fallen in a spread out over the track while to the W large boulders [769] had tumbled to the S. Along the N side of the terminal a line of posts would have provided extra revetment for the rampart on this side. The surviving posts consisted of, from E to W, flat-bottomed oak post [715], pencil-tipped alder post [739/1], and flat-bottomed oak post [730/2]. The latter has provided a *tpq* date of 270 BCE. On the W side of the entrance young roundwood oak posts [736] and the post represented by post-hole [784] may have had the same revetting function.

The rampart might also have been surmounted by fenceline for a while. A large stone-packed post-hole 0.45 m in diameter and 0.45 m deep, [745], lay just behind the terminal on the central axis of the rampart and some 2.6 m further E is [724] a smaller post-hole 0.3 m in diameter with edge-set packing (Figure 6.11). A cluster of edge-set stones nearer the tip of the rampart may also be the remnant of another post-hole on the same alignment. None of the posts had survived and it is likely that the post in [745] had been deliberately removed; oak post [715] lay only a metre away and was still *in situ* so it seems improbable that the post in [745] would not also have survived.

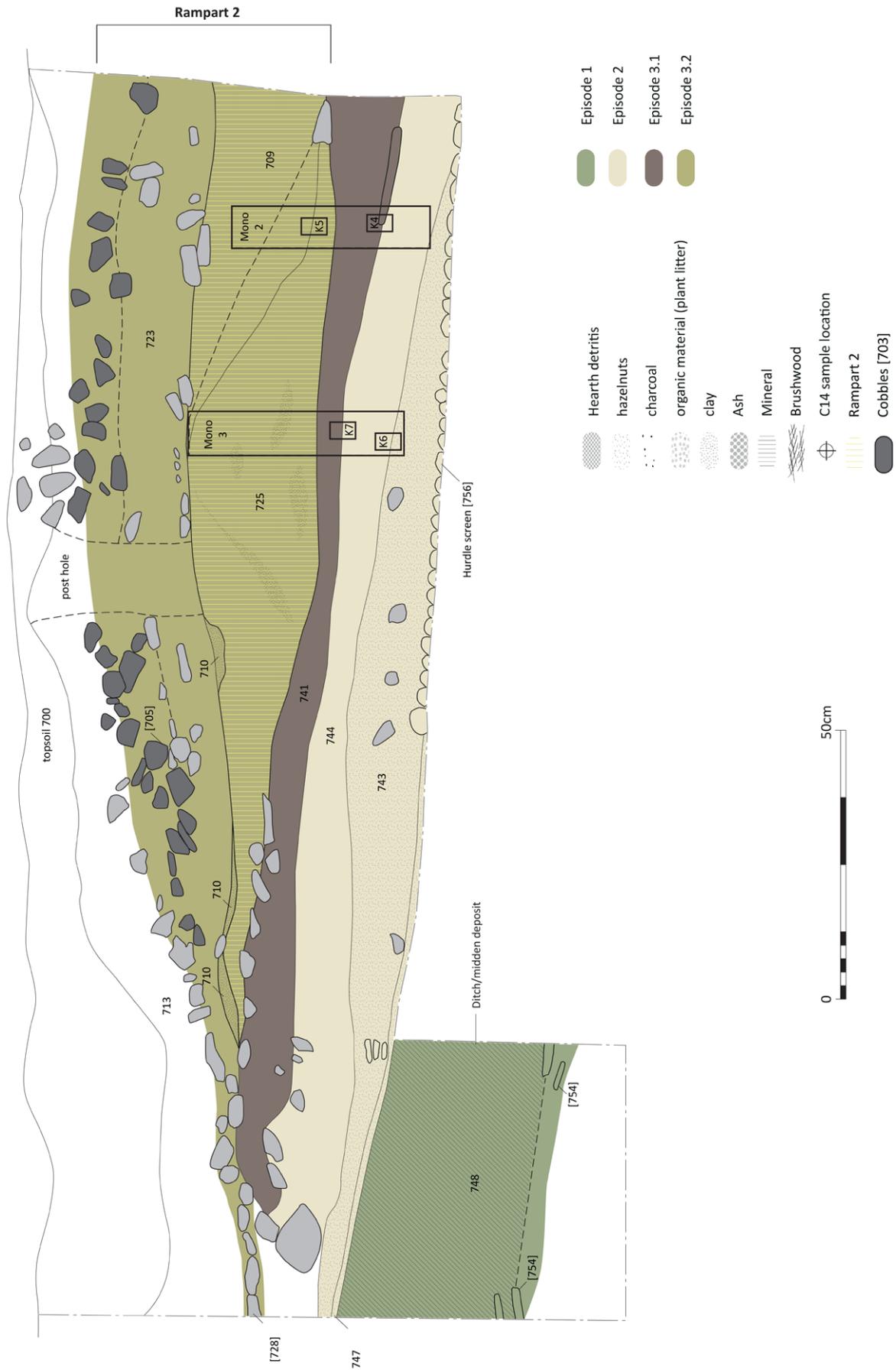


Figure 6.10. Section through Rampart 617/767.



Figure 6.11. Rampart 2 looking W. The orange sand [709] is exposed, lying to the S of the dumped deposits [725]/[773]. The stone revetment of the terminal is just beginning to appear in the background, and post-hole [724] is visible in the foreground. The remains of the cobble surface [703] can be seen in the baulk.

A surface of tightly packed cobbles ([703] and [604]) covered the top of the rampart along its circuit (Figures 6.5, 6.8 & 6.10).

The orange sand, charcoal-rich deposits and cobble surface of Rampart 2 continued E into Trench 11 where it had been built over the remains of ST3 and appeared to terminate just before the E baulk (Figure 6.13).

A spread of large angular stones [1114] may represent the remains of a retaining wall around the terminus at this point. The rampart did not continue into Trench 17. A band of cobbles [1701] ran in front of the S baulk in this trench; these could be spill from the cobble surface which topped the rampart in Trenches 7 and 11 but they may equally be the continuation of the cobble trackway lying just in front of the interior face of the rampart (see below). Either way, the rampart itself lay further to the S of Trench 17.

Trench 5 and Trench 16 were both dug to explore the extent of the perimeter enclosure along the E edge of the island. Rampart 2 was located in Trench 5, a trench 0.8 m



Figure 6.12. The eastern terminal of Rampart 2 defined by the orange sand [709]. The stone from the revetment has tumbled out over the entrance.

wide and 7 m long, and lying some 5.5 m E of Trench 17. Although only seen across a 0.8 m span of the trench the distinctive orange sand [504] of the rampart was identified, overlain by a very charcoal-rich deposit [503] similar to [723] in Trench 7. Deposit [503] contained over 1 kg of charcoal, one of the richest found on the settlement, mainly of alder (75%) and birch (25%), and fragments of burnt bone were present, so this must represent a dump of domestic debris. Small horizontal timbers were visible below the rampart, lying directly over the natural peat, raising the possibility that the rampart may have been constructed over a timber framework at this point on its circuit. However, given the proximity of Trench 5 to ST3 it is equally possible that the timbers represent structures external to but associated with the Episode 2 roundhouse. Just over 1 m beyond the outer edge of the rampart deposits were two small *in situ* posts, one alder [TP5/3] and one ash, set 0.8 m apart. These were only 0.14 m and 0.08 m in diameter respectively so are unlikely to represent a palisade structure like that of

Figure 6.13. Rampart 2 in Trench 11, terminating just short of the baulk on the left. The spread of stones [1114] may represent the remains of a retaining wall around the terminal of the rampart. The cobble surface [703] can be seen in the baulks. The lighter stones in the foreground represent tumble from Hearth 8 in ST3 and the white garden tags mark the location of the stakes of the outer wall of ST3.



Figure 6.14. Palisade 4 forming a façade on the E side of the entrance.



Palisade 3. An E extension of the trench did not uncover any further posts along its projected line, so again these might relate to activity associated with ST3 rather than the defensive perimeter.

Some 2.7 m further N in Trench 16, a 1 m<sup>2</sup> test-pit, a horizontal timber and a single *in situ* post were uncovered but there was no evidence of the distinctive components of the rampart, the orange sand, charcoal-rich deposits or the cobble surface.

These components were present in the continuation of the rampart around the SW perimeter of the island. In Trench 6 the rampart was identified by its distinctive bright

orange colour, forming a bank [617] some 2.5 m wide. Here it was also capped by a cobble surface [608].

### 6.3.3 Palisade 4

Palisade 4 lay some 3.4 m outside of and concentric with Palisade 2. It had been erected within the natural peaty sediments of the surrounding loch and could not therefore be tied into the stratigraphic sequence of the settlement (Figure 6.5). It is only its dendro date which places it in Episode 3.2. It was exposed in Trenches 7, 9 and 12, apparently forming a façade on either side of the entrance onto the settlement (Figure 6.14).



Figure 6.15. Palisade 4 in Trench 9, the curved faces of the outer tangential logs facing outwards. The boulder packing is visible inside the palisade.

Along most of its exposed length the palisade consisted of large oak planks set vertically into the peat. Although a cut could not be detected the planks must have been set into a slot cut into the peat because they were all mostly flat-edged and were packed on both sides with medium-sized boulders [706] (Figure 6.15).

The planks had survived to just above the surface of the peat, to a maximum length of 0.87 m. The planks on either side of the entrance, [701/1], [701/2], and [701/11–15] were fairly consistent in design in that they were mostly outer tangentials. The exceptions were [701/13] and [701/14], both central tangentials which dendro analysis indicates were probably from the same parent log (Chapter 7.2.4.2). It is likely that they were originally inserted as a single plank which had subsequently split in half. The average width of this group of planks was 0.54 m. The planks had been set into the peat with edges abutting but there was no consistency as to whether they had been set with bark edge facing outwards or inwards.

Further W around the circuit in Trench 12 there was much less conformity in the conversion of the oaks used in



Figure 6.16. The entrance area looking E. Rampart 2 is visible, defined by its orange sand and the tumbled stone from the revetment. The cobble surface [728]/[720] is visible in the foreground and curving around the N edge of the rampart.

the palisade. There was a mixture of central, middle and outer tangential planks which vary in width from 0.17 m to 0.41 m, so are considerably smaller than those around the entrance. A half-log [701/5], a quarter-log [701/7] and a roundwood post [701/10] had also been used along this stretch; and dendro analysis shows that [701/7] was a re-used timber (Chapter 7.2.4.2). The impression given is that less care was used in the selection of the timbers along the E circuit of the palisade than in the selection of the larger, more standardised planks used on either side of the entrance.

The roundwood post [701/10] may mark the terminal of this section of the palisade. It sits off-line and in front of [701/9] and, unlike the other posts and planks which were all flat-based (Chapter 14.3.4), [701/10] was pencil-tipped and may thus have had a pinning function. The oak palisade could not be traced to the W of [701/10] and unfortunately the projected line was blocked by a large sycamore tree. Trench 14 was dug as close as possible to the tree on its W side to follow the projected line but all this revealed was two closely-set alder roundwood posts,

very similar in size and configuration to the alder posts in the earlier Palisade 2 uncovered in Trench 6 (Chapter 4.1.3).

The change in construction style along this section, ie the use of smaller, more irregular oak planks and posts in Trench 12, could relate to appearance and display. The oak plank palisade on either side of the entrance would have presented a solid and impenetrable wall at the point where the settlement was most visible from the shore, whereas a more motley assortment of timbers could be used/ re-used around the settlement where it backed into the loch. Along the NW perimeter of the island T8 and T9, the posts recovered during the digging of the drainage ditch (Chapter 1.2), and TP3/1, a collapsed post found in Trench 3 (Figure 1.11), were all felled in 243 BCE (Table 7.2) so it seems most likely that during Episode 3.2 a palisade encircled the island. These were all roundwood oak posts with pencil-tips, again demonstrating the variety of timber types used in the palisade around the back of the island.

On the E edge of the island Trench 5 extended some 6 m out beyond the rampart into the littoral zone around the island but Palisade 4 was not uncovered, so it is likely that the palisade did not extend this far around the E edge.

#### 6.3.4 The entrance and track

A cluster of the packing stones [706] marks the terminal of Palisade 3 on the E side of the entrance; it does not extend further W beyond this point. If this terminal is aligned with [726/1], the E terminal post in Palisade 3, it creates a right angle with the line between the W terminal post [770/1] suggesting that this was the configuration of the Episode 3.2 entrance. There is no surviving evidence of a structure such as a wall or bank creating a boundary along the E side of the entrance, and the W side was not uncovered. However, the area in between the two posited sides of the entrance were covered in a dense layer of cobbles [728]/[720] while the space between Palisades 3 and 4 was relatively clear of stones, other than later tumble from the packing of Palisade 3. This suggests that there might have been a boundary, a fence perhaps, which has not survived. The cobbles were up to 0.3 m deep in places, particularly N of the entrance between the two rampart terminals (Figure 6.16), where there were also lenses of hearth debris [772] possibly washed in during a flooding episode, so there may be multiple phases of resurfacing within this deposit. The cobbles curved N around the E terminal creating a surface along the N edge of the rampart. The cobbles [1701] observed in front of the S baulk in Trench 17 may be a continuation of this surface.

#### 6.4 Episode 3.3: 223 BCE

This episode is evidenced by a single isolated post, BURN1, found in the side of the burn (Figure 1.11). It was a young oak roundwood pencil-tipped post with bark edge, 0.2 m

diameter and surviving to a height of over 0.8 m. Just above the tip was a shallow notch, all that remained of a tow-hole. There was no other evidence of archaeological activity nearby and nothing on the island that could be definitively ascribed to this episode. However, it remains feasible that some of the latest radiocarbon dates from the settlement could reflect activity associated with this episode.

#### 6.5 Late stone structures

The upper levels of the site comprised a well developed loamy topsoil, in places up to 0.45 m deep. This topsoil layer contained abundant archaeological material, primarily in the form of charcoal, burnt bone and woody fragments but was in all areas disturbed by roots and earthworm activity. Occasionally, larger fragments of wood were encountered during the removal of topsoil, suggesting that these upper deposits comprise the decayed remains of late activity and post-abandonment collapse of structural remains. No structural sense could be made of the majority of this material, but in some areas stone structures were encountered immediately beneath the turf, some in positions that mean they cannot have related to the structures located beneath and consequently they are interpreted as remnants of buildings and activity belonging to Episode 3 that do not survive organically.

In the final identifiable phase in Trench 6, a heavy stone wall was built, surviving as a low wall up to three courses high with an outer face on the S side [601] (Figure 6.17). Some of the blocks used to construct [601] were very large, up to 1 m in length. The wall itself was over 2 m thick, although the outer face was higher than the flattened area to the N, raising the possibility that the inside area was meant to be walked on.

The stone wall [601] was clearly significantly later than ST6, and directly overlay it without respect to its position, suggesting they were long-dilapidated or dismantled by the time of the construction of the stone wall. The alignment of [601] was nonetheless broadly similar to the earlier palisades, however, suggesting that the overall extent and shape of the settlement may have been similar at this time.

To the north of [601] in the interior of the settlement, several layers of occupation debris and charcoal were encountered in the decayed upper levels. One of these, [612] was a very thick deposit of large roundwood charcoal lumps, suggesting a significant conflagration of a structure. It is probable that this layer relates to a building located just inside the stone-walled enclosure, probably following the abandonment of ST6 but before the construction of the stone wall [601]. This evidence, along with similar lenses of burning and clay [614], suggests that several phases of activity, construction and rebuilding may be represented in the desiccated and decayed upper layers excavated in Trench 6.

### 6.5.1 Stone trackways (?)

At some point following the abandonment of ST4, two stone surfaces were constructed, one running E–W across the site, the other running to the N (Figure 6.18).

The first [1001], probably the earlier, comprised mainly rounded greywacke boulders up to 0.4 m across but including some larger slabs up to 0.8 m across, closely packed and no more than two or three stones deep. There was a relatively clear edge to this layer of stones on the N side, suggesting the stone layer was kerbed, and there was little tumble beyond the northern extent. To the W, [1001] ran up against and probably under a second layer of similar greywacke boulders [1006], which had a clear edge to the E and N, suggesting it ran N to S. Again, [1006] was closely packed and, although in places was several stones deep, was for the most part only a single stone deep suggesting that the boulders were packed as a surface, rather than deriving from collapse of a nearby stone structure. A yellow-brown clay [1009] was found amongst the stones of both [1001] and [1006]. This clay layer had a clear interface with the



Figure 6.17. Stone wall [601].

charcoal-rich upper floor layer [1003] described above, and [1003] ran beneath [1009]. As such, the stone surfaces are separated from the use of ST4 and must post-date the abandonment of that building.

The stone surfaces [1001] and [1006] are almost certainly related to the stone wall [601] located in the northern, upper levels of Trench 6, and also to the large, closely packed stones encountered in Trench 13, which were exposed beneath the turf but not excavated further (Figure 6.19). Their interpretation is hampered by the relatively limited areas exposed, and because no organic remains associated with them survived. While they remain only indirectly dated, they must belong to Episode 3 or later since they post-date the use of ST4 and ST6; they must also indicate a significant phase of activity at the site, post-dating the majority of the surviving deposits reported in this monograph.

Similar, although less coherent, stone surfaces were also encountered over the timber trackway in Trench 18. These manifested as a collection of disorganised rubble, greywacke stones up to *circa* 0.4 m across [18002]. They formed no obvious structure but were similar in character and stratigraphic position to the stone structures excavated in Trenches 6, 10 and 13. As in these trenches it was unclear what the purpose of the stones was, but it is probable that they relate to either an enclosing wall similar to, or part of [601], or a metallated track across the site. It is possible that the stone surfaces represent an alternative approach to the creation of dry walking surfaces, dealt with by the timber trackway in use in earlier Episodes.

### 6.5.2 Episode 3 ecofact summaries

Table 6.1 summarises the type of ecofact analysis undertaken for each of the contexts described below.

#### 6.5.2.1 [605]

##### Micromorphology

Deposit [605] was the infill within the palisade slot [618] within sample BA/K13. It has a diffuse boundary with the underlying [617] but is distinguished by its greater proportion of both charred and uncharred organic material which is reflected in part by its redder hue. In comparison

CONTEXT	MM	LP	MA	BO	INS
605	*				
617	*				
709	*				
725	*				
741	*				

Table 6.1. Summary of ecofact analyses for Episode 3 contexts.

with the underlying context [617], [605] was found to be less coarse with fewer rock fragments, mineral aggregates and individual coarse minerals. However, a wider range of lithologies were identified within the mineral component which suggests a different sediment origin for this context when compared with that below. Preservation of organic matter is generally better than in the underlying context with higher quantities of birefringent fibrous tissue fragments observed. Both charred and uncharred plant material are randomly oriented with some clustering of charred material towards the centre of the unit. Identified pedofeatures include nodules of reddened possibly burnt sediment and

occasional to many patches of crystallitic 'ash' associated with clusters of phytoliths indicative of input of burnt possible hearth waste. The observed diatoms reflect the prevailing damp conditions across the site. The channel and chamber and in some places porous crumb microstructures are indicative of reworking of the sediment post deposition. Deposit [605] thus comprises a heterogenous mixed deposit which appears to incorporate mixed sediment with evidence for hearth waste juxtaposed with unburnt material. The porous crumb microstructure of the sediment and frequent channels and chambers suggest a higher degree of reworking than observed in other contexts across the



Figure 6.18. Possible stone trackways over ST4.



Figure 6.19. Deposit of stones encountered in Trench 13.

sampled sequence, perhaps reflecting the location of the deposit higher up the profile. It is possible that the mixed waste material observed reflects re-use and re-deposition of material from the earlier settlement/ occupation phase to infill the palisade.

#### 6.5.2.2 [617]

##### Micromorphology

Deposit [617] is contained within two units within sample BA/K11, BA/K12 and within the lower unit of sample BA/K13. This is a highly heterogeneous deposit comprised of a complex mix of mineral and organic material. This context has suffered a high degree of post-depositional pedoturbation. It may be an accident of sampling that the burnt bone recorded in the field (internal ref) was not observed within the thin sections, although a few cellular charcoal fragments increasing in frequency upwards were observed. Anthropoc influence across the context is further indicated by the likely presence of ash in this deposit which is inferred through the survival of patches of phytoliths in association with reddened substrate and crystallitic b-fabric. Any actual ash will have been dissolved due to the acidic and wet conditions that prevail across this site. The ashy deposits and charcoal material are found in direct association with fresher unburnt material, so this deposit does not contain any evidence for *in situ* burning. Subtle changes in the proportion of organic material within each unit with a tendency for concentrations of plant material at the base of each unit may indicate the presence of inverted turf material which has subsequently been partially reworked, thus potentially documenting at least three phases of application of turves within the sampled sequence. However, unlike within the Episode 3 turf-built bank [621], where the turf material used for construction was largely derived from predominantly organic, natural peat, the material used for construction of this bank contains significantly higher proportions of coarse mineral material and was also evidently influenced by human occupation with incorporation of domestic hearth waste (probable ash) observed throughout.

#### 6.5.2.3 [709]

##### Micromorphology

Deposit [709] differs from the underlying [725] in terms of its microstructure which is massive and shows little evidence for reworking. The composition of both organic and mineral inclusions is, however, very similar to the underlying layer and, as such, it is likely that it was sourced from a location with similar geological composition and levels of background human activity. The difference in structure may represent a source area with a less active soil fauna or perhaps more likely represents sediment derived from lower down the soil profile. The presence of

iron/ manganese nodules is indicative of podsolisation, a process that often occurs in buried soils and is typical of B horizon type material found in the general locality (Bown et al 1982: 128). Evidence for podsolisation is often found directly below occupation surfaces as the subsoil becomes compacted and drainage is inhibited (Simpson et al 1998). The massive microstructure may also have formed through the compaction of the sediment horizon below an active topsoil or within the bank. It is therefore likely that [709] represents material derived from below the active topsoil [725] which was used as a source of material to construct the rampart. The inverted form of the profile is typical of bank/ rampart material where sediment is re-deposited in the order in which it was excavated. Thus, it appears that the rampart was constructed from a nearby soil material with the upper part of the rampart constructed from B horizon material.

#### 6.5.2.4 [725]

##### Micromorphology

Deposit [725] was sampled in two locations and found to be of different character in each. Within BA/K2 it has a homogenous crumb microstructure indicating that it has been subject to reworking by soil meso and micro fauna. However, the presence of numerous clasts of anorthic sediment which have sharp boundaries with the surrounding matrix indicates that the sediment may have been reworked prior to its deposition (the sediment clasts are rich in organic material and would thus have been likely reworked following deposition within the sediment). A clear boundary between the two sedimentary units and a slight difference in sediment composition also indicates that reworking following sediment deposition has been limited, allowing for differences between the two units to be preserved. It is consequently hypothesised that the reworking of both sedimentary units occurred prior to their deposition within the bank, ie that the bank was constructed from re-deposited soil material. The slight difference in composition between the sedimentary units probably indicates a slightly different source of material used for construction of the bank. In both cases it is likely that sediment clasts were accidentally incorporated during the construction of the bank. The hypothesised 'ash' deposit identified during excavation (internal ref) was not directly observed in this sample, although the observed crystallitic b-fabric may indicate some ash within the matrix. Anthropoc indicators within the unit include charcoal and phytoliths and indicate that the bank was constructed from a sediment derived from an area of general human occupation but are not present in sufficient quantities to suggest that this was an occupation horizon.

Sample BA/K14 by contrast has a heterogenous microstructure and include patches of crystallitic b-fabric

which may represent ash that has been mixed into the matrix. Unit 2 in particular includes a complex juxtaposition of microfabric types with sharp straight vertical, sloping and horizontal boundaries. The complex arrangement of different sediment types within Sample BA/K14, coupled with frequent evidence for incorporation of charred material, indicates that this part of the deposit has been derived from domestic fuel waste. Sharp boundaries between deposits suggest that they have been rapidly buried following their re-deposition and not reworked. It is thus likely that this part of the bank has been constructed from hearth waste material derived from a domestic setting. The difference in deposit types between the two samples indicates that the rampart was constructed from a variety of sediment sources making use of locally available material.

#### 6.5.2.5 [741]

##### **Micromorphology**

Deposit [741] possibly represents the remains of a bank and was sampled to elucidate the processes responsible for its formation. Within BA/K1 [741] directly overlies surface [744] with which it has a diffuse boundary. The near

absence of anthropic indicators within [741] suggests that this deposit was not formed under direct human influence. The small quantities of observed charcoal could have blown into the deposit from the surrounding area and the anorthic sediment clasts at the top of Unit 3 BA/K4 may have been mixed in from overlying deposits. The high level of decomposition of organic material and the relative homogeneity of the unit indicates that it has been subject to extensive pedoturbation, and the presence of diatoms is indicative of its formation under damp conditions. The sub-angular microstructure likely results from a reworking of the sediment by soil micro and mesofauna. The presence of iron/ manganese nodules and accretions is indicative that this layer has also undergone oxidation and reduction and, given the high organic matter content, this is likely to have caused shrink swell forming the observed cracks and fissures. Iron/ manganese nodules can also form under burial conditions (Wilson 2000) and thus their formation may have been influenced by the burial of this deposit within the earthwork bank.



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# Dendrochronology

Anne Crone

## 7.1 Introduction

Six species of wood were used in the construction of the settlement (Figure 14.1) but, of these, only four species are suitable for dendrochronological analysis. Oak is the only species present that can provide precise calendar dates for tree-felling, and by implication building events, while alder, hazel and ash have all been used successfully elsewhere to provide relative dating, establishing chronological links between structures (ie Morgan 1988; Crone 1988, 2000, 2014; Billamboz 2008; Barratt et al 2019; Tyers et al 2024). The ring-patterns of the other two species present, birch and willow, can be both difficult to measure and unreliable and, as they did not occur in large size or numbers at BLoM, their analysis was not attempted.

Table 7.1 lists the number of each species analysed and the proportion that has been dated or grouped. The criteria for selection varied with species. All the oak found on the settlement (except for the very small roundwood used in wickerwork screens) was sub-sampled for dendrochronology because it had the potential to provide calendar dates. For the other species only sequences with over 20 rings and with surviving bark edge were selected, the logic behind these criteria being that the bark edge was necessary to provide the felling date and the sequence length would provide adequate overlap between sequences. All the species have differing environmental requirements and growth responses and so they were analysed separately in the first instance (Schweingruber 1988: 125).

An overall chronology for the settlement was presented in Chapter 2. In this chapter the dendrochronological results are discussed in more detail; the chronological relationships within the dated and grouped sequences are presented, together with the statistical and visual correlations which support these relationships. In Chapters 7.2–7.5 the results are presented firstly by species, then by episode and by structure.

### 7.1.1 A note on felling dates, felling ranges and felling bands

Before presenting the results, comment on the interpretation of the outer growth rings is necessary. On ring-porous species such as oak and ash it is relatively straightforward to distinguish the outermost growth ring and thereby the exact year in which the tree was felled. If the sapwood on oak is missing, or damaged and/ or partially removed then a sapwood estimate is applied to provide a *tpq* in the case of the former and a felling range in the case of the latter. There is currently insufficient data for prehistoric oak in Scotland to provide a local sapwood estimate and so the English estimate of 10–46 years (English Heritage 1998: 13) has been used here wherever necessary.

Identifying the outermost growth rings on alder and hazel has proved far more challenging. In numerous studies (Crone 2014; Crone forthcoming a) suppressed growth

	No. analysed	No. dated/ grouped	% dated/ grouped	Age range (years)
Oak	109	58	53	25–384
Alder	109	45	41	20–212
Hazel	101	39	39	20–56
Ash	28	7	25	20–145

Table 7.1. Summary data for all species analysed by dendrochronology.

in the outermost rings of alder has been observed to the extent that the tree appears to have ceased growth. In a study of living multi-stemmed alders, some of the stems were missing as many as five of the outermost growth rings, despite the presence of bark edge (*ibid*), while another study of coppiced alder stems revealed a similar pattern (Crone 1988). This phenomenon is probably caused by the overshadowing of dominant stems so that growth is progressively suppressed until the stem ceases to lay down a growth ring altogether (Elling 1966). Small variations in the number of growth rings present could also be accounted for by the sampling position up and down the stem (Wilmking et al 2012; Cook et al forthcoming). Whatever the explanation, ‘missing’ outer rings when the bark edge is *in situ* presents a problem in the interpretation of the end-dates of grouped sequences. Analysis of the alder at BLoM has thrown this problem into sharp relief but has also pointed to a solution.

There was a seven-year spread of end-dates amongst the grouped alder logs forming the foundation structure [046] in ST1 (Figure 7.1).

This structure cannot have been refurbished (it was well sealed by later floor surfaces and hearths) nor is it likely that there would have been a need to stockpile timbers over such an extended period of time (but see below), given the relatively small number of timbers involved in the construction of the roundhouse. Furthermore, there were also stratigraphic inconsistencies, some of the foundation timbers displaying end-dates which fall after those of floor surface [009] which lies over them. The only feasible explanation for this inversion and for the spread of end-dates is that some of the logs stopped laying down discernible growth rings many years before they were felled. Both [046/2] and [046/15] displayed larger, clearer, and therefore more reliable, rings at the ends of the sequences and as these both end in Rel Yr 140, the outermost year of the sub-chronology, it seems reasonable to argue that this is the year in which all the components of the foundation were felled. Thus [046/13] must have ceased laying down growth seven years earlier in Rel Yr 134. Overall, there is a spread of nine end-dates amongst the grouped alder

sequences from ST1 which means that within ST1 it is not possible to distinguish episodes of rebuilding and refurbishment that took place within that nine-year span.

Amongst the 14 grouped alder logs from the trackway there was also a nine-year spread of end-dates, from Rel Yr 132 to Rel Yr 140 (Figure 7.2). These included both tangential logs and logs aligned longitudinally along the edges of the trackway.

Structurally, the trackway appears to be a single-phase construction; the longitudinals could potentially represent additions to the trackway but it is difficult to see how the tangential logs were replaced because they were so tightly packed together (Chapter 3.1). The spread of end-dates means that, if there was replacement of logs along the trackway, it happened within a decade at most and cannot be distinguished using tree-ring analysis.

Cessation of growth appears to be less prevalent in hazel but there are several instances of the phenomenon at BLoM. Amongst the 16 grouped hazel stakes from the double outer wall of ST2 ([232], [233] and [260]) there is a seven-year spread of end-dates, from Rel Yr 54 to Rel Yr 60, although most of them lie between Rel Yrs 57–60, with only one sequence ending in Rel Yr 54 (Figure 7.3).

The double outer wall is undoubtedly a single-phase construction, a woven wicker wall with no evidence for repair, so this spread of end-dates can only reflect cessation of growth. As six of the sequences end in Rel Yr 59 and one on which Rel Yr 60 is beginning to form, it seems reasonable to argue that all the stakes used in the wall were cut down in the early spring of Rel Yr 60. In ST3 one of the stakelines [1135] also displayed end-dates spanning four years; again, it can only have been built in a single event.

Some of the variation in end-date displayed in these structures could be the result of stockpiling. There is clear evidence in the oak and ash assemblages from Episode 1 that timber was stockpiled over a two- to three-year period for the construction of the settlement (Chapters 7.2 & 7.5) so some of the alder and hazel may also have been felled in preparation. However, there is no evidence nor any logical reason for the stockpiling of timber for periods of up to nine years.

In summary, it has not been possible at BLoM to use alder or hazel to distinguish building events which took place less than nine years apart. Nonetheless, this still provides valuable information on the duration of structures, ie that refurbishment within ST1 took place within a decade, and that refurbishment to the trackway, if any, also took place within a decade. The approach taken here has therefore been to accept broad felling bands of up to a decade for building events, and in the following sections the end-dates are interpreted in terms of felling bands.

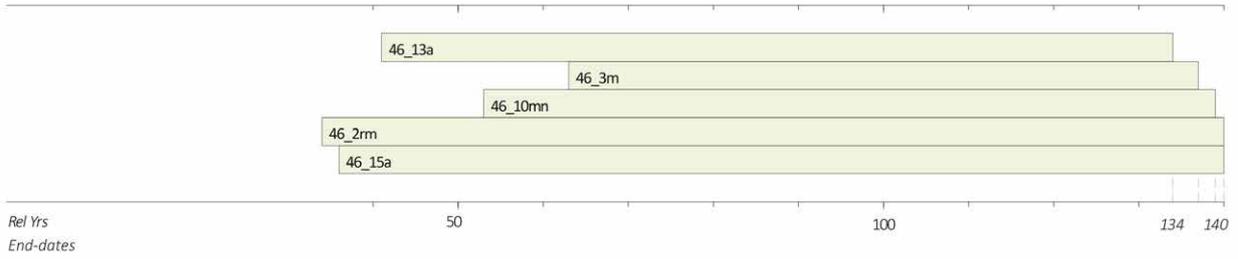


Figure 7.1. The chronological relationships between the alder timbers [046] in ST1, displaying a span of end-dates.

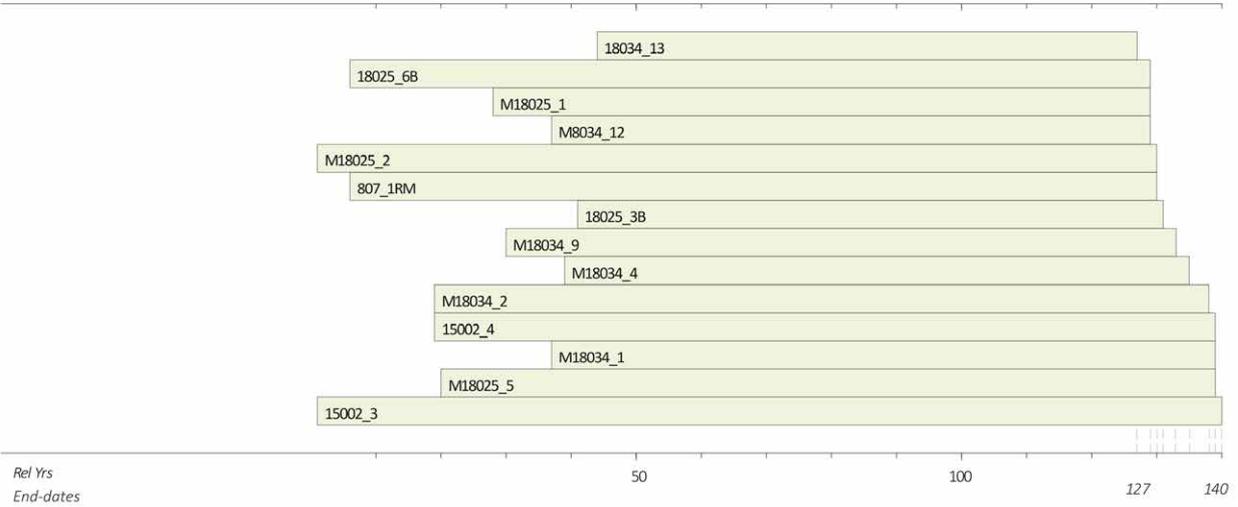


Figure 7.2. The chronological relationship between the alder logs in the trackway, displaying a span of end-dates.

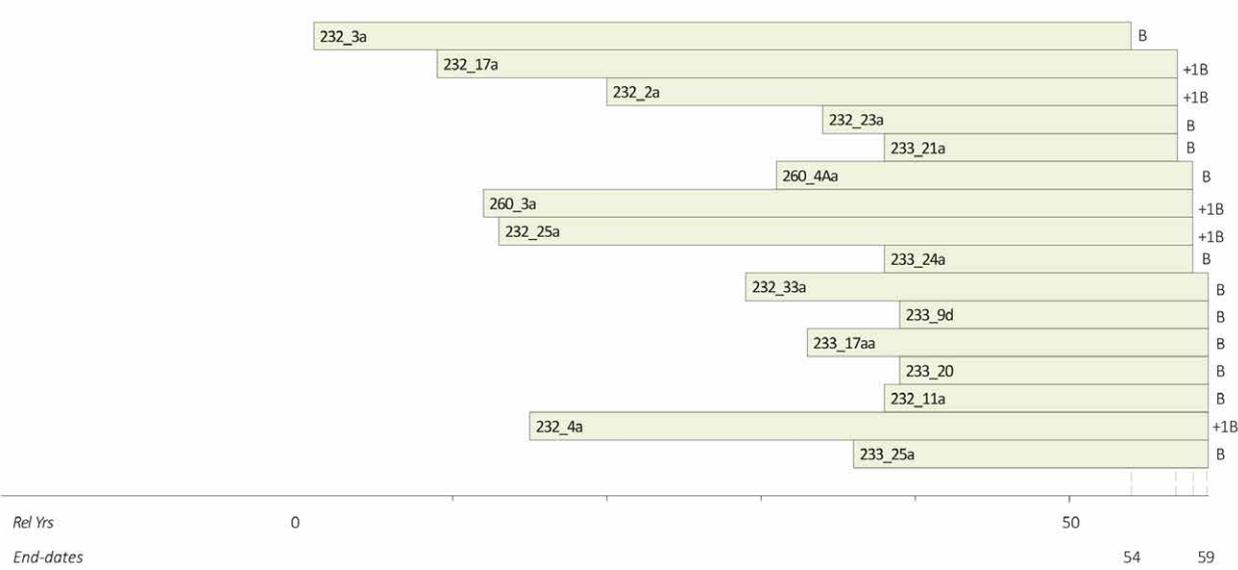


Figure 7.3. The chronological relationships within chronology *ST2x16HAZ*, the 16 grouped hazel stakes from the double outer wall of ST2.

Context	Sample no.	Context description	Conv*	Rings	Sapwd	Outer rings	Calendar range	Felling date/felling range/ <i>tpq</i>
<b>EPISODE 1</b>								
<b>ST1</b>								
[021/C]	021/C	post-ring	A	45	21	be	479-435 BCE	435/4 BCE
[021/D]	021/D	post-ring	A	144	51	be	578-435 BCE	435/4 BCE
[40]	SF18	packing stave	D1	120	6	/	592-473 BCE	
[40]	SF19	packing stave	D1	114 +3	14	/	573-461 BCE	461-429 BCE
[40]	SF20	packing stave	E1	90	/	/	617-528 BCE	
<b>ST2</b>								
<b>Phase 1</b>								
[225]	1	post-ring	A	65	/	/		
[225]	2	post-ring	A	115	30	be		
[225]	3	post-ring	A	101	11	/	549-449 BCE	449-414 BCE
[225]	4	post-ring	A	99	22	be s?	533-435 BCE	435 BCE
[225]	5	post-ring	A	116	19	be s/s?	550-435 BCE	435 BCE
[225]	T2/16	post-ring	A	83	39	be?		
Test-pit	TP1	post-ring	B1	90	21	/		
[243]	T2/2	plank wall	CT	263	/	/	738-476 BCE	<i>tpq</i> 466 BCE
[243]	T2/3	plank wall	OT	136	45	+1 to be		
[243]	T2/5	plank wall	OT	114	24	be w		
[243]	T2/14	plank wall	OT	135	38	+1 to be		
[243]	T2/15	plank wall	OT	218	34	/	651-448 BCE	448-436 BCE
[243]	6	plank wall	OT	155	45	be		
[248]	1	plank	D	177	48	be	611-435 BCE	435 BCE
[263]	1	inner post-ring	A	108	20	be w?	544-437 BCE	437/436 BCE
[263]	3	inner post-ring	A	104	24	be w?	538-435 BCE	435 BCE
[263]	5	inner post-ring	A	110	32	be w?	544-435 BCE	435 BCE
[263]	6	inner post-ring	A	104	25	be ss?	538-435 BCE	435 BCE
[267]	1	foundation	D1	40+1	27	+1 to be s/s		
[305]	1	horiz planks in entrance	OT	182+	/	/	698-518 BCE	<i>tpq</i> 508 BCE
[305]	2	horiz planks in entrance	OT	205+	/	/		
[306E]		outer plank wall	OT	41 + 192+	30	+1 to be	627-436 BCE	435 BCE
[306W]		outer plank wall	CT	291+	29	+1 to be	726-436 BCE	435 BCE
[307E]	1	oak post in entrance	A1	142	h/s?	/		
[307E]	3	oak post in entrance	A1	51	?	near h/s?		
[307W]	1	oak post in entrance	A1	63	/	/		
[316]	2	tangential timbers in entrance	CT	144	/	/	695-552 BCE	<i>tpq</i> 542 BCE
[323]	1	outer plank wall	CT	374	29	be w		
[323]	2	outer plank wall	CT	361+	29	be w	797-437 BCE	437/436 BCE
[323]	3	outer plank wall	OT	22 + 254		be w	690-437 BCE	437/436 BCE
[323]	4	outer plank wall	OT	189	/	/	657-469 BCE	<i>tpq</i> 459 BCE
[323]	5	outer plank wall	CT	260	12	?	712-453 BCE	453-419 BCE

Context	Sample no.	Context description	Conv*	Rings	Sapwd	Outer rings	Calendar range	Felling date/felling range/ <i>tpq</i>
<b>Phase 2</b>								
[258]	1	Hearth 3	C	80	4	/		
[262]	T2/13	sub-floor structure	?	77	/	/	688-612 BCE	<i>inner rings</i>
<b>Phase 3</b>								
[222]	T2/1	entrance structure	A	106	/	/		
[287]		timber under Hearth 5	C	90	/	/		
<b>ST5</b>								
[288]	1	outer wall plank	CT	167	/	/	749-583 BCE	<i>tpq</i> 573 BCE
[288]	2	outer wall plank	CT	47	/	/	760-714 BCE	
<b>Trackway structures</b>								
[15010]	1	oak post in Episode 1 palisade	A	139		be w	574-436 BCE	<b>436/5 BCE</b>
[18034]	11	threshold timber	OT	360	53	be	690-438 BCE	<b>438/7 BCE</b>
[18033]		post by threshold	A	44 + 1	20	be s/s	481-438 BCE	<b>437 BCE</b>
[775]	1	threshold timber 1 of 3	OT	85	14	? dam		
	2	threshold timber 2 of 3	OT	173 +7 unnm	53 +7unnm	be? dam		
	3	threshold timber 3 of 3	?	76	/	/		
[793]	1	post through threshold mortise	A1	32	13	be?		
[794]	2	longitudinal in trackway	A1	37 +1	?	+1 to be		
[15004]	2	longitudinal in trackway	A	27 +1	15	+1 to be		
[18025]	S4	longitudinal in trackway	A	71	/	/		
[761]	1	post	A?	148	19	be w		
[761]	A1	x 4 offcuts	D/OT	87	38	?		
	A2		D	136	41	be?		
	A3		D	124	39	be w		
	A4		C1?	30 +1	15	be s/s		
<b>Palisade 1</b>								
[15056]		oak post in post-pad	A1	162	/	/	742-581 BCE	<i>tpq</i> 571 BCE
[15006]	1	oak post in N of Trench 15	A	131	23	/	581-451 BCE	451-428 BCE
<b>EPISODE 2</b>								
<b>ST3</b>								
[1160]	2	plank in Hearth 5	OT	129	/	/		

Context	Sample no.	Context description	Conv*	Rings	Sapwd	Outer rings	Calendar range	Felling date/felling range/ <i>tpq</i>
[1727]	S2	raft under Hearth 5	A	37	/	h/s		
[18035]		plank within ST3	OT	118	/	/		
<b>ST6</b>								
[636]		post	A	114	h/s?	/		
[651]	2 SE	4-poster	A	43	23	be s/s		
[651]	4 NW	4-poster	A	53	24	+1 to be		
<b>Entrance area planks (re-used in Episode 3.1)</b>								
[727]	1	fragmentary plank	CT or D?	125	/	/	561–437 BCE	<i>tpq</i> 427 BCE
[729]	1	fragmentary plank	OT	328	/	h/s?	747–420 BCE	410–374 BCE
[729]	2	fragmentary plank	OT?	157	/	/	765–609 BCE	
<b>EPISODE 3.1</b>								
<b>Entrance area posts</b>								
[707]	1	posts along E side trackway	A	51	+16	sw detached		
[707]	2	posts along E side trackway	A1	102	45	be? sw dam		
[707]	3	posts along E side trackway	A	57	17	be? sw dam		
[707]	4	post along E side trackway	A	54	26	be? sw dam	333–280 BCE	<i>tpq</i> 280 BCE
[730]	1	post along E side trackway	A	42 + 1	15	be s/s	318–277 BCE	<b>276 BCE</b>
[757]	1	post along E side trackway	OT or A1?	118	21	be w	396–279 BCE	<b>279/8 BCE</b>
[757]	2	post along E side trackway	OT or A1?	96 + 1	31	+1 to be	372–279 BCE	<b>278 BCE</b>
[795]	1	post along W side trackway	A1	28 + 1	14	+1 to be	306–279 BCE	<b>278 BCE</b>
[797]	1	post along W side trackway	A	62	22	be?	340–279 BCE	<b>279/8 BCE</b>
<b>Trackway planks [737]</b>								
[737]	1	trackway plank	A?	38	/	/	]	
[737]	3	trackway plank	OT?	30	/	/	] 333–278 BCE	<i>tpq</i> 268 BCE
[737]	4	trackway plank	OT?	42	/	/	]	
[737]	5a	trackway plank	OT	54	/	/		
[737]	5b	trackway plank	OT	32	/	/		
<b>EPISODE 3.2</b>								
<b>Palisade 4</b>								
[701]	2a	palisade plank	OT	136	41	be w		
[701]	2b	palisade plank	OT	148	36	be?		

Context	Sample no.	Context description	Conv*	Rings	Sapwd	Outer rings	Calendar range	Felling date/felling range/ <i>tpq</i>
[701]	3	palisade plank	CT	337	49	be w	580-244 BCE	244/243 BCE
[701]	4	palisade plank	CT	384	45	be w	627-244 BCE	244/243 BCE
[701]	5	palisade plank	OT	93	26	be w	337-244 BCE	244/243 BCE
[701]	6	palisade plank	CT	292	47	be? sw dam	534-245 BCE	245/244 BCE?
[701]	7	palisade plank	C	121	/	h/s?	752-632 BCE	<i>tpq</i> 622 BCE
[701]	8	palisade plank	OT	132 +1	47	be s/s?		
[701]	9	palisade plank	OT	132 +1	34	be s/s		
[701]	10	palisade plank	A	est 35-40 r		/		
[701]	11	palisade plank	OT	253	31	be w	497-245 BCE	245/244 BCE
[701]	13	palisade plank	CT	288	31	be w	531-244 BCE	244/243 BCE
[701]	14	palisade plank	OT	238	/	h/s?	523-285 BCE	<i>tpq</i> 275 BCE
<b>Entrance area posts</b>								
[770]	1	Post in Palisade 3	A	68	/	h/s?	339-272 BCE	<i>tpq</i> 262 BCE
[770]	2	Post in Palisade 3	A	58	/	/	332-275 BCE	<i>tpq</i> 265 BCE
[715]	1	post	A	82	32	be? sw dam		
[726]	1	palisade posts	A	est 25-30 r		/		
[730]	2	post along E side trackway	A	40	/	/	319-280 BCE	<i>tpq</i> 270 BCE
[736]	1	posts along W side trackway	A	34	/	be? sw dam		
<b>Perimeter posts</b>								
u/s	T8	palisade post	A	104	27	be	346-243 BCE	243 BCE
u/s	T9	palisade post	A	96	26	/	342-247 BCE	
TP3	1	post	A	91+1	16	be s/s	334-244 BCE	243 BCE
<b>EPISODE 3.3</b>								
<b>Perimeter posts</b>								
Burn	1	post from burn	A	55	18	+1 to be	278-224 BCE	223 BCE
<b>Miscellaneous</b>								
	SF268	offcut	A1	88	28	be?		
	SF309	offcut under ST3	A1	107	/	/		
[764]	1	stake	A	56	19	be?		
[753]	1A	stake	A	24 +1	all	be s/s		

Table 7.2. The oak; summary of dendrochronological data. Felling dates in red, all re-used timber highlighted in green and radiocarbon-dated timbers highlighted in blue. Conv\* = conversion codes (see Crone & Barber 1981); be = bark edge; be s/s = spring/ summer felled; be s = summer felled; be w = winter felled; +1 to be = new ring beginning to form after last measured ring; h/s = heartwood/ sapwood boundary; dam = damaged.

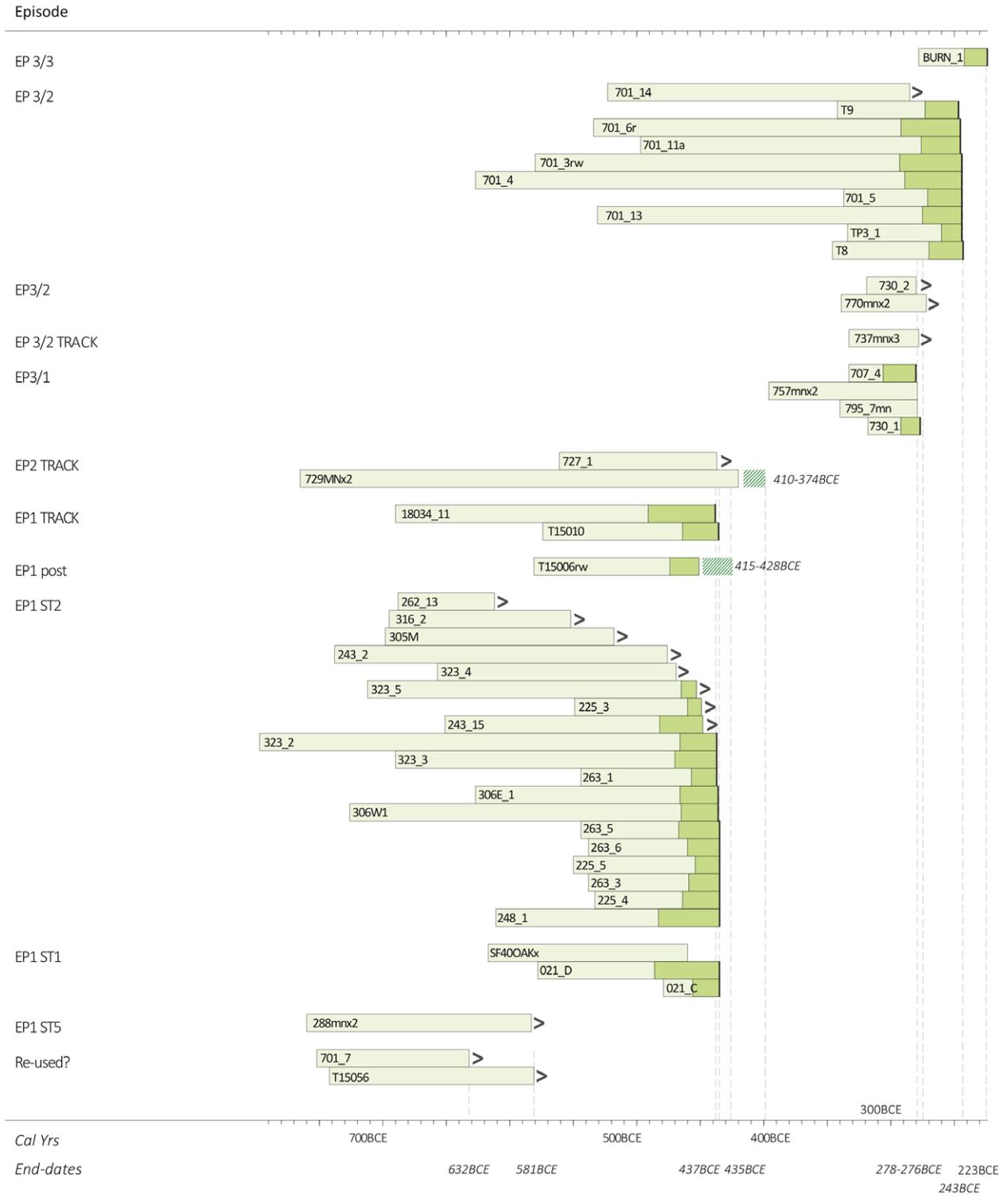


Figure 7.4. The chronological relationships between all the dated oak timbers from BLOM.

## 7.2 Dendrochronological analysis of the oak

### 7.2.1 Introduction

The analysis of the oak assemblage (Table 7.2) was undertaken after each of the six seasons of fieldwork so it was very much an iterative approach, building on the data and results from the previous year. In all, 55 sequences have been dated and a master chronology for the site has been constructed which includes all dated sequences over 90 years in length. *BLoMx42* is 555 years in length and is dated to 797–243 BCE. Analysis was done on a structure-by-structure basis, so correlation was sought within structures and against existing chronologies. Consequently, some of the correlations quoted below to provide corroboration for position-of-best-match are against older versions of the site master chronology or original structure chronologies.

### 7.2.2 Episode 1

Oaks from Episode 1 came from ST1, ST2 and ST5 and from the trackway and associated structures (Table 7.2). The chronological relationships between the dated sequences are presented in Figure 7.4.

#### 7.2.2.1 ST1

ST1 produced only five oak timbers, two roundwood posts [021] and the three cleft oak stakes from the stakeline [040].

The posts [021/C] and [021/D] did not correlate with each other, possibly because they came from different sources; [021/C] was 144 years in age while [021/D] was only 45 years of age. However, on the assumption that they were felled in the same year they were averaged together to form a mean chronology *021mnx2*; a low correlation ( $t = 4.14$ ) with *BLoMx34* (an early version of the site master chronology) and some of its components date it to 435 BCE, indicating that the timbers were felled in the winter/ spring of 435/434 BCE.

The cleft oak stakes from stakeline [040] correlated well together (Table 7.3).

A mean chronology *SF40oakx3*, 158 years long was constructed which has been dated to 618–461 BCE (correlations with the ST2 oak is shown in Table 7.4). As sapwood was present on two of the stakes it was possible to calculate that the tree from which the stakes had been cleft was felled sometime between 461 BCE and 429 BCE.

#### 7.2.2.2 ST2

ST2 produced 36 oak timbers suitable for dendro analysis; these came primarily from the vertical plank walls, [243], [306] and [323], the posts of the internal post-rings [225] and [263], and the posts [307] and some of the horizontal timbers [305] and [316] in the entrance structure. The number of growth rings present varied hugely, from 51 rings to 374 rings but many sequences

	SF18	SF19	SF20
SF18	*	7.62	6.96
SF19		*	6.54
SF20			*

Table 7.3. T-value matrix for *SF40oakx3*, the three cleft oak states from stakeline [040].

were incomplete, either because of the methods of conversion used which had removed the inner rings (see Chapter 14.3.1) or because of decay which had removed the outer rings. Nonetheless, it was clear that particular types of oak had been selected for specific purposes, relatively short-lived roundwood for the posts of the post-rings (average number of rings present = 99) and large, very long-lived trunks to make the vertical planks (average number of rings present = 231).

Nineteen timbers have been dated (Table 7.4; Figure 7.5).

Eleven of the dated timbers retain the bark edge, three of which indicate felling in the winter/ spring of 437/436 BCE, two in the early spring of 435 BCE and six in the spring/ summer of 435 BCE. A further timber, [243/15], was probably felled in 436 BCE. These results indicate that ST2 was built in 435 BCE but preparation for construction had begun a year to 18 months previously in the winter/ spring of 437/436 BCE.

Some of the correlations between pairs of the sequences are so high as to suggest that those pairs of planks were converted from the same tree. These include [306W] and [306E] ( $t = 10.13$ ), [323/2] and [323/5] ( $t = 12.74$ ), and [243/2] and [323/3] ( $t = 10.35$ ). It is noticeable that each pair includes a central and outer tangential plank (Table 7.2), which suggests that they represent one half of the original log which was then cleft into two planks (see Chapter 14.3.1).

It has not been possible to date 16 of the sampled oaks from ST2. The vertical planks [243] were very difficult to measure; the outermost rings, particularly in the sapwood, were very compressed and distinguishing individual rings was often impossible. It seems most probable that they were felled at the same time as the other plank walling [323] and [306] but the differences between the growth-patterns, which has hindered any correlation, suggests that the [243] planks came from a different woodland (see Chapter 17.2.3.3). It is also noticeable that the posts only correlate well within themselves and poorly with the rest of the oak from ST2 (Table 7.4), again suggesting an origin in a different woodland.

#### 7.2.2.3 ST5

Only two pieces of oak were recovered from this structure, fragments of vertical oak planks [288/1] and [288/2]. The short overlap between the two pieces suggests that [288/2]

	starts	ends	225_3	225_4	225_5	263_1	263_3	263_5rm	263_6	243_2sh	243_15b	248_1	262_13	305M	306E_1	306W1a	316_2	323_2a	323_3rw	323_4	323_5l
225_3	549BCE	449BCE	*	4.98	3.77	5.87	-	4.43	-	-	-	3.66	\	-	-	-	\	-	-	3.55	-
225_4	533BCE	435BCE		*	5.37	-	3.03	-	3.93	-	-	3.07	\	\	-	-	\	-	-	4.61	-
225_5	550BCE	435BCE			*	3.60	-	5.55	5.15	-	-	3.46	\	-	-	3.11	\	-	-	-	-
263_1	544BCE	437BCE				*	-	5.49	-	-	-	-	\	-	-	-	\	3.29	3.21	-	4.81
263_3	538BCE	435BCE				*		2.62	5.34	-	-	-	\	\	-	-	\	-	-	-	-
263_5rm	544BCE	435BCE						*	4.12	-	-	-	\	-	-	-	\	-	-	-	-
263_6	538BCE	435BCE							*	-	-	-	\	\	-	3.23	\	-	-	-	3.69
243_2sh	738BCE	476BCE							*	5.41	-	-	6.04	5.27	5.38	6.95	4.78	8.60	10.35	9.26	8.82
243_15b	651BCE	448BCE							*	-	*	3.17	5.29	4.83	3.50	5.73	6.43	-	-	5.73	4.44
248_1	611BCE	435BCE							*	-		*	\	5.48	5.34	6.05	5.90	-	3.87	5.30	-
262_13	688BCE	612BCE							*	-			*	3.37	\	6.90	4.81	4.96	6.47	5.28	4.82
305M	698BCE	518BCE							*	-				*	4.94	8.48	6.01	3.98	7.30	4.14	4.17
306E_1	627BCE	436BCE							*	-				*	-	10.13	4.02	4.59	7.42	6.44	5.19
306W1a	726BCE	436BCE							*	-					*	-	6.01	4.57	7.64	8.70	8.36
316_2	695BCE	552BCE							*	-							*	-	5.80	6.33	-
323_2a	797BCE	437BCE							*	-							*	*	9.45	9.23	12.74
323_3rw	690BCE	437BCE							*	-								*	*	9.55	7.08
323_4	657BCE	469BCE							*	-								*	*	9.19	9.19
323_5l	712BCE	453BCE							*	-								*	*	*	*
288mmX2	760BCE	583BCE		-	-	-	-	-	-	7.79	5.43	4.08	4.22	4.02	4.34	9.02	-	5.61	4.00	4.27	5.70
SF40oakx3	618BCE	461BCE		-	-	-	-	-	-	4.00	-	-	-	-	4.05	4.55	-	-	4.31	-	-

Table 7.4. ST2; t-value matrix for dated oak (all values >3.00 shown), T-values >10.0 are highlighted in red. The posts are highlighted in red.

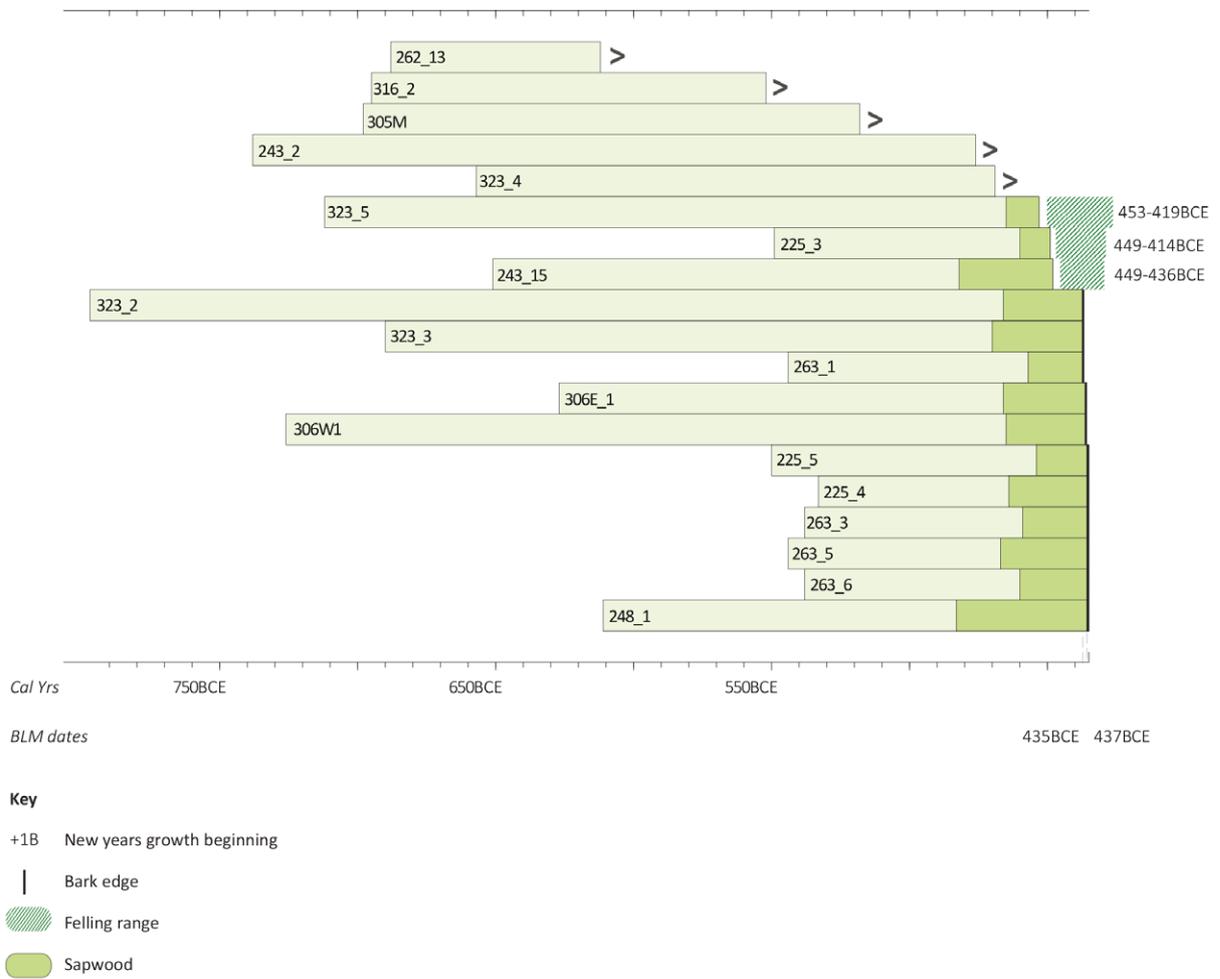


Figure 7.5. The chronological relationships between all the dated oak timbers from ST2.

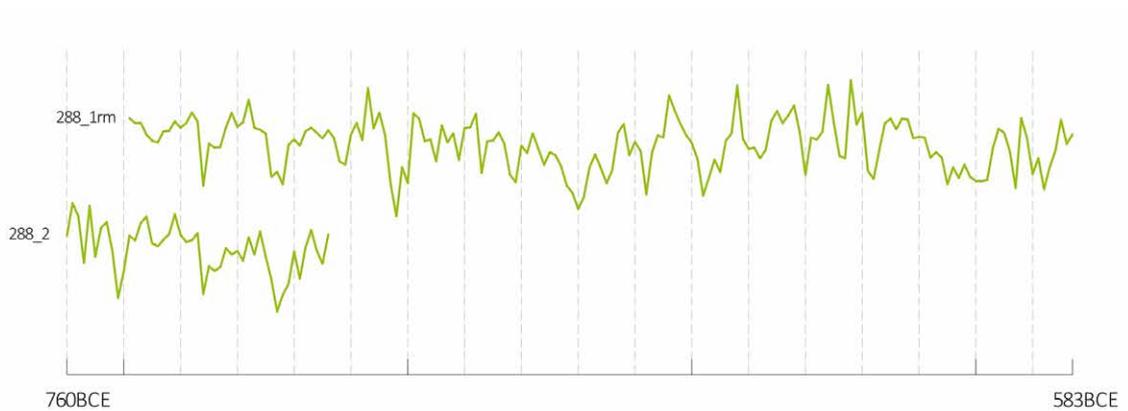


Figure 7.6. Visual correlation between vertical oak planks [288/1] and [288/2].

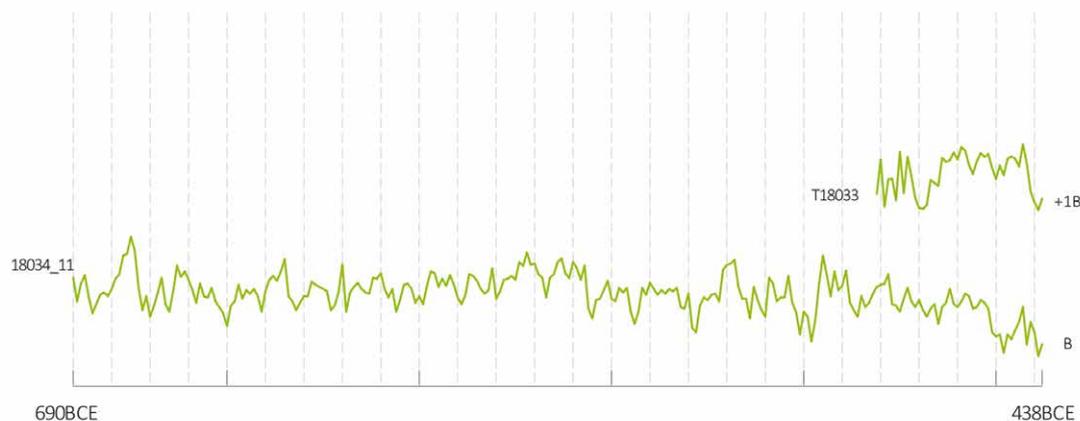


Figure 7.7. Visual correlation between post [18033] and threshold beam [18034/11].

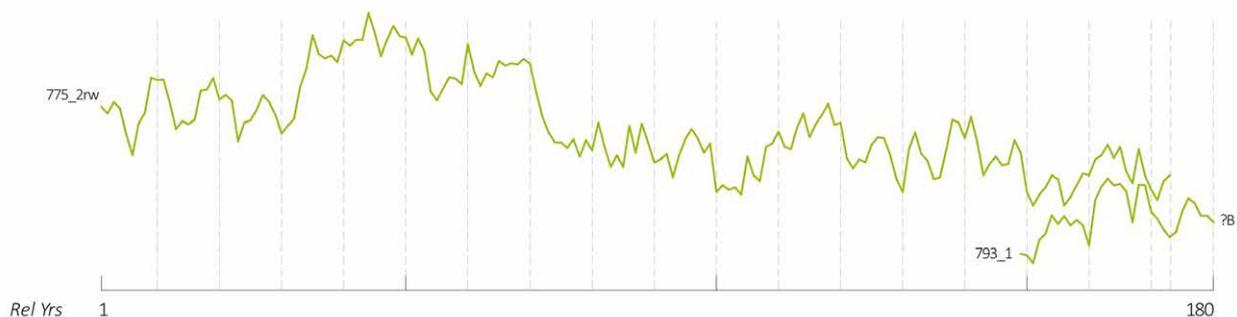


Figure 7.8. Visual correlation between post [793/1] and threshold beam [775/2].

is probably an inner fragment off the same original wall plank (Figure 7.6).

Consequently, a raw mean *288mnx2* was constructed which correlated very well with the ST2 sequences (Table 7.4) dating the outermost ring of *288mnx2* to 583 BCE; as there is no surviving sapwood this provides a *tpq* of 573 BCE for the construction of ST5. However, the close spatial integration of ST5 in the cluster of Episode 1 houses, as well as strong correlations with some of the ST2 sequences (Table 7.4) suggests that it was contemporary with the rest of the settlement.

#### 7.2.2.4 The trackway structures

The trackway was built primarily of alder logs, but oak was used at key positions along the trackway, as threshold beams and as posts pinning the threshold beams in place. Threshold beams were found in three positions along the trackway: at the entrance through the Episode 1 palisade, midway along the trackway in Trench 18 and not clearly associated with a barrier, and in the entrance area. Oak logs were also occasionally used as longitudinal components along the sides of the trackway. A total of eight oak samples from the trackway structures were analysed.

#### The Episode 1 Palisade 1 entrance threshold structure

The threshold beam was not sampled for logistical reasons. [15010], the roundwood post which pinned the W end of the beam in place and was also the terminal post of Palisade 1, retained its bark edge and was felled in the winter/spring of 436/5 BCE.

#### The middle threshold structure (Trench 18)

The threshold beam, [18034/11], was an outer tangential plank with a sequence of 360 rings and was complete to bark edge, but only the outer 253 rings were used in the analysis because the innermost rings contained bands of very compressed rings and there was the possibility of errors. It was felled in the winter/ spring of 438/437 BCE. Post [18033], inserted into the mortise at the E end of [18034/11], was a young fast-grown roundwood post complete to bark edge. Although there was no statistical correlation, it is visually acceptable when aligned with the outer ring of [18034/11] (Figure 7.7). As a new ring was just beginning to form under the bark on 18033 this means that it was felled in 437 BCE. It is thus probable that [18034/11] was also felled in 437 BCE.



Figure 7.9. Visual correlation between horizontal planks [729/1] and [729/2] in the entrance area.

### The entrance area threshold structure

The threshold beam, [775], was an outer tangential plank. It was too large and embedded in the baulk to move so the exposed mortised end was sampled, beyond the mortise, resulting in three separate fragments. The longest of these is [775/2rw], a composite sequence 173 years long; there were at least seven sapwood rings before the bark edge which were too compressed to measure, so there were at least 180 rings present. Growth is asymmetric and there were bands of very compressed rings and because of these issues, the three separate fragments did not match. Post [793/1] inserted into the mortise at the E end of [775] was a young fast-grown roundwood post. It matches well visually with [775/2rw] (Figure 7.8), suggesting that the estimate of seven unmeasured sapwood rings on [775/2rw] is correct. These sequences could not be dated.

#### 7.2.2.5 Post [15006]

A large oak post, [15006], was found within the area of the Episode 1 settlement but not clearly associated with any structures. It had been felled sometime between 451 BCE and 428 BCE.

#### 7.2.2.6 Episode 1 summary

The primary settlement was developed over a period of 2–3 years. The trackway into the settlement began to be laid in 437 BCE and in that and the following year oaks were felled in preparation for the construction of the roundhouses. Palisade 1 and ST2 were constructed in the spring/ summer of 435 BCE. ST1 may have been built in the same year or the following year.

### 7.2.3 Episode 2

Very little oak was used in the Episode 2 structures ST3, ST4 and ST6. None was found in ST4. Oak planks found in the entrance area may belong to this episode.

#### 7.2.3.1 ST3

Apart from the ring of small cleft oak stakes [1758] used in the construction of Hearth 8, which were too short for dendro analysis, the only oak used in the construction of ST3 were two pieces of oak, [1160/2] and [1727/2], which were part of the foundation under Hearth 5, and a poorly preserved plank, [18035], found just inside the W wall line. None of the ST3 oaks could be dated.

#### 7.2.3.2 ST6

Only three oak timbers were found in ST6. These included two of the posts in the four-poster structure [651] and a post, [636], possibly from an outer wall. The two posts from [651] correlated well with each other ( $t = 5.04$ ) indicating that they had both been felled in the same year, and a mean chronology, *651mn*, 53 years long was constructed. None of the ST6 oaks could be dated.

#### 7.2.3.3 Horizontal planks in the entrance area

Three heavily decayed planks were found in the entrance area lying rather haphazardly to the N of the threshold. Two of them, [729/1] and [729/2], compared well together ( $t = 5.5$ ) and a context chronology, *729MNx2* was constructed, 346 years in length. Their chronological relationship suggests that they may have been part of the same timber which had split up, [729/2] forming the innermost fragment (Figure 7.9).

It was found that *729MNx2* correlated well with *BLoMx24* ( $t = 6.71$ ), dating the outermost growth ring to 420 BCE. Although their surfaces were heavily eroded the outer edge of [729/1] is curved, suggesting that it may be near the heartwood/sapwood (h/s) boundary; thus *729MNx2* was definitely felled after 410 BCE and may have been felled between then and 374 BCE. Other timbers of this biological age in the assemblage (ie 300+ growth rings) have the maximum number of sapwood rings (Table 7.2) so it is more likely that the tree was felled in early decades of the 4th century BCE. The Episode 1 settlement went out of use *circa* 400 BCE

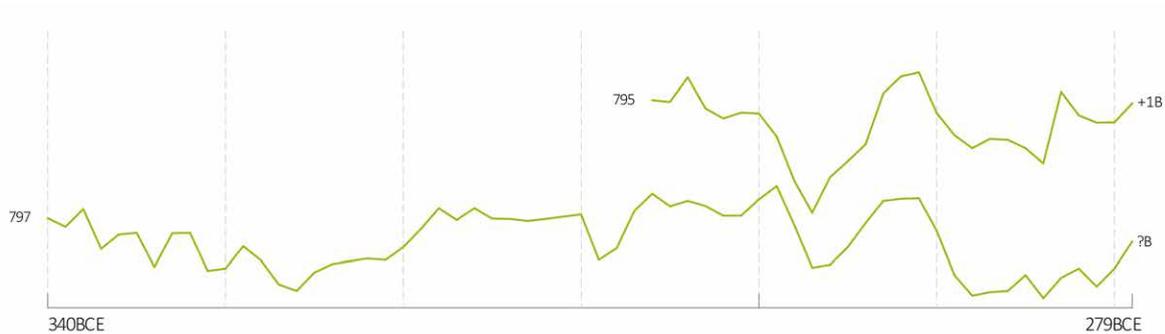


Figure 7.10. Visual correlation between posts [795] and [797].

(Chapter 2.3) so these planks may thus represent resurfacing of the trackway during the Episode 2 refurbishment of the settlement.

Timber [727] appears to have been a large splinter which had split off a plank; none of its original surfaces survived. It compared well with *BLoMx24* ( $t = 5.00$ ) and with some of its components dating its outermost ring to 437 BCE. It would therefore have been felled sometime after 427 BCE. It could feasibly have been part of the same phase of refurbishment as the [729] planks.

#### 7.2.3.4 Episode 2 summary

It has not been possible to date any of the buildings in this episode, mainly because very little oak was employed in their construction and the sequences of what was used were either too short or fragmentary. There is evidence of building activity on the trackway sometime after 410 BCE and probably in the first quarter of the 4th century BCE.

### 7.2.4 Episode 3

All the evidence for this final episode comes from a sequence of defensive perimeters around the site and it is the dendrochronological evidence which has defined the sequence.

Nineteen oak posts around the entrance area were analysed (Table 7.2). These were all roundwood posts, and varied in age from 24 to 148 years, although only five were over 100 years of age. Nine posts have been dated, mainly against each other or against *MN701x7S*, the palisade chronology (see below).

From earliest to latest the chronological sequence is as follows:

#### 7.2.4.1 Episode 3/1; 278–276 BCE

Posts [757/1] and [757/2] were formed from half-logs and had been inserted alongside each other to revet Bank 1 that lies along the E edge of the trackway. There was no correlation between the two sequences but, because of their position and identical appearance, it was assumed that they had had to be felled at the same time and so a mean chronology *757mnx2* was

constructed in which the outer rings were aligned (the two sequences were also individually producing the same felling date with low correlations when run against the *BLoM* masters). Chronology *757mnx2* produced significant correlations (*MN701x7S*  $t = 5.52$ ; *BLC7000*  $t = 4.8$ ) dating the mean chronology to 279 BCE. As [757/2] displays early spring growth under the bark, the trees were felled in 278 BCE.

Posts [795] and [797] were young roundwood posts which lay along the W edge of the trackway. They matched each other statistically ( $t = 3.81$ ) and visually (Figure 7.10) with their outer rings aligned and a mean chronology *795\_7mn* was constructed which compared well against an earlier version of the post chronology, *TR7POSTx7* ( $t = 6.25$ ) dating it to 279 BCE. Post [795] displays early spring growth under the bark so it was felled in 278 BCE. Post [797] was probably also felled in 278 BCE but the outermost ring was too damaged to determine whether early spring growth was present.

Posts [707] are an alignment of four posts which lay along the E edge of the trackway as it passed through the entrance area. The four posts were all of undressed roundwood but the sapwood was very decayed. Post [707/4] is the only one that has been dated and it was probably part of this phase of construction; the outermost surviving ring is dated to 280 BCE but there was some damage to the bark edge and there may have been 1–2 more unmeasurable growth rings, so it too was probably felled in 278 BCE.

Post [730/1] also belongs in this episode. It lies on the same alignment as the [707] posts but lay amongst the stones around the rampart terminus. The outermost ring is dated to 277 BCE but early spring growth was just beginning to form so it was felled in 276 BCE.

This group of dated posts indicates that there was building activity around the entrance way in 278 BCE and 276 BCE, with the construction of post-built walls and an earthen bank on either side of the trackway.

#### 7.2.4.2 Episode 3/2; 243 BCE

The date of 243 BCE for this episode comes from the felling dates for the oak planks [701] in Palisade 4. The dated oak timbers from Palisade 3, the terminus of Rampart 2 and

the trackway surface produced only *tpq* dates of 270 BCE, 268 BCE, 265 BCE and 262 BCE which would require them to have lost 27 yrs, 25 yrs, 22 yrs and 19 yrs respectively to have also been felled in 243 BCE. These are well within the sapwood ranges for native oak (English Heritage 1998) and therefore the construction of Palisade 4, Rampart 2 and the resurfacing of the trackway have been placed in this episode. Nonetheless, the *tpq* dates leave open the possibility that numerous other building events have been subsumed within this one episode.

### Palisade 3 & Rampart 2

Four oak posts were recovered from the slot of Palisade 3; [770/1] and [770/2] lay to the W of the trackway and [726/1] and [726/2] lay to the E. Posts [726/1] and [726/2] were both very decayed and not viable for analysis; [726/1] was too fast-grown and all that remained of [726/2] were splinters. Posts [770/1] and [770/2] were both roundwood posts but the sapwood had not survived on either. There was no statistical correlation between the two posts but the visual correlation was acceptable and a mean chronology, *770mnx2* was constructed which dated against *MN701x7S* to 272 BCE ( $t = 5.68$ ); this provides *tpq* dates of 262 BCE and 265 BCE for [770/1] and [770/2] respectively. Post [730/2] is a roundwood post inserted at the tip of the rampart terminus. It is dated to 280 BCE but, as no sapwood has survived, this provides a *tpq* of 270 BCE.

Post [770/1] provides a *tpq* of 262 BCE for the construction of Palisade 3. The palisade provided an outer revetment for the earthen Rampart 2 and this rampart lies over the Episode 2 house, ST3. Thus [770/1] also provides a *terminus ante quem* of 262 BCE for Episode 2.

### [737]: the oak plank trackway surface

Five fragments of planks forming the trackway were sampled; these were no more than splinters and consequently produced very short sequences. Three sequences were averaged together to produce a mean chronology *737mnx3*, 54 years long which compared well with *TR7POSTX9* ( $t=5.26$ ) and *MN701x7S* ( $t= 5.2$ ) dating it to 278 BCE. As none of the outer rings had survived this provides a *tpq* of 268 BCE for the construction of the plank trackway surface. This event could conceivably have happened in Episode 3/1 but it seems more likely that it would have happened in Episode 3/2 when the rampart and palisade signalled a major re-orientation of the entrance and a change in the nature of the perimeter (Chapter 6.3).

### Palisade 4

Palisade 4 was excavated across three trenches, Trench 7 ([701/11] to [701/15]), Trench 9 ([701/1], [701/2a] and [701/2b]) and Trench 12 ([701/3] to [701/10]) and 16 timbers were sampled (Table 7.2). Of these, two planks were

Burn 1	
@ 224 BCE	
<b>Master chronology</b>	
<b>DIMNX7 (323–153 BCE)</b>	5.6
<i>Dormans Island (AOC data)</i>	
<b>BLC7000 (5289 BCE–CE 1983)</b>	4.92
<i>Pilcher et al 1984</i>	
<b>T972 (295–194 BCE)</b>	4.73
<i>(Cults Loch 3) AOC data</i>	
<b>DORSEY (575–116 BCE)</b>	4.32
<i>(Co Armagh) QUB data</i>	
<b>LMACNEAN (272–187 BCE)</b>	4.26
<i>(Co. Fermanagh) QUB data</i>	
<b>NAVAN (275–126 BCE)</b>	3.97
<i>(Co. Armagh) QUB data</i>	

Table 7.5 Correlations between BURN1 and other site chronologies.

selected for conservation and two had short ring-sequences. Some of the remaining 12 samples produced the longest ring-sequences from the site.

Seven of the sequences have been dated (*MN701x7S*). Timbers [701/3], [701/4], [701/5] and [701/13] were all felled in the winter/ spring of 244/243 BCE while [701/11] was felled in the winter/ spring of 245/244 BCE. The outermost surviving ring on [701/6] is dated to 245 BCE but the bark edge was damaged, so it was not possible to determine whether there was another ring beyond that. Sapwood had not survived on [701/14] but its correlation with [701/13] was so high ( $t = 11.86$ ) as to suggest it had been converted from the same tree, so it too was probably felled winter/ spring of 244/243 BCE. Palisade 4 was therefore constructed in 243 BCE, while [701/11] (and possibly [701/6]) indicates that some of the timbers were felled up to 18 months beforehand.

Some of the undated samples from this context, [701/2a], [701/2b] and [701/8], were distinguished by bands of very compressed rings and dispersed pore patterns, which made measurement difficult and there may be errors in the measured sequences.

### Outlying perimeter posts

Three roundwood oak posts were recovered in apparently isolated positions along the W perimeter of the island. T8 and T9 are the posts recovered during the digging of the drainage ditch (Chapter 1.2), and [TP3/1] is a collapsed post found in Trench 3. The three sequences correlated well with each other (T8 & T9  $t = 6.20$ ; T9 & [TP3/1]  $t = 4.47$ ) and a mean chronology, *PALx3*, 104 years long and ending at the bark edge, was constructed. *PALx3* correlated well

Master chronology	701/7 @ 632 BCE	15056 @ 581 BCE
<b>BLoMx40</b>	9.51	7.64
797–243 BCE		
<b>CLMNx9</b>	5.24	4.37
709–438 BCE		
<b>KILLORAN</b>	4.40	-
871–194 BCE		

Table 7.6. Re-used timbers; correlations with other site chronologies.

with *MN701x7S* ( $t = 5.20$ ) dating it to 243 BCE. Both T8 and [TP3/1] were felled in the spring of 243 BCE so these posts must form part of the same perimeter construction as Palisade 4.

#### 7.2.4.3 Episode 3/3; 223 BCE

An isolated post was found on the edge of the burn. It was a young roundwood post with bark edge intact and comparison with other dated master chronologies produced significant and consistent correlations, dating it to 278–224 BCE (Table 7.5). A growth ring was just beginning to form under the bark, so the timber had been felled in 223 BCE. This is the only evidence for building activity in this episode.

#### 7.2.4.4 Episode 3 summary

The dating evidence for this episode reflects frequent rebuilding of the settlement perimeter over six decades, in 278–276 BCE, in 243 BCE and, finally, in 223 BCE. If we assume that occupation continued after this final building event, and allow a generation at least for that occupation, then the settlement was probably finally abandoned in the early 2nd century BCE.

### 7.2.5 Re-used timbers? Pre-settlement activity?

Two oaks have produced significantly earlier dates which suggest pre-settlement activity.

Oak [701/7], one of the timbers from Palisade 4, has been dated to 752–632 BCE. There was no surviving sapwood on [701/7] but the curvature of the outer edge suggests that it may lie near to the h/s boundary; thus the tree was definitely felled after 622 BCE and possibly before 586 BCE.

Post [15056] was the post in the post-pad on the E side of the Episode 1 threshold structure. This roundwood post had lost all its sapwood and some outer heartwood rings, and a concentric crack along the rings divided the ring-pattern, so it had to be measured in two discrete sequences. Comparison with the site master indicated that there was

no gap between the sequences and a single sequence was constructed. The outer ring of this composite sequence has been dated to 581 BCE. The curvature of the outer edge suggests that the outermost ring may lie on or near the h/s boundary, thus the tree was definitely felled after 571 BCE and possibly before 535 BCE.

Both these timbers indicate building activity in the late 7th century BCE and early half of the 6th century BCE. In this context it is interesting to note that [701/7] was a quarter-log, an unusual conversion when compared with the planks (Chapter 14.3.1) used throughout the construction of Palisade 4, while [15056], although a roundwood post, had lost many of its outer rings to erosion, suggesting that it had been hanging around for some time. There is no other evidence of activity that pre-dates Episode 1 on the island so these timbers may represent re-use of old building materials from another settlement.

Table 7.6 shows that the sequences from these timbers produced highly significant correlations against a version of the site master chronology which did not include them (*BLoMx40*). However, as single sequences with surprisingly early dates, further corroboration was sought by comparing them against other dated master chronologies. They both correlate well at the dated position with *CLMNx9*, the master chronology from Cults Loch 3 (Crone 2018: 36–39) but there are no other master chronologies from geographically proximate areas which cover the relevant timespan. Only one other Irish chronology KILLORAN, produced a correlation for [701/7].

### 7.2.6 Summary

The chronology of the settlement, as represented by the dendrochronological evidence, is summarised as follows:

#### Pre-settlement activity

Sometime in the late 7th century/ early half of the 6th century BCE there is building activity (not necessarily on the island) represented by re-used timbers.

#### Episode 1

The trackway into the settlement begins to be laid in 437 BCE and construction of the Episode 1 settlement and palisade takes place in 435 BCE.

#### Episode 2

There are no dates for the Episode 2 buildings but there is building activity on the trackway sometime after 410 BCE and probably in the first quarter of the 4th century BCE.

#### Episode 3

3/1: In 278–276 BCE a barrier of posts is constructed on either side of the trackway in the entrance area.

Context	Sample no.	Context description	Diam (mm)	Rings	Outer rings
<b>EPISODE 1</b>					
<b>ST1</b>					
9	1	sub-floor structure	/	95	be?
9	3	sub-floor structure	/	78 +1?	be?
9	4	sub-floor structure	/	49	be
16	11	stakes	65	32	be s/s
28	6	stakes	60	24	be
41	3	hearth framework	-	100+	be?
41	5	hearth framework	-	103	be
42	1	hearth framework	-	90	be
46	2	primary foundation	250	107	be s/s
46	3	primary foundation	150	75	be
46	4	primary foundation	100	60	be
46	5	primary foundation	200	47	be w?
46	6	primary foundation	190 - 220	186	be
46	7	primary foundation	160	98	be
46	8	primary foundation	210	154	be
46	9	primary foundation	180	90	be
46	10	primary foundation	160	87	be
46	11	primary foundation	130	71+	be
46	13	primary foundation	160	94	be
46	14	primary foundation	100	75	be
46	15	primary foundation	240	105	be w?
47	9 (8A)	surface W of hearth	-	88	be
021/A1	1	post-ring	-	77	be
021/A2	2	post-ring	-	73	be
021/A3	3	post-ring	-	77	be
021/B	021/B	post-ring	-	77	be
<b>ST2</b>					
223	1	post-ring	260	81 +	be
223	2	post-ring	220	89	be
263	2	Hearth 3	150 -170	37	be
263	4	Hearth 3	125	29	be
263	7	Hearth 3	140 -155	42	be
272	1	Hearth 3	65	26	be
272	3	Hearth 3	80	54	be
277	1	foundation	200	95	be
277	2	foundation	185 - 210	121	+1 be
277	3	foundation	170	107	be
277	4	foundation	215 - 270	115	be
277	5	foundation	175	43	+1 be
277	6	foundation	180 - 200	115	be

Context	Sample no.	Context description	Diam (mm)	Rings	Outer rings
277	7	foundation	240 - 270	139	be
321	2	external surface	210	110	be
321	3	external surface	200	91	be
<b>Palisade 1</b>					
1022	1	palisade post	160	32	?
1022	2	palisade post	220	102	b
1022	3	palisade post	160	84+	b w
1022	4	palisade post	140	94	b w
1022	5	palisade post	245	91	b w
1022	6	palisade post	180	102	b w
1022	7	palisade post	300	114	b?
1022	8	palisade post	180	93	b
1022	9	palisade post	220	104+	b
1022	10	palisade post	180	95	b
1022	11	palisade post	180	70+	b
1022	12	palisade post	150	108	?
1022	13	palisade post	110	97	b w
<b>Trackway structures</b>					
796	1	longitudinal half-log	310 X 160	104	be
807	1	longitudinal log	250	123 +1	+1 to be
15002	2	trackway log	290	127	be
	3	trackway log	320	140	be
	4	trackway log	240	121	be
	5	trackway log	200	121 +1	+1 to be
15004	1	longitudinal log	180 × 150	121 +1	+1 to be
18025	1	trackway log	190	102	be
	2	trackway log	280	130	be
	3	trackway log	170	91	+1 to be
	5	trackway log	200	120	+1 to be
	6	trackway log	200	124	? +1 to be
18034	1	trackway log	190	103	be
	2	trackway log	230	120	+1 to be
	4	trackway log	200	97	be
	7	trackway log	270	212	be
	8	trackway log	190	125	+1 to be
	9	trackway log	230	104	be
	10	trackway log	200	31	+1 to be
	12	trackway log	230	93	be
	13	trackway log	230 × 180	84	be
	14	trackway log	190	127	be
763		post in fenceline	100	40	b?

Context	Sample no.	Context description	Diam (mm)	Rings	Outer rings
<b>EPISODE 2</b>					
<b>ST3</b>					
1711	1B	stake	80	30	be
1716	S6	stake	95	35	be
1755	1	sub-floor structure	170	62	be
	2	sub-floor structure	135	51	be
	3	sub-floor structure	175	52	be
1760	S10	stake	100	24	be
	S16	stake	90+	42	be?
	S17	stake	50	39	be
	S22	stake	90	26	be
1760	S26	post	110 - 160	22	be
15007	3	stake	42	21	be
	5	stake	60	20	+1 to be
	17	stake	60	20	+1 to be
	35	stake	50	21	+1 to be
15036	1	post	160	25	be
15052	2E	sub-floor structure	60	20	+1 to be
<b>ST6</b>					
626		stake	170	104	be
<b>Trackway structures</b>					
776	1	trackway log	90	28	be?
	2	trackway log	155	23 +1	+1 to be
794	1	trackway log	190 X 240	46	be
	3	trackway log	110	25	be
<b>Palisade 2</b>					
609	6	post		82+	be
609	8	post	220	74	be
609	9	post	185	96	be
<b>EPISODE 3?</b>					
742	1	post	145 x 115	36+1	+1 to be
	4	post	110	37 +1	+1 to be
TP5	3	stake from Test-pit 5	140	28	be

Table 7.7. The alder; summary of dendrochronological data. be = bark edge; be s/s = spring/ summer felled; be s = summer felled; be w = winter felled; +1 to be = new ring beginning to form after last measured ring.

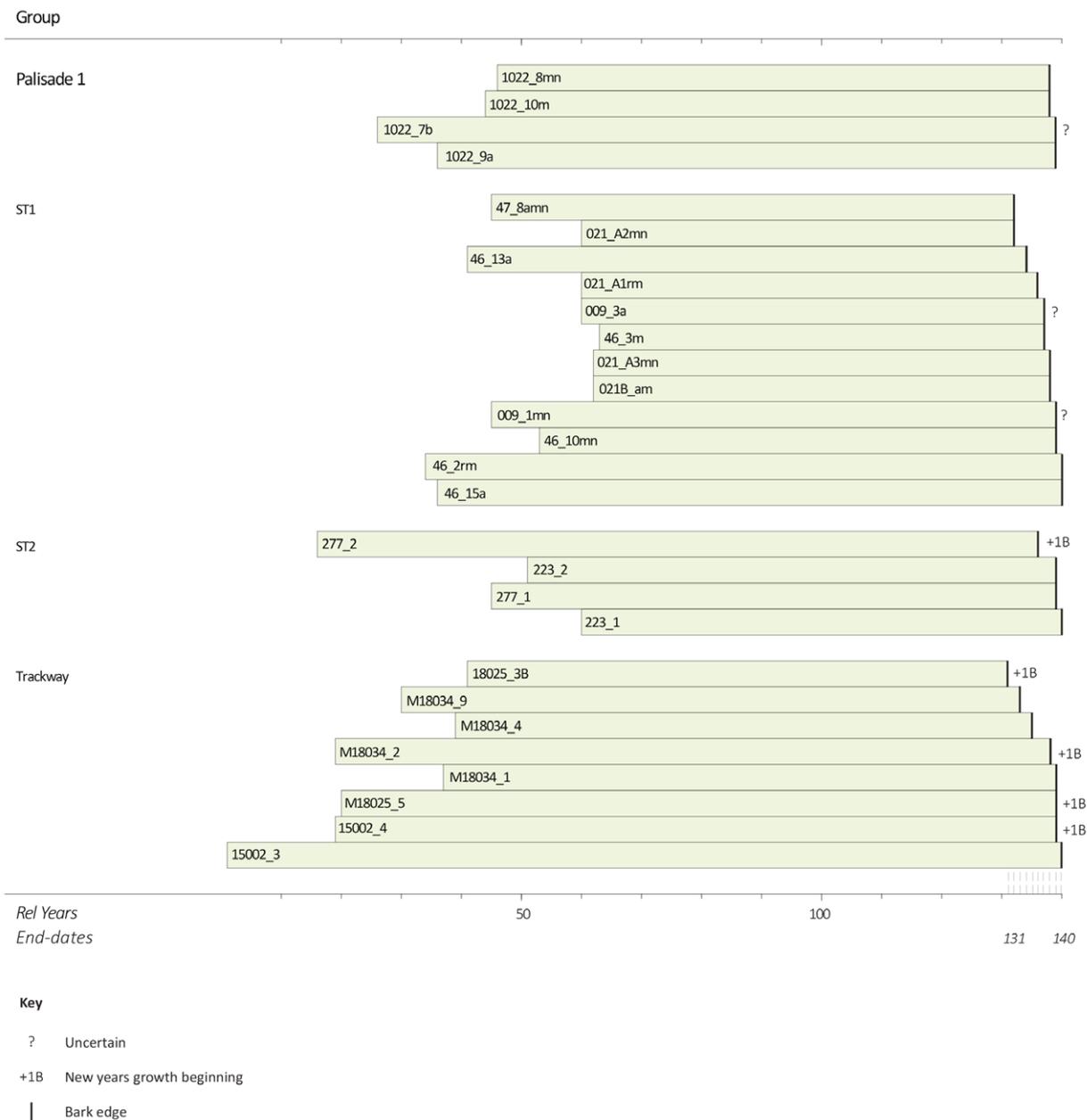


Figure 7.11. The chronological relationships between the Group 1 alder timbers.

3/2: Palisade 4 is constructed in 243 BCE. A palisade of oak posts continues the circuit of this palisade around the W edge of the island. Palisade 3, the terminus of Rampart 2 and the trackway surface produced *tpq* dates of 270 BCE, 268 BCE, 265 BCE and 262 BCE so these structures may form part of the major re-modelling in 243 BCE or they may represent continuing modifications to the defensive perimeter from Episode 3/1 onwards.

3/3: There is further work on the perimeter of the settlement in 223 BCE, represented by the single post in the burn.

## 7.3 Dendrochronological analysis of the alder

### 7.3.1 Introduction

Some 103 alder timbers were analysed, of which 45 have been chronologically grouped (Table 7.7). The assemblage contained a significant quantity of long-lived alder; some 43% were over 70 years of age and the oldest present was 212 years of age. The age structure of the alder assemblage is discussed in detail in Chapter 18.1.4.1.

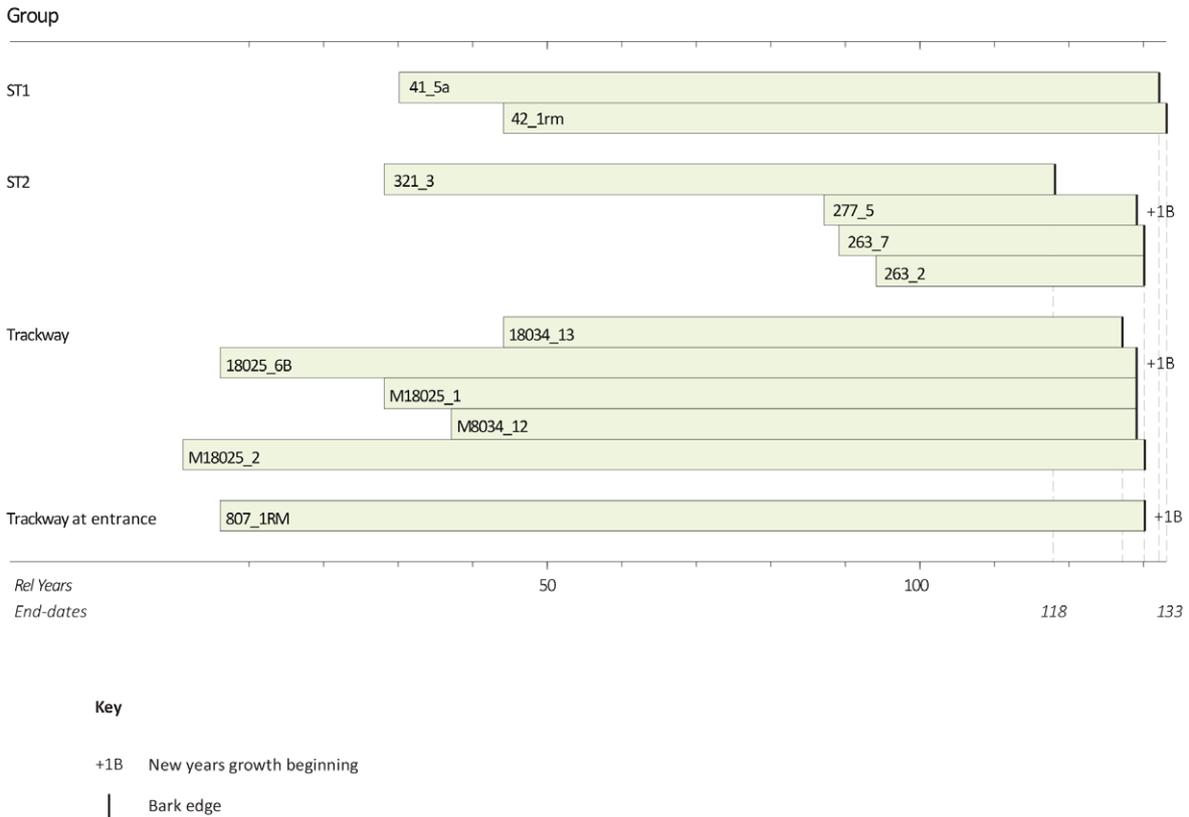


Figure 7.12. The chronological relationships between the Group 2 alder timbers.

Two chronologies for the grouped Episode 1 sequences have been formed, *GROUP1x28*, 140 years long, and *GROUP2x12*, 133 years long (Figures 7.11 & 7.12).

Both chronologies display good internal correlation (Tables 7.8 & 7.9) but there are no correlations between the chronologies. However, there are transverse logs from the trackway in both chronologies and from a structural and stratigraphic viewpoint they must belong to the same phase of construction.

Therefore, it is argued here that, although the chronologies cannot be precisely aligned, the end-dates for the trackway logs all fall within the same felling band, a nine-year band in *GROUP1* (Figure 7.11) and a four-year band in *GROUP2* (Figure 7.12). The relationships within these chronologies place the construction of ST1, ST2, Palisade 1 and the trackway, from the entranceway into the interior, within the same felling band. All these constructions contain oak which had been felled between 437–435 BCE, so they were all built in Episode 1. Almost all the analysed alder timbers are from Episode 1 with only 23 timbers from Episode 2 and none from Episode 3.

## 7.3.2 Episode 1

### 7.3.2.1 The trackway

Fourteen components of the trackway have been grouped. This includes log [807/1] from the entrance way, transverse logs [15002] and [18034], and longitudinal logs [15004] and [18025]. The grouped sequences display end-dates spread over nine years in *GROUP1x28* and over four years in *GROUP2x12*. Thus, if there was replacement of logs along the trackway it happened within a decade and cannot be distinguished using tree-ring analysis. The key relationship is that of log [807/1] with the other trackway logs; this demonstrates that the Episode 1 trackway extended out beyond Palisade 1 to the entranceway on the S edge of the island.

### 7.3.2.2 Palisade 1

Four components of the palisade have been grouped. These display end-dates over two years.

			REM_9a	009_1mn	009_3a	021_A1rm	021_A2mn	021_A3mn	021b_am	46_2rm	46_3m	46_10mn	46_13a	46_15a	47_8amn
	<i>starts</i>	<i>ends</i>													
REM_9a	36	139	*	3.88	-	3.59	3.69	3.84	-	5.50	-	3.79	6.02	4.81	3.48
009_1mn	45	139		*	-	6.38	3.63	4.18	4.19	4.70	-	-	5.29	3.51	3.44
009_3a	60	137			*	-	3.09	-	-	-	3.40	3.48	-	-	-
021_A1rm	60	136				*	8.88	8.44	6.88	5.51	3.01	-	5.00	-	3.64
021_A2mn	60	132					*	10.53	3.76	6.80	3.46	-	4.47	5.63	3.54
021_A3mn	62	138						*	3.97	5.95	-	3.21	5.35	-	3.19
021b_am	62	138							*	-	-	-	5.26	-	5.57
46_2rm	34	140								*	3.50	-	6.47	6.29	3.11
46_3m	63	137									*	6.30	4.00	-	-
46_10mn	53	139										*	4.22	-	3.41
46_13a	41	134											*	3.26	6.97
46_15a	36	140												*	-
47_8amn	45	132													*
223_1	60	140													
223_2	51	139													
277_1	45	139													
277_2	16	136													
1022_8mn	46	138													
1022_10mn	44	138													
15002_3	1	140													
15002_4	19	139													
18025_3B	41	131													
M18025_5	20	139													
M18034_1	37	139													
M18034_2	19	138													
M18034_4	39	135													
M18034_9	30	133													
REM_7mn	26	139													

Table 7.8 The alder; t-value matrix for *GROUP1x28*. All t-values >5.0 highlighted in red (above).

### 7.3.2.3 ST1

Fourteen timbers from ST1 have been grouped. These include timbers from the foundation logs [046], the post-ring [021], the floor surfaces [009] and [047], and the hearth framework [041] and [042]. There is a spread of end-dates over nine years, with stratigraphic inconsistencies throughout. For instance, the foundation logs [046], display end-dates which fall after those of the floor surfaces which lie above them (Figure 7.11). There is evidence in ST1 for as many as three phases of refurbishment, ie the stack of three superimposed hearths and the replacement posts in the post-ring (Chapter 3.3) but these phases could not be disentangled using tree-ring analysis. However, the analysis does suggest that if we allow for roughly three years between each refurbishment (nine years divided by three phases) then ST1 was probably not occupied for much more than a decade.

### 7.3.2.4 ST2

Seven timbers from within ST2 have been grouped. These include timbers from the foundation structure [277], the sillbeams [223] and the inner post-ring [263]. These display a range of end-dates over four years. There is no evidence that any of the superstructure was replaced so it is assumed that the post-ring and sillbeams were erected at the same time as the foundation structure.

One of the logs [321] forming the external surface around ST2 has also been grouped. This is the only grouped sequence that lies outwith the nine-year felling band displayed by all the other grouped Episode 1 sequences. Its end-date lies 13 years before the latest of the end-dates displayed by the GROUP2 sequences (Figure 7.12) but it is improbable that a single timber represents an earlier phase. Rather, it displays a pronounced decrease in the outermost rings and probably

223_1	223_2	277_1	277_2	1022_8mn	1022_10mn	15002_3	15002_4	18025_3B	M18025_5	M18034_1	M18034_2	M18034_4	M18034_9	REM_7mn
-	3.14	-	-	-	4.05	-	-	-	-	3.89	3.58	4.60	-	4.28
-	-	-	-	-	-	3.29	-	-	-	-	-	3.37	-	3.54
-	-	-	-	-	-	3.71	-	-	3.22	-	3.62	-	-	4.34
-	-	-	-	-	-	-	-	4.66	-	-	3.87	3.14	5.03	4.18
3.98	4.22	3.97	5.70	4.26	5.20	-	5.90	4.02	-	3.48	6.61	5.41	4.86	6.61
-	-	-	3.94	-	3.49	-	-	3.69	-	3.69	4.46	4.65	3.58	4.66
-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.61
-	4.59	3.99	4.15	4.36	6.44	4.37	-	4.55	3.21	5.10	5.47	4.29	5.04	5.93
-	-	-	-	4.07	-	3.19	-	3.53	-	3.62	4.76	-	4.89	-
-	3.57	-	-	-	-	-	-	4.10	-	-	4.42	-	3.77	-
-	3.27	-	3.67	3.64	6.68	-	3.54	4.21	4.08	3.94	5.09	5.89	5.35	4.02
5.16	4.33	3.79	5.71	5.26	5.62	3.78	4.23	-	-	4.95	4.37	5.65	3.02	4.58
-	-	-	-	-	5.37	-	-	3.31	5.70	-	3.77	5.48	3.61	3.85
*	3.98	4.09	3.19	-	3.10	-	-	-	-	5.30	-	5.05	-	3.08
	*	4.04	-	3.81	3.40	-	-	3.14	-	5.32	3.98	3.48	-	-
		*	6.11	3.66	4.60	-	4.33	-	-	6.71	5.30	-	-	3.75
			*	4.27	4.90	-	3.94	-	-	4.49	4.63	4.26	-	4.78
				*	7.39	-	3.97	3.73	-	4.31	8.45	-	5.51	3.90
					*	-	4.14	4.07	-	6.96	7.51	6.65	5.34	4.62
						*	-	-	-	-	-	-	-	3.77
							*	-	-	3.69	5.14	3.48	-	-
								*	3.74	-	6.60	3.08	9.18	4.31
									*	-	3.07	4.20	4.67	3.35
										*	6.98	4.34	3.56	3.67
											*	5.92	7.76	5.91
												*	3.85	5.78
													*	4.71
														*

			M18034_12	41_5a	42_1rm	263_2	263_7	277_5	321_3	807_1RM	18025_6B	18034_13B	M18025_1	M18025_2
	starts	ends												
M18034_12	37	129	*	3.80	5.36	4.43	3.42	5.73	5.91	7.52	7.32	7.31	9.50	7.66
41_5a	30	132		*	3.92	-	-	3.45	6.76	5.35	3.96	3.06	4.26	5.36
42_1rm	44	133			*	-	-	-	5.23	6.79	6.25	5.61	5.66	6.27
263_2	94	130				*	-	4.56	-	-	-	3.77	3.85	-
263_7	89	130					*	-	-	-	-	-	-	3.22
277_5	87	129						*	3.26	3.95	4.34	3.92	6.34	3.81
321_3	28	118							*	8.22	6.75	4.62	7.13	7.80
807_1RM	6	130								*	6.78	9.09	9.20	12.36
18025_6B	6	129									*	7.43	7.79	6.46
18034_13B	44	127										*	8.63	10.59
M18025_1	28	129											*	7.93
M18025_2	1	130												*

Table 7.9. The alder; t-value matrix for GROUP2x12. All t-values >5.0 highlighted in red.

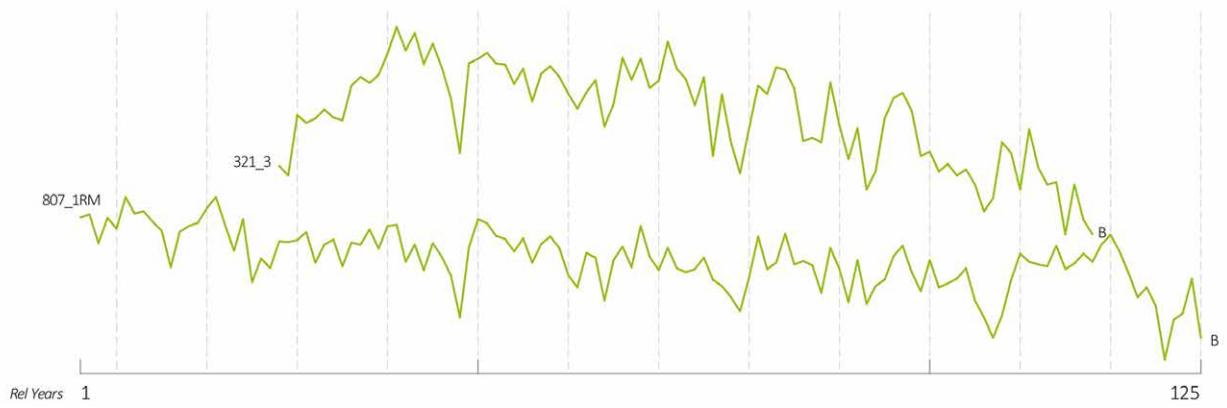


Figure 7.13. Visual correlation between logs [321] and [807/1].

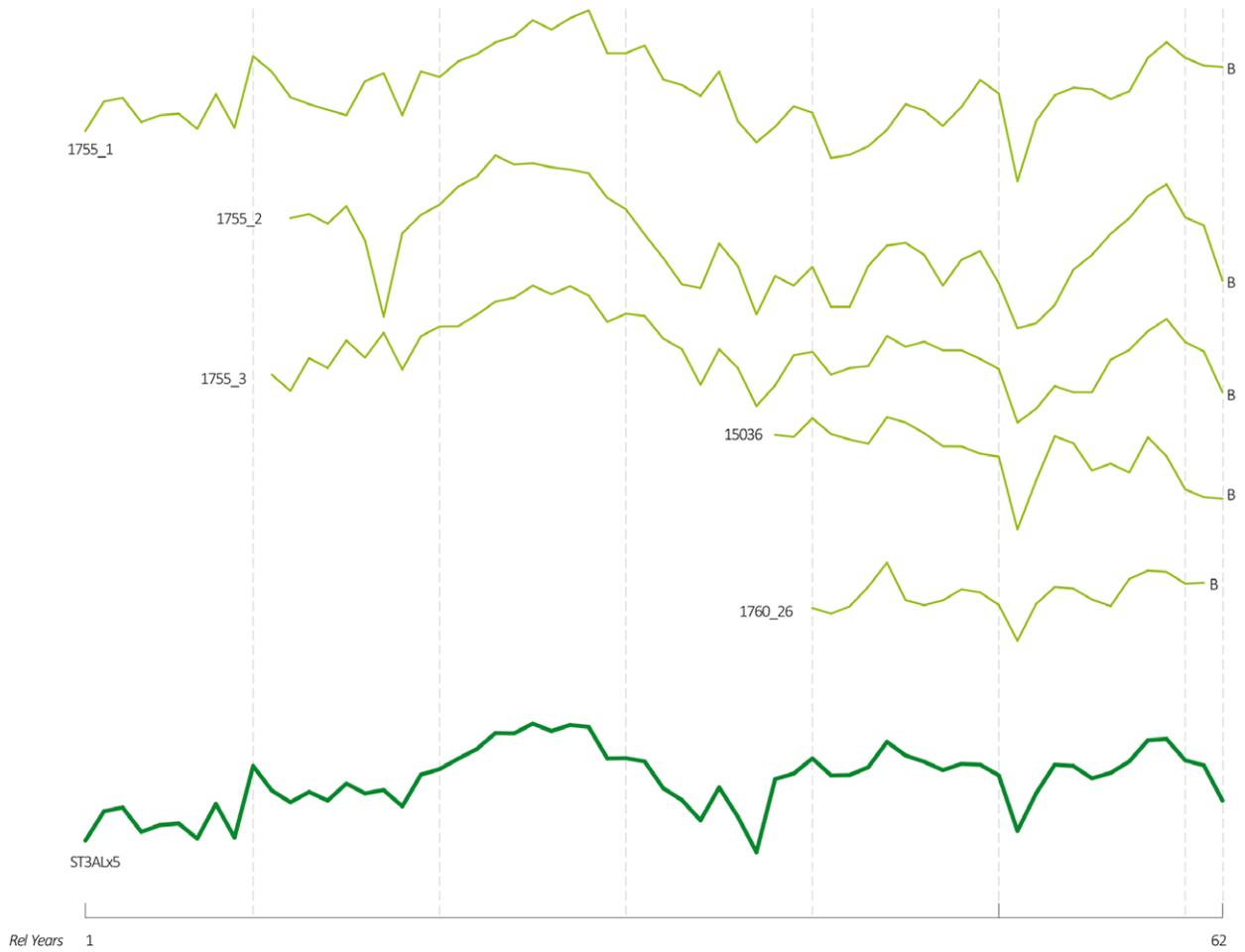


Figure 7.14. Visual correlations between the components of the alder context chronology *ST34Lx5*. The context chronology is shown in darker green.

Context	Sample no.	Context description	Diam	Rings	Outer rings
<b>EPISODE 1</b>					
<b>ST1</b>					
15	4	stake	40	28	be?
16	12	stake	76	25	be s/s
16	15	stake	80	45	be s/s?
28	4	stake	65	32	be
28	5	stake	80	30	be s/s
40	6	stake	50	23	be s/s
48	1	stake	66	38	be
48	2	stake	90	45	be
48	3	stake	62	24	be
<b>ST2</b>					
232	1	inner stakeline	72	49	be
232	2	inner stakeline	81	38	be s
232	3	inner stakeline	91	54	be
232	4	inner stakeline	82	45	+1 to be
232	11	inner stakeline	74	22	be
232	17	inner stakeline	74	49	be s
232	22	inner stakeline	84	46	be
232	23	inner stakeline	78	24	be
232	25	inner stakeline	95	46	be s
232	27	inner stakeline	63	43	be
232	31	inner stakeline	135	56	be s
232	33	inner stakeline	61	31	be
232	34	inner stakeline	74	50	+1 to be
233	9	outer stakeline	47	21	be
233	10	outer stakeline	56	44	?be
233	13	outer stakeline	54	25	be s
233	14	outer stakeline	60	39	be s
233	15	outer stakeline	63	43	be
233	17	inner stakeline	51	27	be
233	20	inner stakeline	51	21	be
233	21	inner stakeline	55	20	be
233	24	inner stakeline	47	21	be
233	25	inner stakeline	64	24	be
233	29	inner stakeline	83	31	be
260	1	inner stakeline	50	23	+1 to be
260	3	inner stakeline	95	47	+1 to be
260	4A	outer stakeline	58	28	be

Context	Sample no.	Context description	Diam	Rings	Outer rings
<b>ST5</b>					
289	2	outer stakeline	60	38	be s
289	3	outer stakeline	65	39	be
289	4	outer stakeline	47	27	be
289	5	outer stakeline	75	20	be s
289	6	outer stakeline	72	40	be
299	1	inner stakeline	60	33	be
<b>Trackway fencelines</b>					
15042	14	stake	75	33	be
15042	20	stake	40	20	be
15042	24	stake	65	33	be
15042	25	stake	65	25	be
15042	27	stake	65	33	be
<b>EPISODE 2</b>					
<b>ST3</b>					
1124	2	Phase 7 stakeline	45 x 50	32	be?
1124	3	Phase 7 stakeline	60	35	be?
1124	5	Phase 7 stakeline	55+	35	be?
1124	6	Phase 7 stakeline	50	21	be?
1124	7	Phase 7 stakeline	65	22	be
1133	2	Phase 7 stakeline	65	34	be
1133	3	Phase 7 stakeline	55	22	+1 to be
1133	4	Phase 7 stakeline	65	25	be
1133	6	Phase 7 stakeline	55	29	be
1133	B1	Phase 7 stakeline	55	21	+1 to be
1133	B2	Phase 7 stakeline	50	26	be
1135	1	Phase 1 outer wall line	47	25	be
1135	3	Phase 1 outer wall line	50	33	+1 to be
1135	4	Phase 1 outer wall line	55	38	be
1135	6	Phase 1 outer wall line	50	35	be
1135	7	Phase 1 outer wall line	67	26	+ 3 to be?
1135	9	Phase 1 outer wall line	55	29	be
1135	10	Phase 1 outer wall line	45	29	be
1135	11	Phase 1 outer wall line	65	36	be
1149	5	Phase 6 Hearth 5	35	24	be

Context	Sample no.	Context description	Diam	Rings	Outer rings
1167	1	Phase 1 inner wall line	47	29	be
1167	9	Phase 1 inner wall line	55	24	be
1710	S2	Phase 6 inner wall line	60	31	be
1710	S3	Phase 6 inner wall line	50	35	be
1710	S5	Phase 6 inner wall line	75	31	+1 to be?
1710	S7	Phase 6 inner wall line	65	32	be
1710	S9	Phase 6 inner wall line	60	31	be
1711	1A	Phase 6 outer wall line	40 × 60	27	+1 to be?
1711	2A	Phase 6 outer wall line	62	27	be
1711	8	Phase 6 outer wall line	60	26	+1 to be
1711	13	Phase 6 outer wall line	60	35	+1 to be?
1716	S5	Phase 7 stakeline	70	28	be
1742	S3	Phase 4 Arc 1	70	44	be
1742	S7	Phase 4 Arc 1	70	34	be
1760	S1	Phase 4 Arc 1	60	21	be
1760	S4	Phase 4 Arc 1	55	30	be
1760	S9	Phase 4 Arc 1	46	20	be
1760	S13	Phase 4 Arc 1	50	20	be
1760	S19	Phase 4 Arc 1	60	44	be
1760	S21	Phase 1 screen 1760/A	95	27	be
1760	S23	Phase 1 screen 1760/A	50	33	be
1760	S24	Phase 4 Arc 1	70	38	be
1760	S25	Phase 1 screen 1760/A	55	41	be?
1760	S28	Phase 1 screen 1760/A	90	35	be
15007	1	Phase 1 outer wall line	45	23	+1 to be
15007	3	Phase 1 outer wall line	42	21	be
15007	5	Phase 1 outer wall line	60	20	+1 to be
15007	6	Phase 1 outer wall line	50	25	be
15007	9	Phase 1 outer wall line	43	28	be
15007	12	Phase 1 outer wall line	42	25	be
15007	16	Phase 1 outer wall line	55	23	+1 to be
15007	17	Phase 1 outer wall line	60	20	+1 to be

Context	Sample no.	Context description	Diam	Rings	Outer rings
15007	18	Phase 1 outer wall line	47	22	be
15007	20	Phase 1 outer wall line	50	22	be
15007	23	Phase 1 outer wall line	65	22	+1 to be
15007	32	Phase 1 outer wall line	50	21	be
15007	33	Phase 1 outer wall line	75	39	be
15007	36	Phase 1 outer wall line	35	21	be
18012	1	Phase 1 outer wall line	55	33	be

Table 7.10. The hazel; summary of dendrochronological data. be = bark edge; be s/s = spring/ summer felled; be s = summer felled; be w = winter felled; +1 to be = new ring beginning to form after last measured ring.

stopped laying down growth early. It correlates most strongly with the entrance trackway log [807/1] ( $t = 7.75$ ) which also displays a similarly dramatic decrease in ring-width in its outer rings (Figure 7.13).

### 7.3.3 Episode 2

#### 7.3.3.1 ST3

Five alder timbers were grouped together as *ST3ALx5* (Figure 7.14). The floor supports [1755] and the two *in situ* concave-based posts [15036] and [1760/26] in the post-ring all display the same end-date.

Stratigraphically the floor supports are Phase 2 and thus, by correlation the posts are also Phase 2 but this would leave the Phase 1 structure without a post-ring and therefore without a roof. As this is improbable the more likely explanation is that Phases 1 and 2 were both part of the primary construction of the house and were completed within the same year.

There were very few correlations amongst the alder stakes from the stakelines in ST3. Only two pairs correlated, [15007/17] and [15007/35] ( $t = 3.2$ ), and [18005/2B] and [18005/2E] ( $t = 3.29$ ), both indicating felling in the same year.

#### 7.3.3.2 Palisade 2

Three of the posts from Palisade 2 were analysed but they did not correlate with each other or with the ST3 alder.

## 7.4 Dendrochronological analysis of the hazel

In all 106 hazel timbers were analysed; age varied from 20 to 58 years with an average age of 29.5 years (Table 7.10). Of these 39 could be grouped. All the hazel

had been used as stakes in the wall lines and inner stakelines of ST1, ST2, ST3 and ST5, and the fencelines along the trackway.

All samples retained the bark edge and in many cases the bark was still *in situ*. Despite this the heartwood immediately under the bark was on occasion decayed and this made observation of the outermost ring difficult (see Chapter 7.1.1).

## 7.4.1 Episode 1

### 7.4.1.1 ST2

Of the 27 hazel timbers in ST2, 16 have been grouped, all from the inner and outer wall lines, [232], [233] and [260]. The five longest of the sequences correlated very strongly together (Table 7.11) and a chronology *ST2x5HAZ* was constructed (Figure 7.15).

Table 7.11. The hazel; t-value matrix for *ST2x5HAZ*. All t-values >5.0 highlighted in red.

			260_3a	232_3a	232_4a	232_17a	232_25a
	<i>start</i>	<i>end</i>					
260_3a	12	58	*	4.33	5.90	5.07	9.62
232_3a	1	54		*	5.31	6.34	4.19
232_4a	15	59			*	3.89	7.42
232_17a	9	57				*	4.49
232_25a	13	58					*

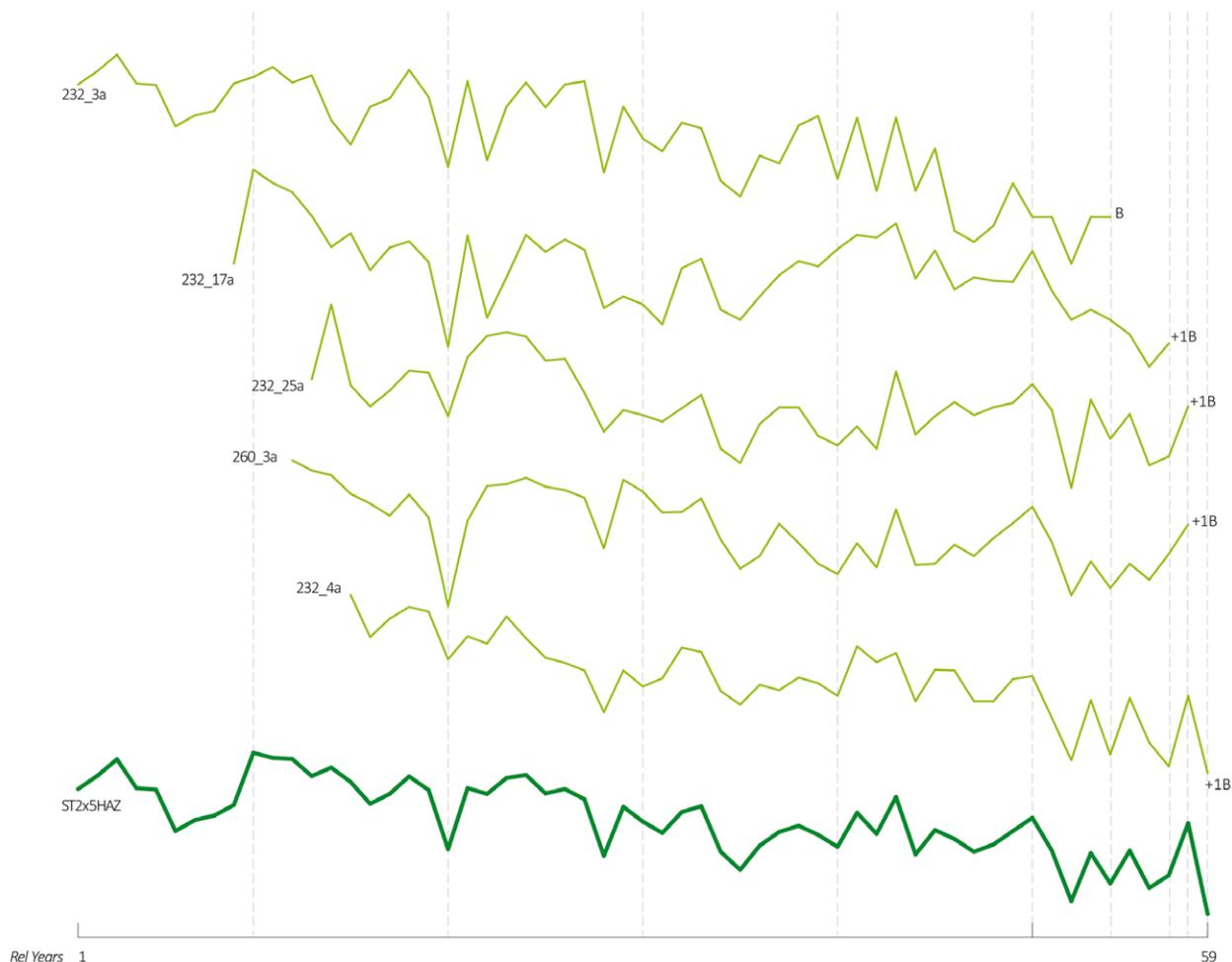


Figure 7.15. Visual correlations between the components of the hazel context chronology *ST2x5HAZ*. The context chronology is shown in darker green.

*ST2x5HAZ* displayed a distinctive ‘sawtooth’ pattern in the outer rings, a pattern which was also displayed in the outer rings of some of the shorter sequences. Consequently, a further 11 sequences were incorporated into a chronology, *ST2x16HAZ*, 59 years long which displays end-dates in Rel Yrs 54, 57, 58, 59 and 60 (Rel Yr 60 is just beginning to form on [232/4]) (Figure 7.16). As the double wall line was undoubtedly constructed as a single event, this spread of end-dates must relate to cessation of growth, with felling of the hazel occurring early in Rel Yr 60 (see Chapter 7.1.1).

#### 7.4.1.2 ST1

There was poor internal correlation amongst the nine hazel stakes from ST1, with only one significant correlation, between [16/15] and [48/2] ( $t = 5.07$ ) although visual

comparison produced pairs of correlations that were convincing. However, they all produced good visual correlations when compared individually against the *ST2* chronology, *ST2x16HAZ* (Figure 7.17) and consequently all nine sequences were averaged together to form a chronology, *ST1x9HAZ*, 59 years long, in which they all end in the same year. This indicates that the stakelines [040] and [048] were constructed at the same time as the inner and outer wall lines [015], [016] and [028].

*ST1x9HAZ* correlates well visually (Figure 7.18) and statistically ( $t = 5.33$ ) with *ST2x16HAZ* with an end-date of Rel Yr 59. Thus, of the 25 grouped sequences from these two structures, 17 have end-dates in Rel Yr 59. This strongly suggests that the hazel used in ST1 and ST2 was felled at the same time.

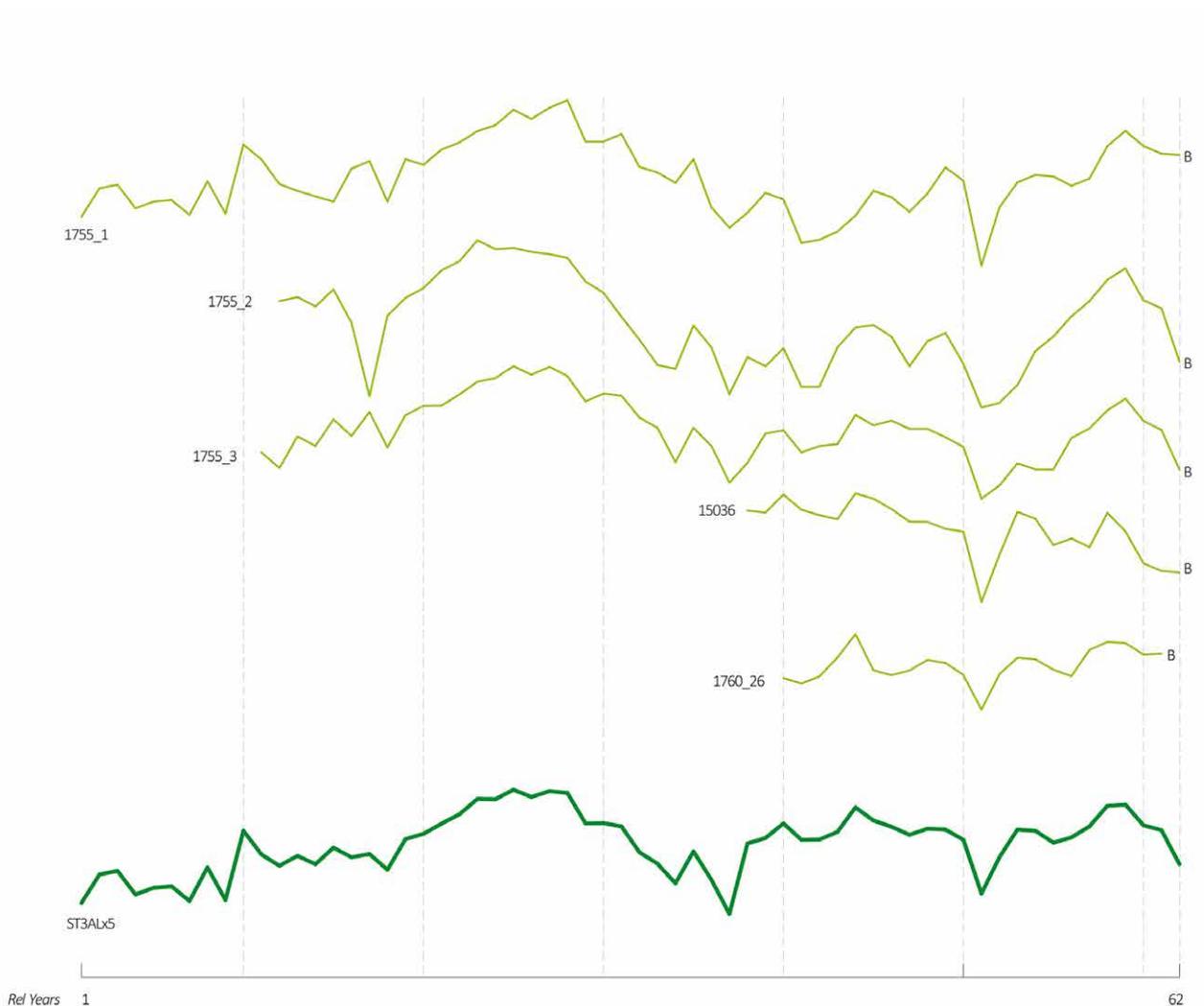


Figure 7.16. Visual correlations between the components of the hazel context chronology *ST16x5HAZ*. The context chronologies are shown in darker green.

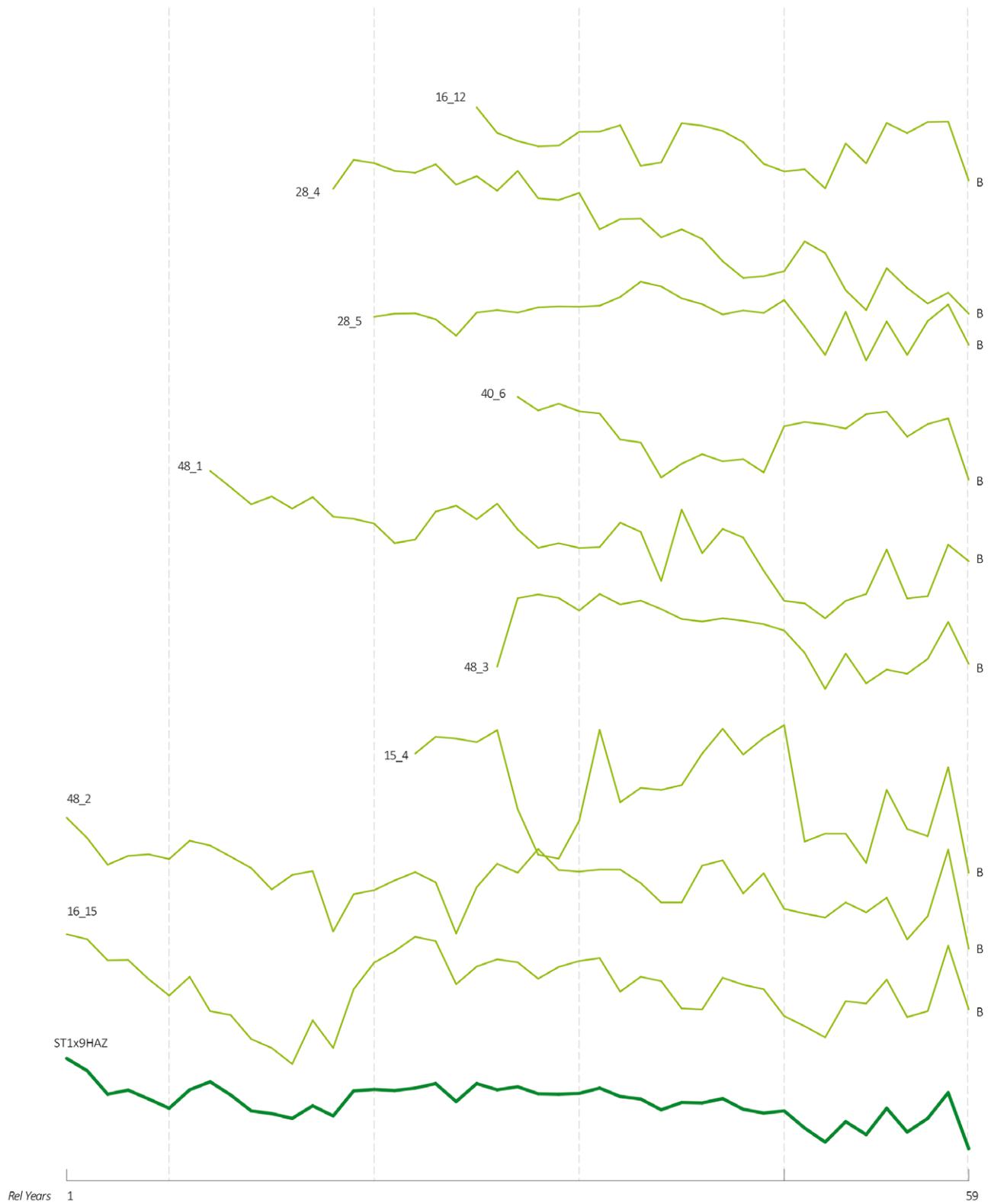


Figure 7.17. Visual correlations of *ST1x9HAZ* components with *ST2x16HAZ*. The context chronology is shown in darker green.

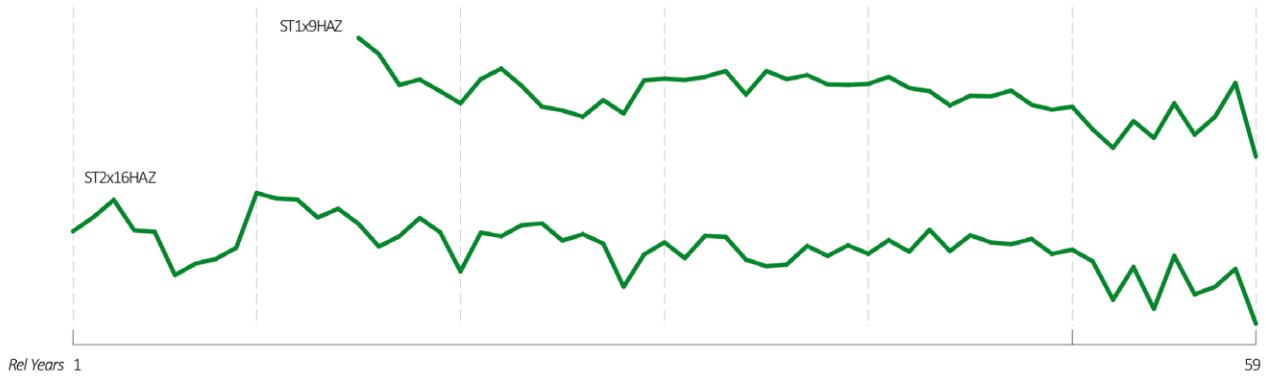


Figure 7.18. Visual correlation between the hazel master chronologies *ST1x9HAZ* and *ST2x16HAZ*.

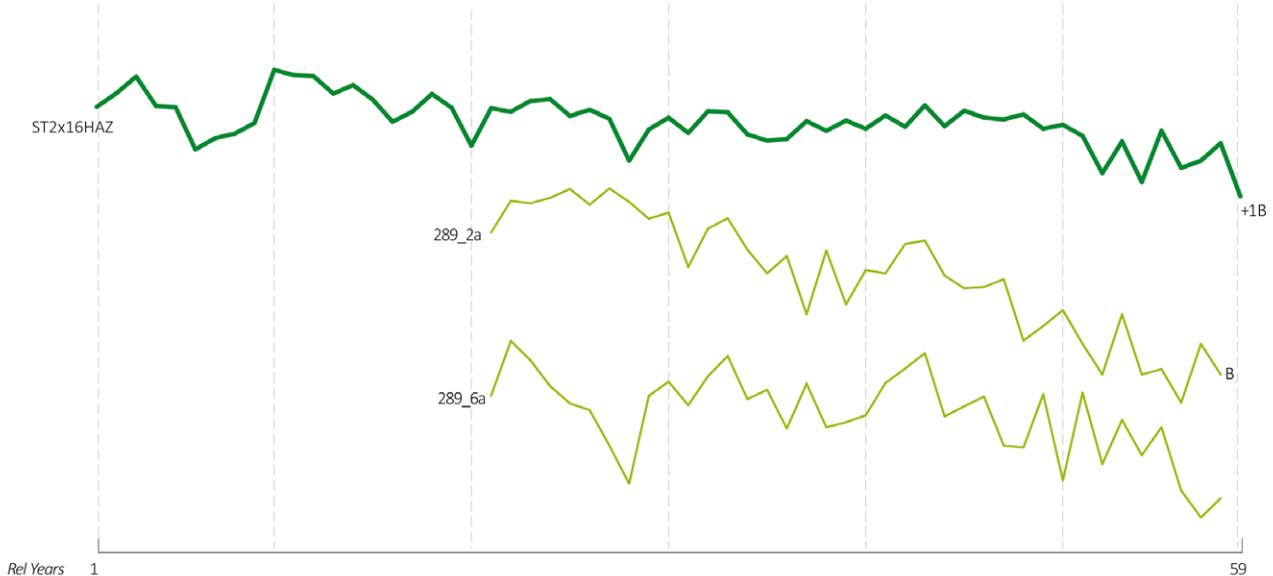


Figure 7.19. Visual correlations between hazel sequences from ST5 and context chronology *ST2x16HAZ*.

#### 7.4.1.3 ST5

There were no correlations between the six hazel stakes from the wall line of ST5, [289]. However, [289/6a] correlated well visually and statistically ( $t = 3.78$ ) with *ST2x16HAZ*, while [289/2a] also produced a visually acceptable correlation (Figure 7.19), both at an end-date of Rel Yr 58. Both sequences display the ‘sawtooth’ pattern in their outer rings, seen in the ST2 sequences. This suggests that the hazel used in ST5 was felled at the same time as that in ST2.

#### 7.4.1.4 Trackway fencelines

None of the hazel stakes from the fenceline along the side of the trackway could be grouped, either with each other or with hazel from the roundhouses. The fenceline hazel displayed large year-to-year fluctuations in ring width so it may have been cropped from a different woodland.

### 7.4.2 Episode 2

#### 7.4.2.1 ST3

Of the 58 hazel stakes from T3 only 12 could be grouped together in a context chronology, *ST3x12HAZMN* (Figure 7.20). However, they are a very coherent group,



Figure 7.20. Visual correlations between the components of the hazel context chronology *ST3x12HAZMN*. The context chronology is shown in darker green.

			18010_1	1167_1	1135_7	1135_9	1133_2	1133_6	1133_B2	1711_13	1135_11	1135_4	1710_7	1710_9	1135_6
	start	end													
18010_1	1	33	*	7.25	3.24	6.13	-	5.19	-	6.18	5.53	4.01	3.34	-	4.10
1167_1	7	34		*	3.13	7.04	3.20	4.54	3.06	3.91	4.63	6.58	3.72	3.58	4.78
1135_7	11	35			*	6.01	3.31	4.59	3.58	3.31	3.99	-	-	3.02	4.30
1135_9	8	35				*	3.75	7.57	5.05	3.80	6.35	4.81	4.46	3.11	5.38
1133_2	3	35					*	-	-	-	3.94	-	-	3.73	4.41
1133_6	10	37						*	-	5.08	7.13	4.06	7.07	-	6.38
1133_B2	12	37							*	-	5.24	-	-	-	3.37
1711_13	4	38								*	4.38	3.20	4.69	-	4.49
1135_11	3	38									*	3.95	3.74	-	5.43
1135_4	2	39										*	4.64	3.36	5.16
1710_7	8	39											*	-	4.57
1710_9	10	39												*	-
1135_6	6	40													*

Table 7.12. The hazel; t-value matrix for ST3x12HAZMN. All t-values >5.0 highlighted in red.

Trench	Context		Context description	Diam	Rings	Outer rings
<b>EPISODE 1</b>						
<b>Structure 1</b>						
1	46	1	hearth framework	160	56	be s/s
1	22	1	sub-floor structure	160	55	be s/s
1	22	2	sub-floor structure	130	61	be
<b>Structure 2</b>						
2	232	5	outer wall stake	40	20	be
2	232	9	outer wall stake	45	20	be
2	232	19	outer wall stake	75	45	?be
2	232	28	outer wall stake	91	48	be s/s
2	232	32	outer wall stake	75	29	be s/s
2	233	7	outer wall stake	35x54	30	be w
2	272	2	Interior stake	46	51	be w
<b>Trackway &amp; entrance</b>						
	792	1	post alongside track	170	145	+ 2 to be?
	763	4	fenceline	80	25	be
	763	8	fenceline	82	27	be w
	763	10	fenceline	78	27	be w
	763	2	fenceline	74	38	be w
<b>EPISODE 2</b>						
<b>Structure 3</b>						
	1167	6	stakes	100	49	+1 to be
		4	stakes	72	36	be

Trench	Context		Context description	Diam	Rings	Outer rings
	15035	1	secondary post	140	114	be
	15051	1	secondary post	150	137	+1 to be
<b>Structure 6</b>						
4	651	3 NE	stake	78	25	be w
<b>Trackway &amp; entrance</b>						
	15002/1	1	trackway logs	140	78	be
	15042	7	post alignment by trackway	40	20	be
	750	W3	fenceline	80	25	be+1
	750	W1	fenceline	82	26	be+1
	751	9	fenceline	76	24	be+1
	762	3	fenceline	140	78	be+1
<b>EPISODE 2/3</b>						
	742	2	posts sealed by rampart	105	54	be
TP5	/	TP5/10	perimeter stake	80	33	be w

Table 7.13. The ash; summary of dendrochronological data.

be = bark edge; be s/s = spring/ summer felled; be s = summer felled; be w = winter felled; +1 to be = new ring beginning to form after last measured ring.

characterised by narrow growth rings at Rel Yrs 14 and 28, producing strong correlations amongst all the components (Table 7.12).

*ST3x12HAZMN* is 39 years long and includes components from the Phase 1 stakeline [1135], the Phase 6 stakelines [1167], [1710] and [1711], and from the Phase 7 stakeline [1133]. Some of the hazel stakes from the stakelines lying immediately to the W of ST3 were compared with *ST3x12HAZMN* and one, [18012] produced a strong statistical ( $t = 6.6$ ) and visual (Figure 7.20) correlation indicating that it had been felled in Rel Yr 32.

The strong correlations with many of the components (Table 7.12) indicate that [18012] was probably one of the stakes in the outer wall line of ST3.

*ST3x12HAZMN* displays end-dates spanning six years from Rel Yr 34 to Rel Yr 39, up to eight years if [18010/1] is also included. Even within stakeline [1135], which must have been constructed as a single phase, there are end-dates spanning four years. Thus, the chronological relationships between the various stakelines cannot be precisely defined because the span of end-dates may simply reflect compressed growth. Nonetheless, the analysis has yielded useful information on the longevity of ST3; the results imply that between the construction of the outer wall line in Phase 1 ([1135]) and its final refurbishment in Phase 7 ([1711]) there may have been as little as 12 years; this figure is arrived by allowing for

the possibility that there may have been up to four missing rings (ie the maximum span of end-dates seen in [1135]) after the last end-date in Rel Yr 39.

## 7.5 Dendrochronological analysis of the ash

Some 28 ash timbers were analysed, of which only nine could be grouped (Table 7.13). The ash was mostly under 60 yrs of age but there were a few much older timbers including one 145+ years of age.

### 7.5.2 Episode 1

#### 7.5.2.1 ST1

Only three ash timbers were found, one from [046], the log foundation around the E side of the hearth and two from [022], the radial timbers of the sub-floor structure. They correlated well together (*ST1x3ASH*, 61 years long – Table 7.14 & Figure 7.21), demonstrating that they had all been felled in the spring/ summer of the same year and confirming that the radial sub-floor and the tangential log foundation were laid down at the same time.

#### 7.5.2.2 ST2

Although there were no statistical correlations between them, three of the 10 samples of ash from ST2 correlated well visually with each other (*ST2x3ASH*, 48 years long

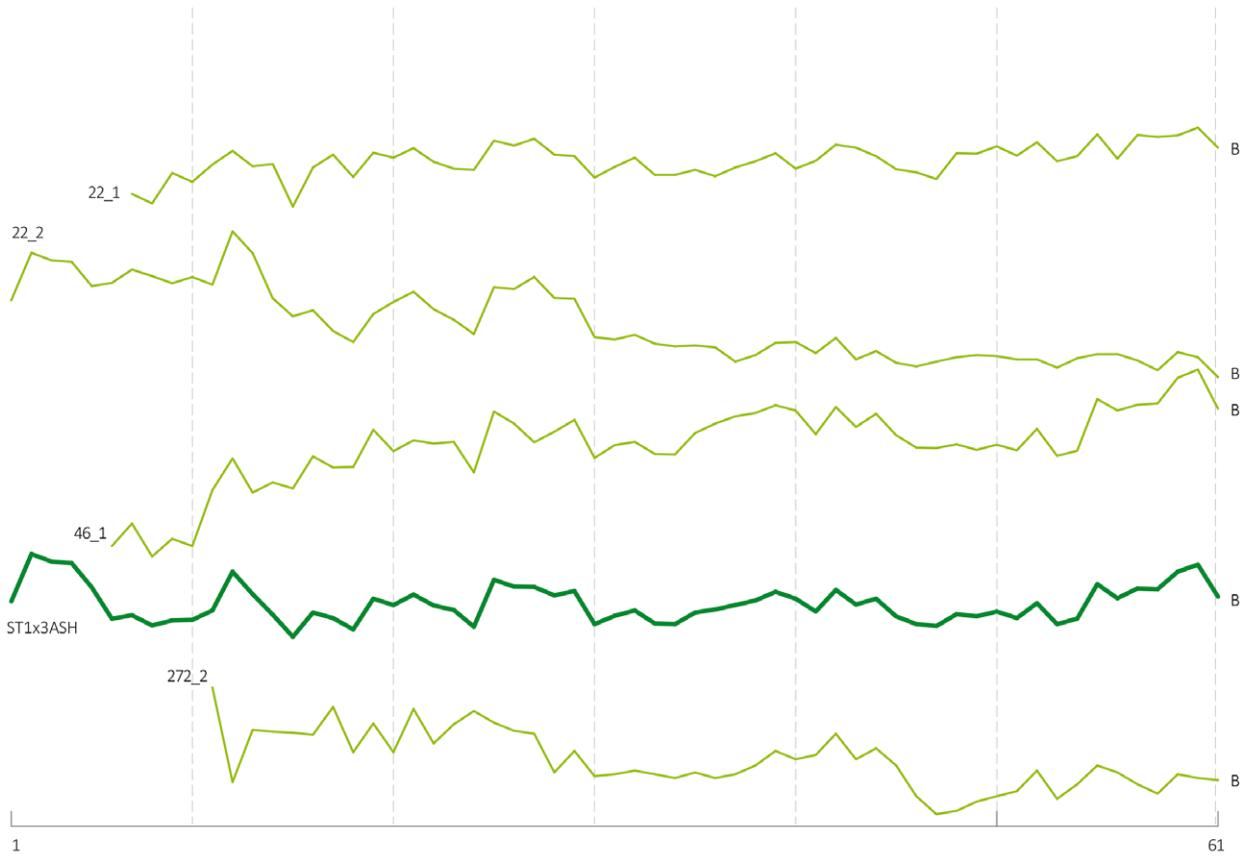


Figure 7.21. Visual correlations between the components of the ash context chronology, *ST1x3ASH*. The context chronology is shown in darker green.

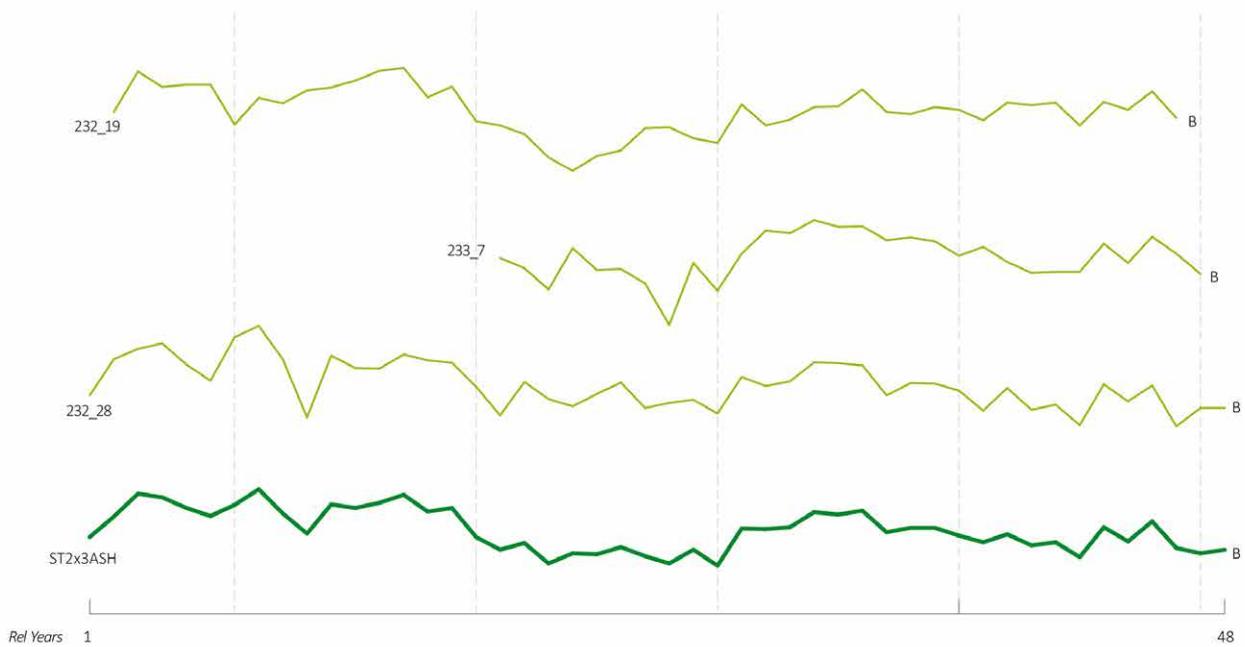


Figure 7.22. Visual correlations between the components of the ash context chronology, *ST2x3ASH*. The context chronology is shown in darker green.

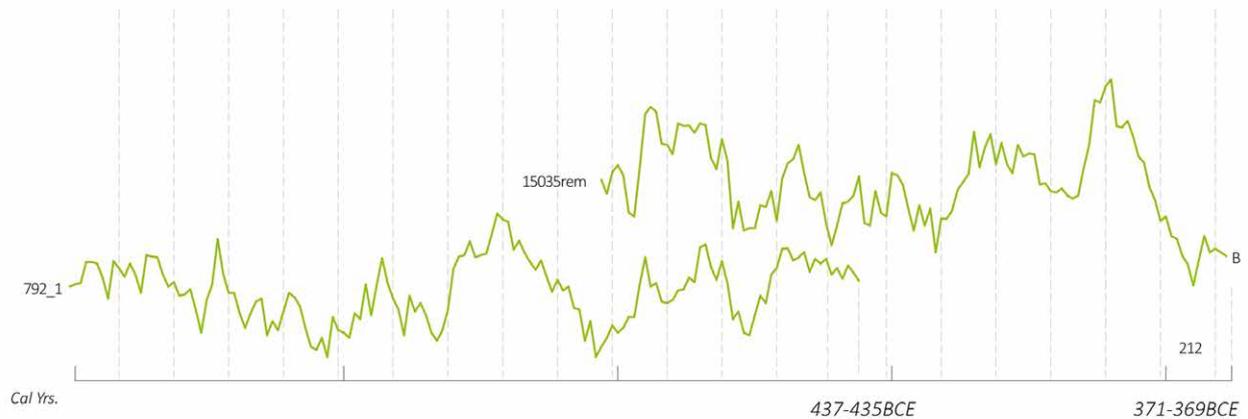


Figure 7.23. Visual correlation between posts [791/1] and [15035].

(Figure 7.22). These were stakes from [232] and [233], respectively the inner and outer wall lines of the structure, and their chronological relationship indicates that there was felling over two years, in Rel Yr 47 and 48. This is consistent with the evidence from the oak assemblage, which suggests that the timber for ST2 was felled over a period of two years, stockpiling for the construction of the building.

	46_1	22_1	22_2
46_1	*	4.4	4.85
22_1		*	4.27
22_2			*

Table 7.14. The ash; t-value matrix for *ST1x3ASH*.

### 7.5.2.3 Intra-structure correlations

There were no visual or statistical correlations between the ash chronologies from ST1 and ST2. However, *ST1x3ASH* compared well with one of the ST2 posts, [272/2] (Figure 7.22);  $t = 3.14$ . This correlation suggests that the ash used in both structures were all felled at the same time, and by implication, that ST1 and ST2 were constructed at the same time.

### 7.5.3 Episode 2

Post [15035], one of the large ash posts in ST3 which is a replacement for an earlier alder post, correlates well both statistically ( $t = 4.91$ ) and visually (Figure 7.23) with [792/1], one of the large posts alongside the trackway in the entrance area, which is likely to be an Episode 1 construction. The correlation suggests that the phase of refurbishment in ST3 represented by [15035] took place some 66 years after trackway construction. Oak timbers used in the trackway were felled between 437 BCE and 435 BCE so the dendrochronological evidence suggests that a refurbishment phase took place between 371 BCE and 369 BCE. This is in agreement with, and further refines, the modelled radiocarbon evidence which places the end of the ST3 occupation between 375–310 cal BCE (Chapter 2.4).



# Radiocarbon dating and Bayesian chronological modelling

Derek Hamilton

## 8.1 Introduction

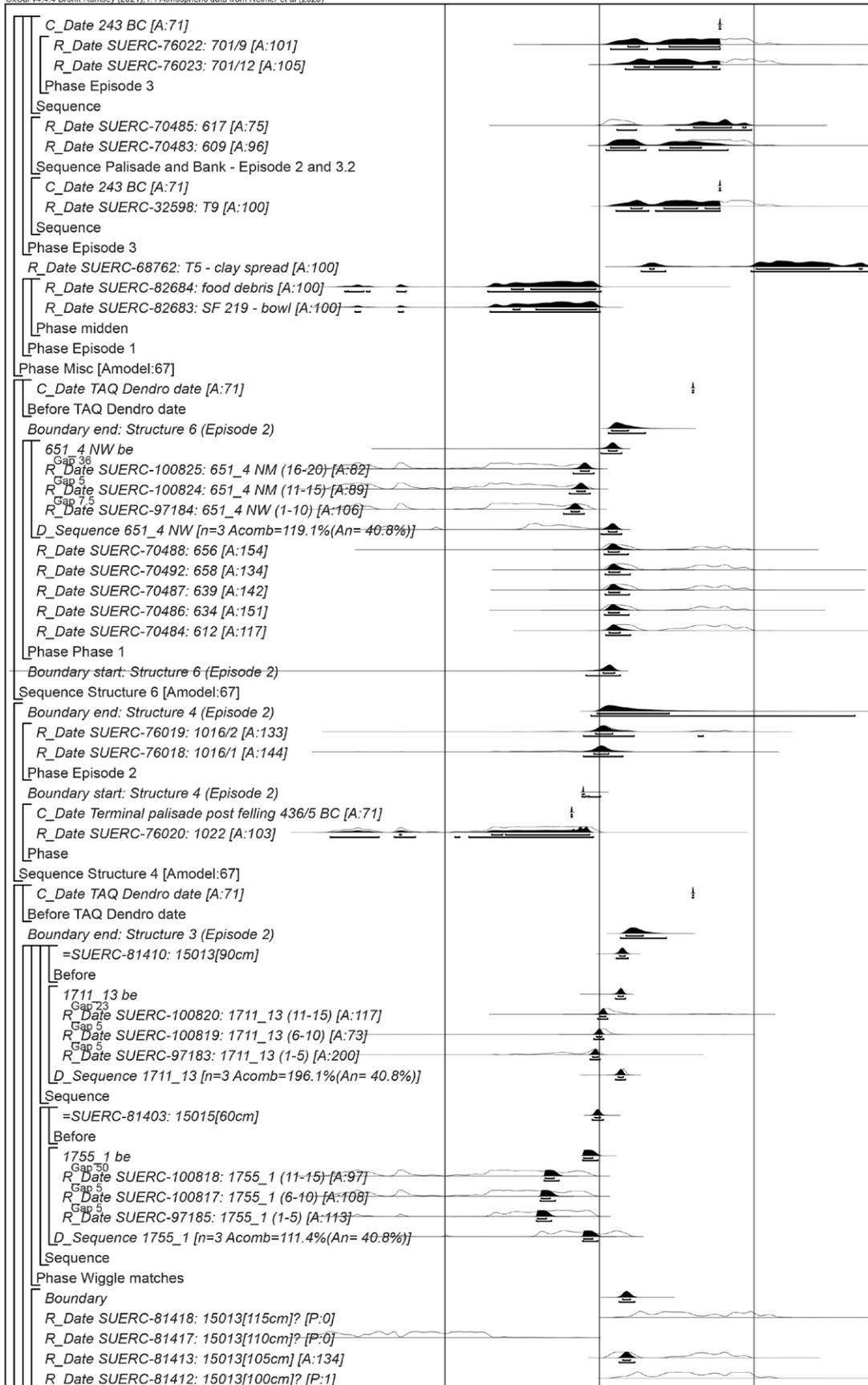
A total of 84 radiocarbon dates are available from material associated with structures and the activity within them excavated at BLoM (Table 2.2). All the samples were single entities (Ashmore 1999) of short-lived charcoal, bracken, waterlogged wood, and the humic acid fraction of well-humified organic floor deposits that likely were initially composed of bracken or similar vegetation. The samples were processed following methods outlined in Dunbar et al (2016) and were graphitised and measured following Naysmith et al (2010). SUERC maintains rigorous internal quality assurance procedures, and participation in international inter-comparisons (Scott 2003) indicates no laboratory offsets; thus, validating the measurement precision quoted for the radiocarbon ages.

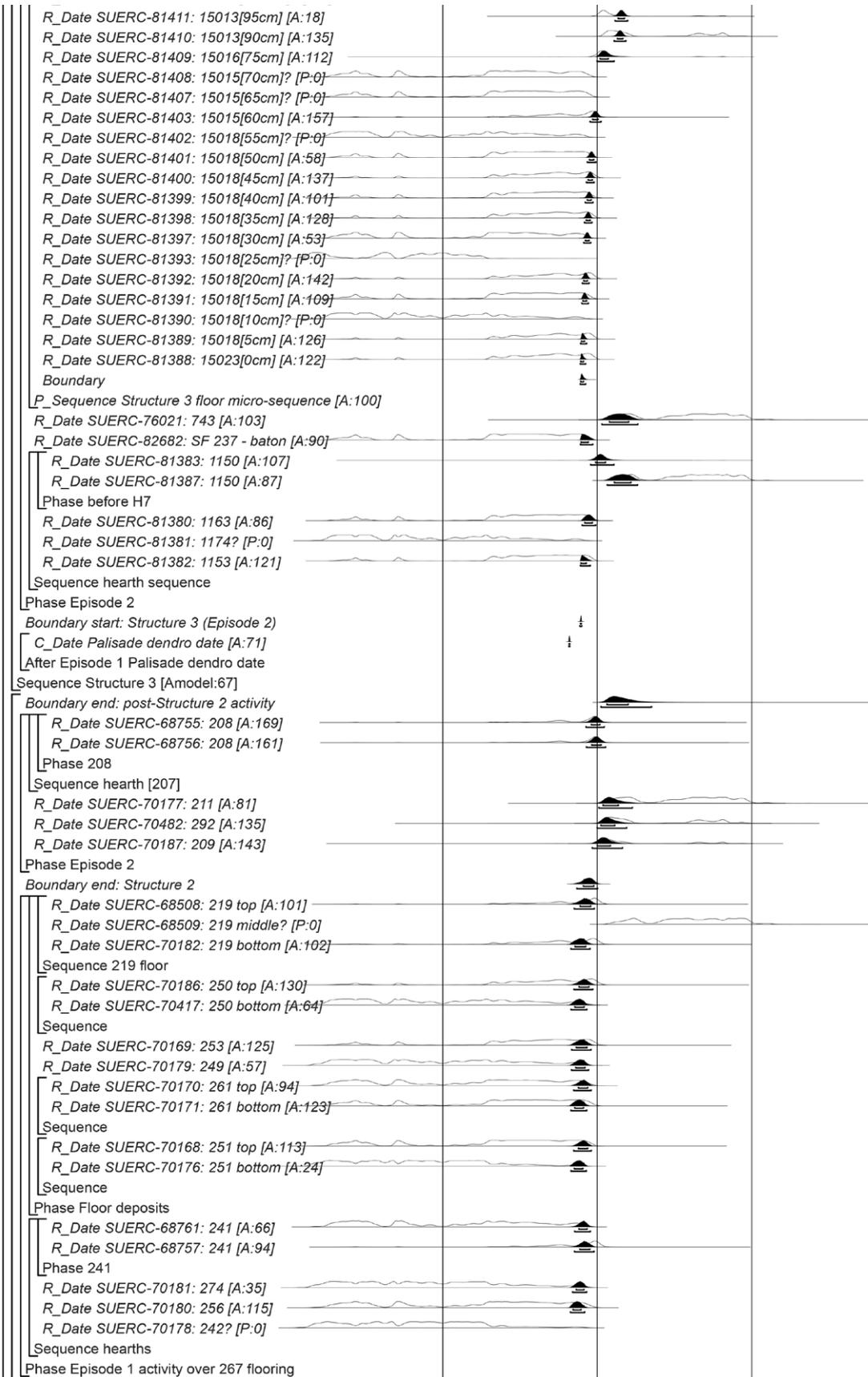
Conventional radiocarbon ages (Stuiver & Polach 1977) are presented in Table 2.2, where they are quoted in accordance with the Trondheim convention (Stuiver & Kra 1986). Calibrated date ranges were calculated using the calibration curves of Reimer et al (2020) and OxCal v4.4 (Bronk Ramsey 1995, 1998, 2001, 2009). The *italicised* dates presented in the text below are posterior density estimates derived from mathematical modelling of archaeological problems and have been rounded outward to five years. These dates can change with the addition of new data or when the modelling choices are varied.

## 8.2 Methodological approach

A Bayesian approach has been applied to the interpretation of the chronology for the individual structures (Buck et al 1996). Although simple calibrated dates are accurate estimates of the radiocarbon age of samples, this is not, usually, what archaeologists really wish to know. It is the dates of the archaeological events represented by those samples that are of interest. At BLoM, for example, the start and end of the use of ST2 in general is of interest, but additionally an understanding of the internal chronological development of the structure with its rebuilt hearths and entrance threshold or of the overall activity associated with that structure in relation to the other structures on the site. The chronology of this activity can be estimated not only by using the absolute dating derived from the radiocarbon measurements, but also by using the stratigraphic relationships between samples.

Methodology is now available which allows the combination of these different types of information explicitly, to produce realistic estimates of the dates of archaeological





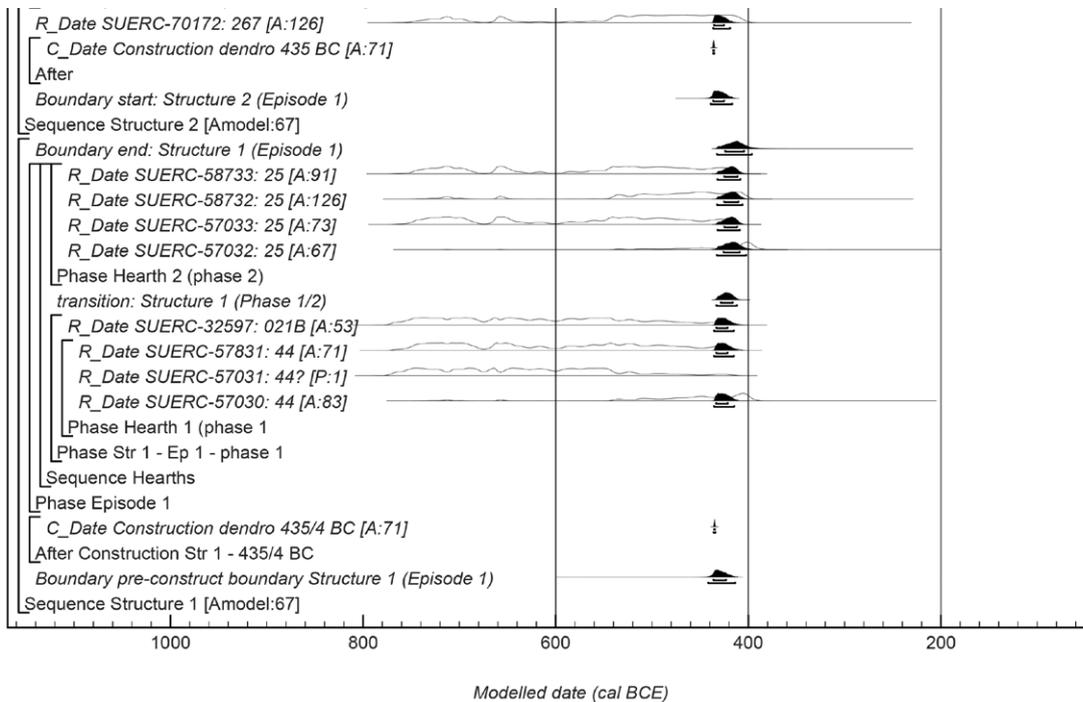


Figure 8.1. Primary chronological model for the dated activity at BLoM. Each distribution represents the relative probability that an event occurred at some particular time. For each of the radiocarbon measurements two distributions have been plotted, one in outline, which is the result of simple radiocarbon calibration, and a solid one, which is based on the chronological model used. Radiocarbon results that appear only in outline have been excluded from the model, as described in the text. The other distributions correspond to aspects of the model. For example, 'start: ST2 (Episode 2)' is the estimated date that Episode 2 activity began in ST2, based on the radiocarbon dating results. The large square 'brackets' along with the OxCal keywords define the overall model exactly.

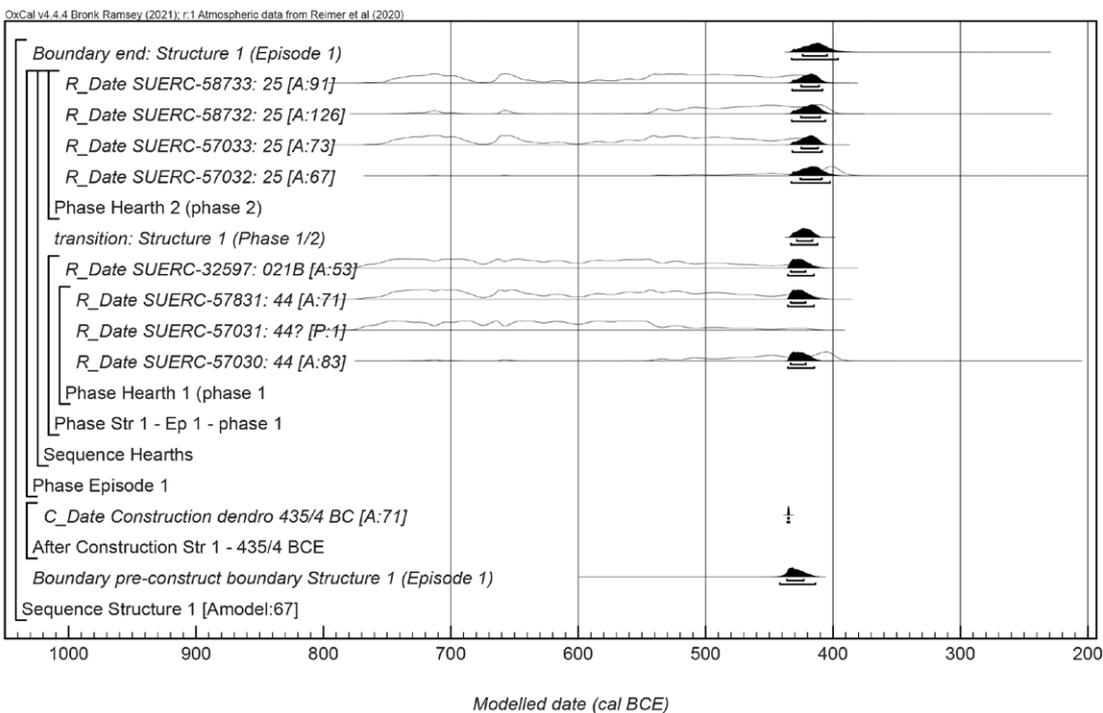


Figure 8.2. ST1 – individual model elements for the five dated structures at BLoM, along with the miscellaneous calibrated radiocarbon results that otherwise are not easily incorporated into the structure models.

interest. It should be emphasised that the posterior density estimates produced by this modelling are not absolute. They are interpretative estimates, which can and will change as further data become available and as other researchers choose to model the existing data from different perspectives. The technique used is a form of Markov Chain Monte Carlo sampling and has been applied using the program OxCal v4.4 (<http://c14.arch.ox.ac.uk/>). Details of the algorithms employed by this program are available in Bronk Ramsey (1995, 1998, 2001, 2009) or from the online manual. The algorithm used in the models can be derived from the OxCal keywords and bracket structure shown in Figure 8.1.

### 8.3 The samples and model structure

The grouping of samples and subsequent modelling follows the spatial arrangement of feature groups on the site. The majority of radiocarbon results are from ST1, ST2, ST3, ST4, and ST6 with a smaller number coming from the Episode 2 and three palisades, and a handful of features across the site that were of intrinsic interest.

#### 8.3.1 ST1 (Figure 8.2)

From ST1 there are seven radiocarbon dates from two hearths in a sequence of three. From the lower Hearth 1 come SUERC-057030, -57031 and -57831, while the upper Hearth 2 produced SUERC-57032, -57033, -58732 and -58733. Additionally, there is a date (SUERC-32597) on alder roundwood recovered from a post within the post-ring that is not stratigraphically linked to the hearths, but within which oak posts were subsequently dated with dendrochronology to 435/4 BCE. The date (SUERC-57031) on a fragment of hazel from Hearth 1 is slightly earlier than expected, given the number of samples taken from the hearths and is either residual material or a slight statistical outlier.

#### 8.3.2 ST2 (Figure 8.3)

Seventeen radiocarbon-dated samples come from ST2, which has been placed in the overall site phasing as Episode 1. A further five results are available from hearth deposits that overlay the structure and are placed in Episode 2. From ST2, the radiocarbon-dated samples derive from either the complex of three stacked hearths or the associated floor deposits.

A layer of bracken [267], which was radiocarbon dated (SUERC-70172), was placed on the ground over which the initial floor layer was constructed. From Phase 1 of ST2 there is a sample of hazel roundwood charcoal dated (SUERC-70181) from Hearth 4 [274]. Phase 2 Hearth 3 [256] has a radiocarbon date (SUERC-70180) from a fragment of alder roundwood charcoal. Hearth 2 [242] is in Phase 3 of ST2 and has been dated (SUERC-70178) from a fragment of alder charcoal. SUERC-70178 is considerably older than expected for its location in the sequence and is likely to represent

reworked material or, given the stacked nature of the hearth stones, represent a statistical outlier in the radiocarbon dating process.

There are four samples from the Phase 1 floor. Context [251] has bracken dated from two layers, denoted as the bottom (SUERC-70176) and top (SUERC-70168). Context [261] was also divided into a top and bottom with waterlogged hazel dated (SUERC-70170) from the top and alder dated (SUERC-70171) from the bottom.

From the floor deposit [249] surrounding the Phase 2 Hearth 3 there is a date (SUERC-70179) from a fragment of alder charcoal. A piece of waterlogged alder wood was dated (SUERC-70169) from deposit [253]. Finally, there is a date (SUERC-70417) from a sample of bracken at the bottom of [250], with a second date (SUERC-70186) from bracken at the top of the context.

The final Phase 3 of ST2, associated with Hearth 2, has radiocarbon dates from four samples in two contexts. Context [219] is an organic floor deposit that contained well-humified material. Three radiocarbon dates were made on the humic acid fraction of samples of the humified material, which were collected from the top (SUERC-68508), middle (SUERC-68509) and bottom (SUERC-70182) of the context. The date from the middle sample was noticeably younger than the other two samples in the sequence and could be the result of younger roots of other intrusive material decomposing in this sample and causing the radiocarbon result to be younger than expected. SUERC-68509 has been excluded from the chronological modelling.

There is a series of radiocarbon-dated samples from contexts that post-date ST2 and form Episode 2 at this site location. These include samples of roundwood hazel and alder charcoal beneath ([241]: SUERC-68761 & -68757, respectively) and over ([208]: SUERC-68756 & -68755, respectively) Hearth 5. There was also a sample of hazel charcoal (SUERC-70482) from under the latest stone structure [291], a fragment of hazel from a hurdle [209] (SUERC-70187) under [292] and a fragment of hazel roundwood charcoal (SUERC-70177) from the Hearth 1 debris [211].

In addition to the radiocarbon dating evidence for the construction and use of ST2, and the post-ST2 activity, dendrochronology has dated the felling of the timbers used in the roundhouse to 435 BCE. Therefore, a date of 435 BCE can be used to provide a *tpq* date for the material that was found within and on top of the ST2 deposits.

#### 8.3.3 ST3 (Figure 8.4)

There are a total of 35 radiocarbon dates on material excavated in ST3, including two radiocarbon wiggle-match sequences. The structure overlies the palisade that was dendro-dated to 436/5 BCE, so all of the structural material is placed later than this in a sequence. Additionally, there was almost certainly a gap in time between the construction and use of the palisade prior to the structure being built

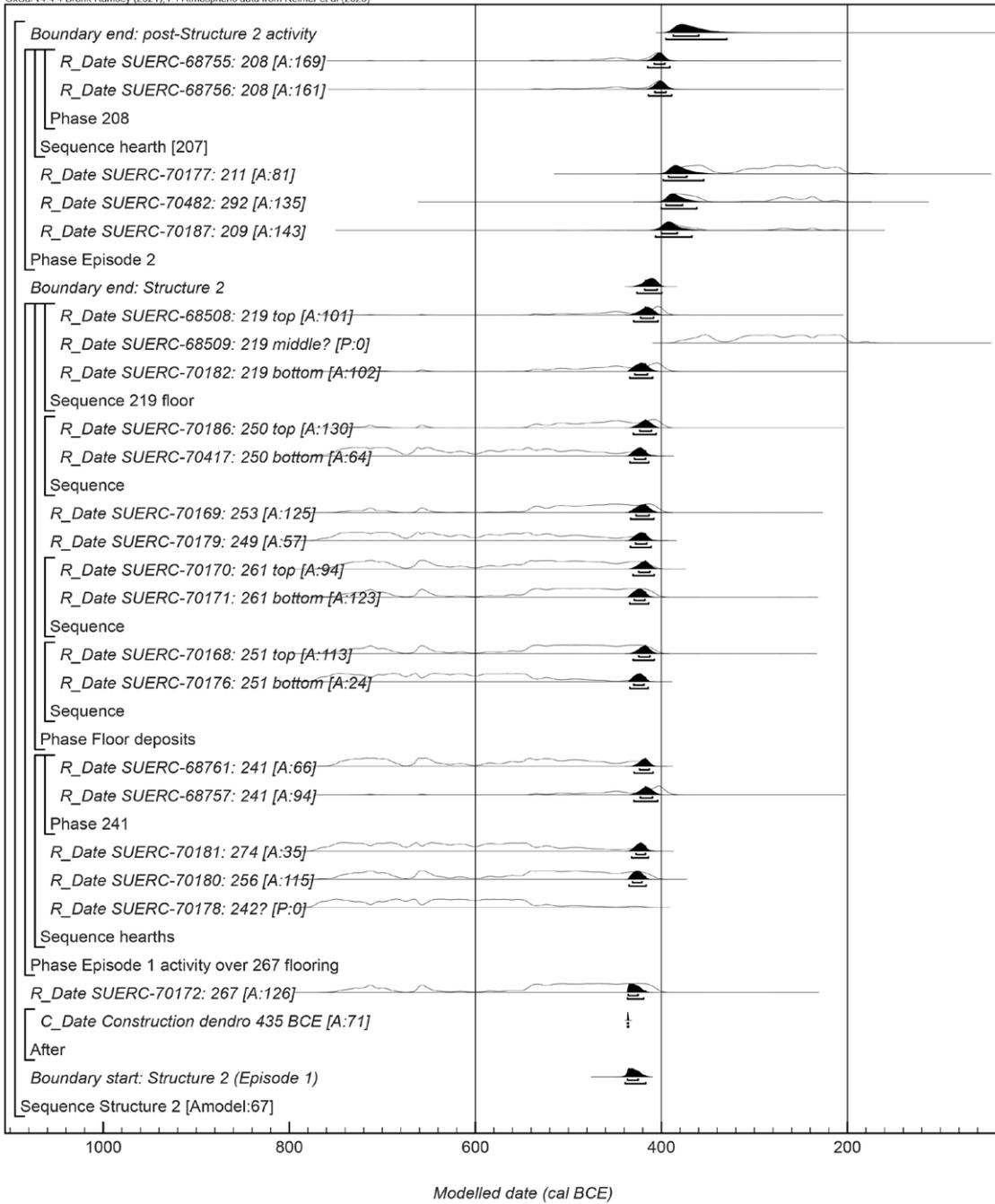


Figure 8.3. ST2 – individual model elements for the five dated structures at BLoM along with the miscellaneous calibrated radiocarbon results that otherwise are not easily incorporated into the structure models.

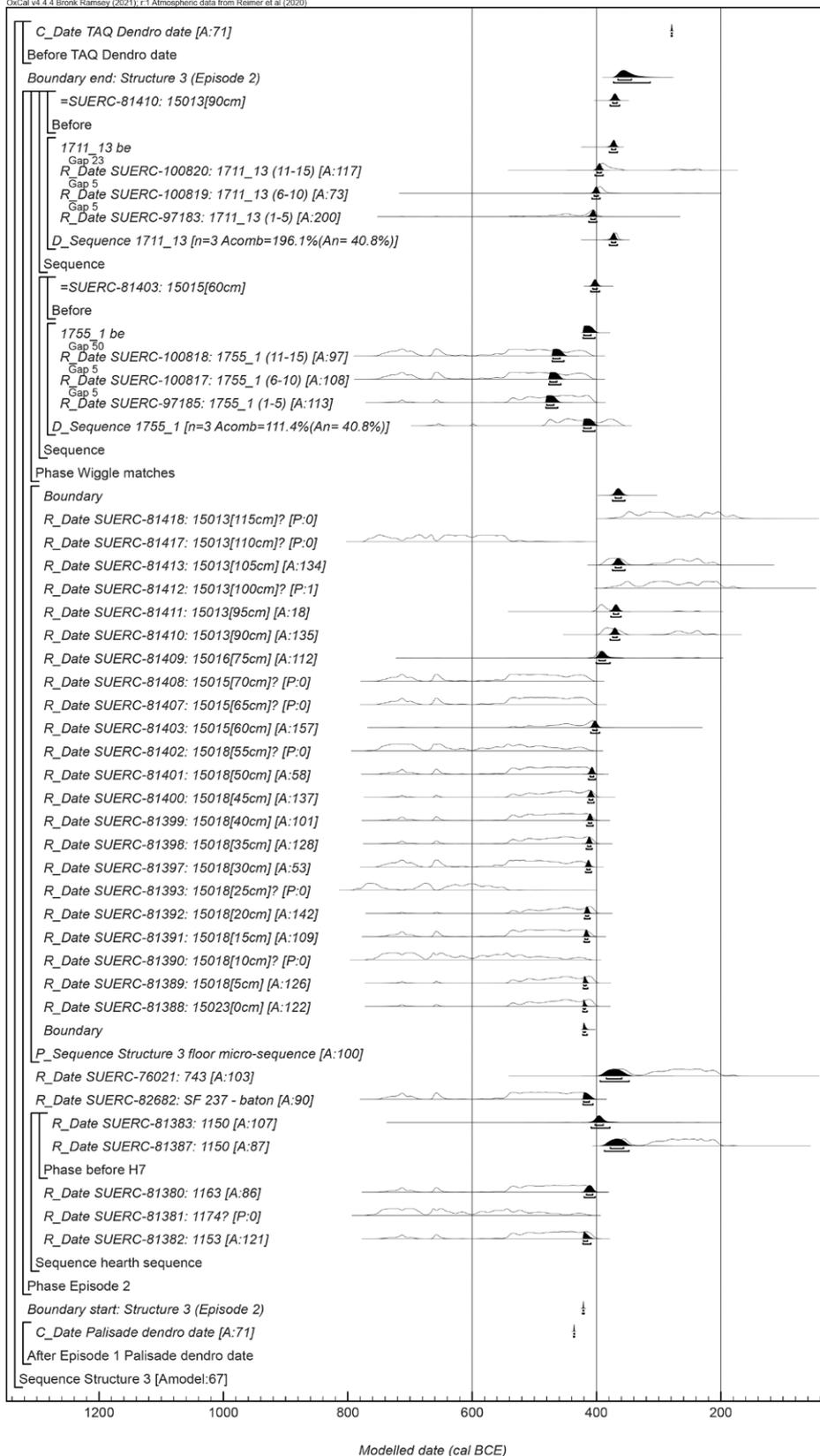


Figure 8.4. ST3 – individual model elements for the five dated structures at BLom along with the miscellaneous calibrated radiocarbon results that otherwise are not easily incorporated into the structure models.

and so a conservative estimate of  $15 \pm 2.5$  years has been included in the model, using the Interval parameter, as a minimum separation between the palisade timber felling/ construction date of 435 BCE and the start of the ST3 radiocarbon dates.

Five radiocarbon dates are from charcoal, charred hazel nutshell and charred plant remains in a secure sequence of hearths. A further 22 radiocarbon dates came from charred or waterlogged plant remains, charcoal and animal bone taken from 5 cm intervals through a 1.15 m deep sequence of floor layers representing activity next to the central hearths (Figures 4.11 & 4.15). There is also a single radiocarbon date (SUERC-82682) from the yew baton (SF237) recovered from within the remains of ST3. The entire set of radiocarbon results from ST3 are from the Episode 2 activity at BLoM, with the excavation of this one structure highlighting the level of rebuilding and/ or refurbishment that living in this environment appeared to necessitate.

Within the sequence from the hearths the lowest dated sample (SUERC-81382) is from a fragment of charred plant remains in the Phase 2 active floor [1153]. This is sealed by Hearth 3, which has had [1174] dated with a fragment of charred hazel nutshell (SUERC-81381). The hazel nutshell appears to be too old given its place in this secure stratigraphic sequence and has been excluded from the chronological modelling. A fragment of alder charcoal was dated (SUERC-81380) from the fill [1163] of the overlying Hearth 4. Finally, two fragments of hazel nutshell were dated (SUERC-81383 & -81387) from the fill [1150] of Hearth 5.

In addition to the dated hearth sequence, there is a radiocarbon result (SUERC-82682) from the yew baton (SF237) from within the structure floor sequence and another (SUERC-76021) on a hazel nutshell recovered from midden deposits abutting the exterior wall of ST3.

The floors of ST3 were sampled using kubiena tins for soil micromorphological analysis. This provided an opportunity to undertake detailed sampling through these layers for radiocarbon dating and analysis, following the methods often employed for palaeoenvironmental sequences (see Gearey et al 2009 for an example of age-depth modelling of a sequence on an Iron Age site in England). These data are described below in their general phases of structure use.

A fragment of charred plant remain was dated (SUERC-81388) from the packing [15023] of the Phase 1 Hearth 1. This sample came from the base of the sequence (0 cm).

There are 11 dates (SUERC-81389–93 & SUERC-81397–402) from the levels 5–55 cm [15018]. The lowermost date has been assigned to Phases 2 or 3, the dates from 10–30 cm to Phase 3, and those from 35–55 cm to Phase 4. The dates are from a range of materials (charred and waterlogged plant remains, charcoal and animal bone) that are given

in Table 2.2. The majority of samples are from active floor deposits, but SUERC-81397 and -81398 have been tied to the hearth sequence (pre- and post-Hearth 3, respectively), as has SUERC-81402 (pre-Hearth 4).

The next group of dates come from levels at 60–85 cm and have been assigned to Phase 6. From here there are four results on charcoal samples (SUERC-81403 & -81407–8) from the active floor in this phase [15015], as well as wood (SUERC-81409) from the area of dirty floor around Hearth 5 [15016].

Finally, Phase 8 in ST3 (90–115 cm) has six radiocarbon results (SUERC-81410–3 & -81417–8). These come from charcoal and a charred hazel nutshell from the active floor surface [15013], with a sample of birch charcoal (SUERC-81418) identified as being from beneath Hearth 7.

Methodologically, the modelling first attempted to simply add the depth constraints to these data and create an age-depth model in OxCal, using the P Sequence function, but that resulted in a model with very poor overall agreement with a large number of results having low individual agreements. These samples come from the active floors within ST3 that will likely have been subject to periods of intensive activity, which would increase the possibility of material being reworked and moving slightly up or down the profile. To better understand the taphonomic processes at play and to be in a position to accurately identify the reworked material, the age-depth model was first refined on its own before being run within the complete model for the entire site. After refining the age-depth model in isolation, the radiocarbon results identified with low individual agreements were excluded from the modelling of the entire structure. The dates excluded from the age-depth model included SUERC-81390, -81393, -81402, -81407, -81408, -81412, -81417 and -81418 (Table 2.2).

Finally, there are two timbers from within the sequence of floors that were radiocarbon dated using the wiggle-match dating technique. Timber [1755/1] from the Phase 2/3 structure has three radiocarbon dates, wiggle match (SUERC-97185, -100817 and -100818), while timber [1711/13], also with three radiocarbon dates (SUERC-97183, -100819 and -100820), comes from Phase 6. Since the timbers can be tied into the phasing of the floor micro-sequence there was an initial desire to integrate these two wiggle-match dates directly into the age-depth model for the floor sequence. However, it is impossible to be exactly certain within which 5 cm block they relate, and also to be entirely sure they were not re-used in their excavated context. Therefore, the wiggle-match sequences stipulate that the bark edge date for each timber must be earlier than the first radiocarbon date in the subsequent phase from the floor sequence. Therefore, the wiggle-match date for timber [1755/1] is earlier than SUERC-81403, the first radiocarbon date from Phase 6, and the bark edge date

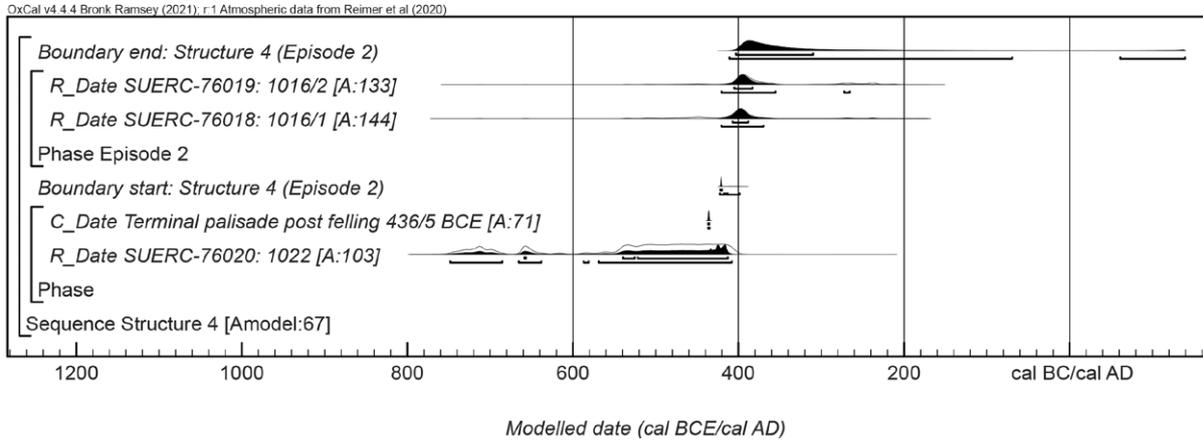


Figure 8.5. ST4 – individual model elements for the five dated structures at BLom along with the miscellaneous calibrated radiocarbon results that otherwise are not easily incorporated into the structure models.

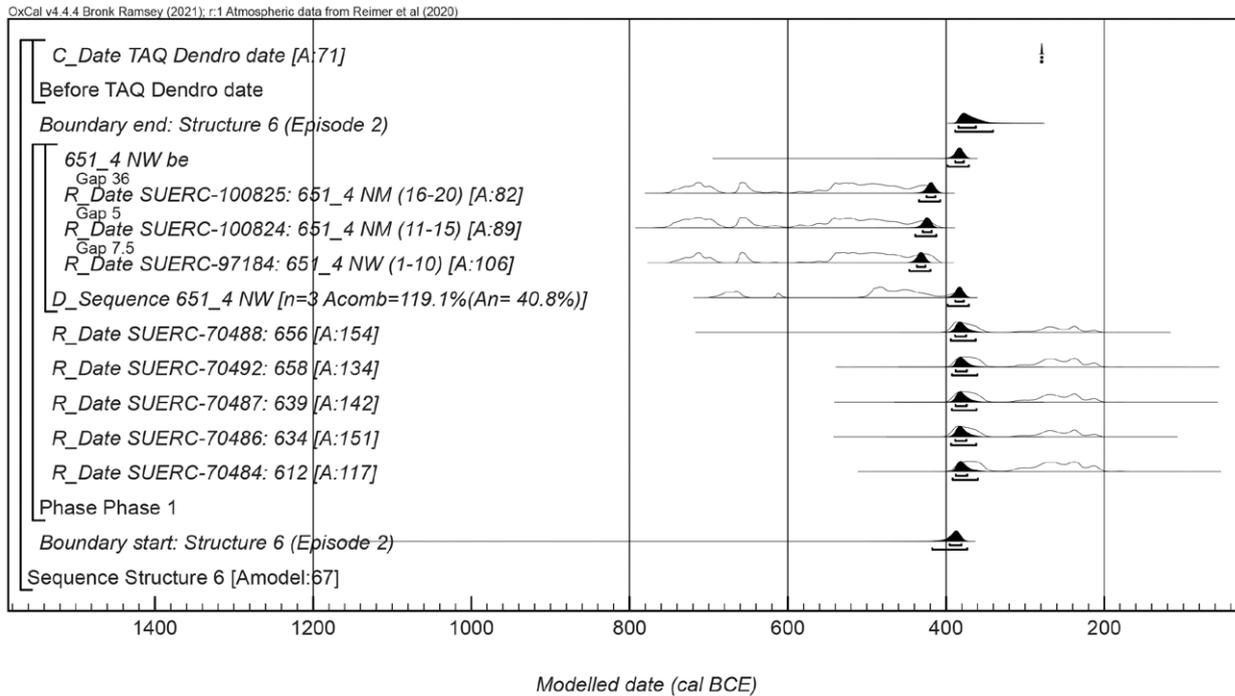


Figure 8.6. ST6 – individual model elements for the five dated structures at BLom along with the miscellaneous calibrated radiocarbon results that otherwise are not easily incorporated into the structure models.

for timber [1755/13] is earlier than SUERC-81410, the first radiocarbon date in the Phase 8 floor sequence.

### 8.3.4 ST4 (Figure 8.5)

There is a single radiocarbon result (SUERC-76020) from the alder post in the Episode 1 Palisade 1 which lies under ST4, and a dendro date of 436/5 BCE for the felling of a post in the terminal of the palisade, which provide a *tpq* for the estimation of the construction of ST4 that has radiocarbon results (SUERC-76018–9) on fragments of

alder charcoal from its floor [1016]. Within the model, an interval of  $15 \pm 2.5$  years has been included in the model as a minimum separation between the palisade timber felling/ construction date and the start of the ST4 radiocarbon dates.

### 8.3.5 ST6 (Figure 8.6)

There are five radiocarbon dates from charcoal and wood deposits associated with deposits in the Episode 2 ST6. These include: hazel charcoal (SUERC-70484) from the

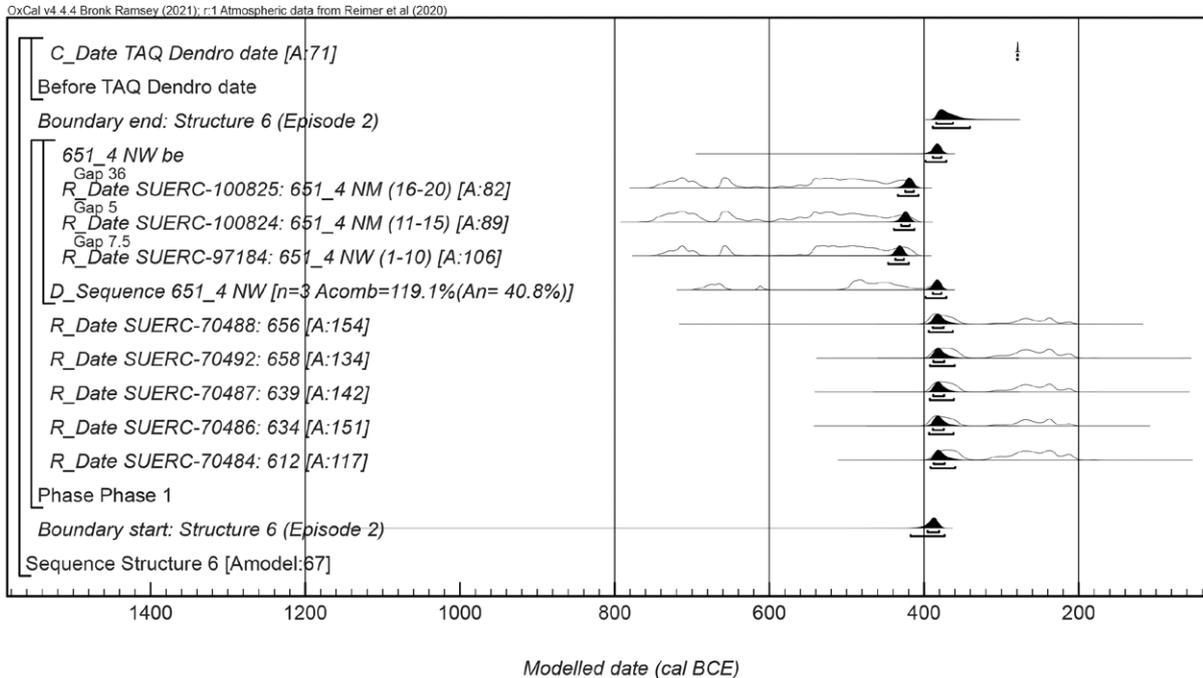


Figure 8.7. Episode 3 – individual model elements for the five dated structures at BLom along with the miscellaneous calibrated radiocarbon results that otherwise are not easily incorporated into the structure models.

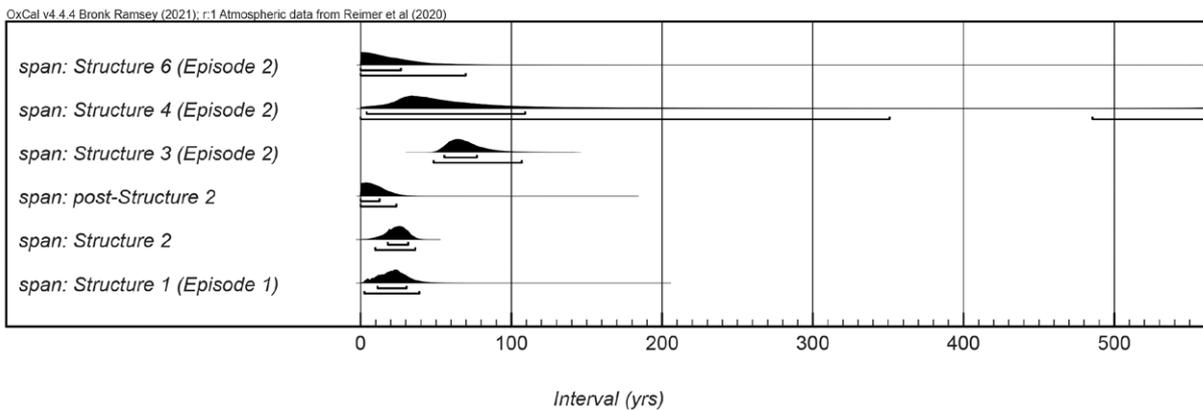


Figure 8.8. Probability intervals for the spans between the start and end probabilities for the dated activity associated with the different structures at BLom. The probabilities are derived from those given in Figure 8.1.

layer [612] beneath stones [601]; alder (SUERC-70486) that formed part of the hurdle matting [634] onto which Oven 1 was built; hazel charcoal (SUERC-70487) from a cooking deposit [639]; ash wood (SUERC-70488) that formed part of a wicker ring [656]; and hazel roundwood (SUERC-70492) from the wicker deposit [658] that formed part of Oven 2. Additionally, there is a three-radiocarbon date wiggle match (SUERC-97184, -100824 and -100825) on a timber from ST6 (651/4 NW).

### 8.3.6 Other structures and miscellaneous samples (Figure 8.7)

From the Episode 1 ditch fill [800] there are two results (SUERC-82683 & -82684) on a fragment of a *Maloideae* bowl (SF219) and a fragment of cattle bone.

There are two radiocarbon results (SUERC-70483 and -70485) on fragments of alder wood and alder charcoal that are from the Episode 2 Palisade 1 and the Episode 3.2 Rampart 2, respectively.

There are three radiocarbon results from timbers in the Episode 3.2 palisade. Two results (SUERC-76022-3) are available on the sapwood rings of two oak planks from Palisade 4. The third (SUERC-32598) is from a fragment of an oak post found during drainage operations in 2010, subsequently dendro-dated to 243 BC.

Finally, a piece of birch charcoal was dated (SUERC-68762) from the clay spread [503] excavated in Trench 5.

## 8.4 Results

The initial model for BLoM has good agreement between the radiocarbon dates, stratigraphic relationships and the overall spatial groupings (Amodel = 67).

ST1 has timber dendro-dated to 435/4 BCE, and so it is assumed this is the date of initial construction (Phase 1) of this Episode 1 structure. The model estimates the structure underwent the transition from Phase 1 to Phase 2 in 435–410 cal BCE (95% probability; Figure 8.1; transition: ST1 (Phase1/2)), or 430–415 cal BCE (68% probability). ST1 went out of use in 435–395 cal BCE (95% probability; Figure 8.1; end: ST1 (Episode 1)), or 425–405 cal BCE (68% probability). The total span of the dated ST1 activity was 1–40 years (95% probability; Figure 8.8; span: ST1 Episode 1), or 10–35 years (68% probability).

Since timbers from the Episode 1 ST2 were dendro-dated, that structure likely began being used in 435 BCE, or very soon after. ST2 ended in 430–400 cal BCE (95% probability; Figure 8.1; end: ST2), or in 420–405 cal BCE (68% probability). The earlier date in the Hearth 207 group provides the date by which the post-ST2 activity took place, and which falls into the site-based phasing of Episode 2. This activity is estimated to have occurred in or by 415–390 cal BCE (95% probability; Figure 8.1; SUERC-68755: 208), or 410–395 cal BCE (68% probability), suggesting there was very little break (if any) between the two episodes. This later activity ended in 400–330 cal BCE (95% probability; Figure 8.1; end: post-ST2 activity), or 390–360 cal BCE (68% probability). The chronological model estimates ST2 was in use for 10–40 years (95% probability; Figure 8.8; span: ST2), or 15–35 years (68% probability). The post-ST2 activity was likely much shorter in duration, lasting for perhaps up to 25 years (95% probability; Figure 8.8; span: post-ST2), or 1–15 years (68% probability).

ST3 falls into Episode 2 and has an estimated start date that is strongly influenced by the underlying dendro-dated palisade date, the applied interval before construction (15 ± 2.5 years – see above), and the earliest radiocarbon results that calibrate across the period approximately 800–400 cal BCE. The start date for the structure is estimated to be 425–420 cal BCE (95% probability; Figure 8.1; start: ST3 (Episode 2)). This model estimates the end date of the activity within ST3 to be 375–310 cal BCE (95% probability;

Figure 8.1; end: ST3 (Episode 2)), or 370–340 cal BCE (68% probability). The chronological model provides what should probably be considered an estimated maximum span of associated activity in ST3 of 45–110 years (95% probability; Figure 8.8; span: ST3 (Episode 2)), or 55–80 years (68% probability).

ST4 also falls into Episode 2, and despite having only two radiocarbon results associated with its use, it overlies material associated with the palisade that has been both radiocarbon and dendro-dated. The model estimates ST4 was constructed in 425–395 cal BCE (95% probability; Figure 8.1; start: ST4 (Episode 2)), or 425–420 cal BCE (68% probability). The structure fell out of use in either 415–70 cal BCE (91% probability; Figure 8.1; end: ST4 (Episode 2)) or 65 cal BCE–cal AD 140 (4% probability), or probably 405–310 cal BCE (68% probability). The lower precision of the estimated beginning and end dates for activity associated with ST4 results in lower overall precision for the calculated span of 1–355 years (91% probability; Figure 8.8; span: ST4 (Episode 2)) or 485–560 years (4% probability), and probably 1–110 years (68% probability).

ST6, Episode 2, has an estimated start date of 420–375 cal BCE (95% probability; Figure 8.1; start: ST6 (Episode 2)), or 400–380 cal BCE (68% probability). The dated activity associated with this structure ceased in 390–340 cal BCE (95% probability; Figure 8.1; end: ST6 (Episode 2)), or in 385–360 cal BCE (68% probability). The overall span of dated activity in ST6 was 1–70 years (95% probability; Figure 8.8; span: ST6 (Episode 2)); or 1–30 years (68% probability).

## 8.5 Discussion

The tight stratigraphic sequencing of many of the radiocarbon dates from BLoM, combined with the high precision of the dendrochronologically dated elements in many of the sequences and potential for mixing of smaller samples between the different floor layers, created a challenge for the chronological modelling of the scientifically dated material. In almost every instance the dates were consistent with their stratigraphic positions, although where the dating was based on intensive sampling across a small vertical area (ie the ST3 micro-floor sequence) it was possible to see how the security of individual samples within these deposits could come into question. What is important, when reflecting on the dating at BLoM, is the overall high level of consistency in the dating through time. The dating of the lower levels falls firmly on the ‘Hallstatt plateau’ (circa 800–400 cal BCE), before moving across the jump to the 400–200 cal BCE ‘wiggle’. Wiggle-match dated tree-ring sequences are also consistent with the other dates and their position within the overall site sequence.

In addition to consistency between the dates and the stratigraphy, it is important to remember that the

modelling of the chronological information is a reflection of the observed archaeology and how that is interpreted in its initial formation and subsequent post-depositional processes. For instance, the model has a sequence between a dendro-dated palisade and radiocarbon-dated ST4, which overlies the palisade. The modelling places a minimum span of  $15 \pm 2.5$  years between the construction of the palisade and the construction of the later structure that overlies it. The interval was selected after taking into consideration the archaeological complexity of the stratigraphy and includes what was felt might be a reasonable minimum use-life for the palisade. In reality, it is possible more time passed. In this instance, the model has estimated the structure was constructed within one to four decades of the palisade and thus suggests the palisade was in use for a short, but not insignificant, time.

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# Micromorphology

Lynne Roy

## 9.1 Introduction

Over the course of the project a total of 96 thin section samples from 91 archaeological contexts have been analysed. Some of these were sampled to answer specific queries regarding deposit composition and formation but many were sampled across generic 'floor deposits' in an attempt to tease out differences across and between the structures and more widely across the site.

The aim of the analysis was to better understand the occupation deposits within the site. To answer this, several research questions were applied to the samples. These focused on:

- Identification of the nature of deposits and their formation processes
- Identification of the nature of interfaces between deposits
- Identification of episodes of dumping
- Identification of flooring materials and active surfaces within floor deposits
- Identification of burning episodes and associated fuel use

## 9.2 Methodology

Samples were taken in kubiena tins and prepared for analysis using the methods of Murphy (1986) by George MacLeod at the University of Stirling in the Department of Environmental Sciences. Thin section description was conducted using the identification and quantification criteria set out by Bullock et al (1985), Stoops (2003) and Verrecchia and Trombino (2021), with reference to Mackenzie and Adams (1994) and Mackenzie and Guilford (1980) for rock and mineral identification. The coarse/ fine limit of 20 µm was used for both the mineral and organic components.

To assess the origin of sediment components, descriptions were made of particle size, shape and the composition of the coarse and fine fraction, particularly the frequency and type of organic matter, rock, minerals and anthropogenic inclusions. Whilst micromorphological identification followed Bullock et al (1985), Courty et al (1989) and Stoops (2003) it is essential to recognise that these methods were developed for assessing soils and are thus not always directly applicable to the highly organic deposits at BLoM. The analysis undertaken for BLoM has thus focused on assessing organic matter, anthropogenic inclusions and principal pedofeatures with an emphasis on cross reference against the archaeobotanical assemblage.

Following observation and description, deposits were grouped into deposit types. Deposit types have been determined by grouping of units according to diagnostic sedimentary attributes and inclusions. Inclusions that were dark black in PPL and XPL with sharp boundaries were identified as charcoal (Bullock et al 1985; Courty et

Abundance	Area %
Very dominant	>70
Dominant	50–70
Frequent	30–50
Common	15–30
Few	5–15
Very few	<5

Table 9.1. Terms used to estimate abundance of fabric constituents (after Stoops 2003: 49).

Abundance	Area %
Many	5–10
Occasional	2–5
Rare	1–2
Trace	<1

Table 9.2. Terms used to estimate abundance of pedofeatures (after Stoops 2003: 49).

al 1989; FitzPatrick 1993; Stoops 2003). Fungal sclerotia were identified by their spherical shape, a dark red/brown colour in PPL and their cellular internal structure (Fitzpatrick 1993). Phytoliths were identified as both linear and clustered features and distinguished due to their external and internal structure as well as being translucent in PPL (Piperno 2006). However, whilst phytoliths were occasionally present, it was not possible to quantify them, since they were frequently masked by organic matter.

Plant remains in thin section were identified by reference to key atlases and reference collections (Fitzpatrick 1993; Schweingruber 1978, 1990; Piperno 2006) and with assistance of AOC's archaeobotanist Jackaline Robertson. Identification of plant family, genus and species in thin section was dependent on plant type, part, size, articulation, orientation and preservation and was frequently not possible due to masking by amorphous organic matter.

Estimates of porosity and void spaces exclude areas of missing sediment and large cracks judged to be a result of processing.

When estimating abundance of fabric constituents and pedofeatures the terms used in Tables 9.1 & 9.2 (after Stoops 2003: 49) have been used.

### 9.3 Geological background

The solid geology at Black Loch comprises sedimentary rocks of the Cairnharrow Formation overlain by a Devensian till drift geology (BGS 2022). These consist mainly of glacial till, glacio-lacustrine laminated clays and silts, fluvio-glacial sands and other indeterminate sands and gravels which could be river gravels, fluvio-glacial outwash spreads or

reworked material from periglacial processes (solifluction). The glacial till of Devensian age is a diamicton (a poorly sorted sediment of highly variable particle size) which was initially eroded from the landscape and then deposited by the expansion and then contraction of the ice sheets at the end of the last glacial period. Sedimentary cores taken on the lake margins close to the site (Chapter 17.1.2.1) record sandy silty clays representative of Late Glacial deposition overlain by organic silty clays and organic silts representative of deposition in a low energy environment during the Holocene. Sediment stratigraphy reveals a gradual transition towards herbaceous monocotyledon peat in the lake environment or fen developed with reeds and fringing vegetation.

Soils are of the Yarrow/Fleet Associations and are locally organic with stony sandy loam topsoils, yellow-brown or strong brown loamy sand B horizons and coarse gravelly subsoils (Bown et al 1982: 128).

The mineralogy of the sand grains and lithology of the rock fragments observed within the samples reflect the soil parent material (gravels derived from sandstones). Rock fragments are generally few and, where present, can be classified as lithic greywackes (see Mackenzie & Adams 1994: 109). In all layers quartz dominates the coarse mineral component. The most abundant grain size in all samples is very fine sand (63–100 µm) to silt-sized (5–63 µm) quartz grains. Several samples contain much coarser grain sizes, including rounded, gravel-sized (>2 mm) rock fragments. Other minerals present in the samples include feldspars biotite and chlorite which never constitute more than 10% abundance.

### 9.4 Results

The results of the analysis are presented with reference to their episode/ phase, structure and context number and according to stratigraphic sequence. As is commonly the case, study of the samples micromorphologically has revealed that deposits recorded as single 'contexts' during excavation frequently consist of multiple complex organic and anthropogenic layers and thus, where appropriate, contexts are split into their constituent sedimentary units. Descriptions of each sedimentary unit are summarised; detailed descriptions and associated tabulated results are presented in the archive reports relating to each season of excavation.

### 9.5 Deposit types

Table 9.3 details a broad range of deposit types that have been identified during micromorphological analysis of samples within the structures (note that trackway and bank deposits are excluded). The descriptive criteria are presented as a summary characterisation of the deposits; in the context summaries deposits are referred to as Type A, B, C etc to facilitate description and to assist in interpretation of site-wide trends. Whilst each sedimentary unit has been

Deposit Name	Description
<b>Type A</b>	<b>Occupation deposit.</b> Characteristically heterogeneous with anthropic indicators frequently >10% and comprised of charcoal with ash and bone occasionally present. Organic matter is primary constituent. Moderate to strong parallel orientation of organic and anthropic components. Microstratification typified by thin lenses occurring throughout. Microstratification is often discontinuous indicating local compaction of the surface although shrink swell processes have obscured this in some samples. Characteristic of periodic accumulation and trampling over time. Lenses/ patches of sediment/ soil from outside the structure occasionally present. Analogous to living floors of Matthews et al 1997 (albeit much wetter and more organic) with evidence for periodic accumulation and compaction/ trampling over time, thus broadly consistent with the beaten floor types of Goldberg & Macphail (2006; 2018: 384). See Figures 9.1, 9.2, 9.3, 9.4 & 9.5.
<b>Type B</b>	<b>Banded organic floor</b> formed from deliberately imported organic matter. Platy to lenticular microstructures with frequent microstratification. Anthropic indicators frequently less than 5% but occasionally as high as 10%. Organic matter is primary constituent. Organic matter is frequently humified but generally well preserved often identifiable monocotyledonous plants and occasionally identifiable to species type eg bracken, sedge or rush. Frequent planar voids and cracks, some of which may be plant pseudomorphs but others likely derived from post-depositional distortion due to shrink-swell processes. Broadly analogous to the 'altered organic layers' of Ismail-Meyer (2014) although generally with lower quantities of anthropic indicators. See Figures 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7 & 9.8.
<b>Type C</b>	<b>Foundation layer.</b> Bracken, sedge and roundwood dominate. No evidence for incorporation of anthropogenic material other than dark flecks which may be microcharcoal. Likely laid down and immediately covered over. Organic matter exhibits excellent preservation. See Figures 9.2 & 9.9.
<b>Type D</b>	<b>Heterogenous fuel-rich floor.</b> Typically found close to the hearths, charred fuel constitutes at least 20% of the floor. Banded plant matter is present but a minor component. Minerogenic spreads rich in charcoal common. Burnt bone occasionally present and rare char may infer cooked meats fats/ blubber (Goldberg & MacPhail 2018: 384). Microstructures are complex but frequently massive and porosity is low. See Figure 9.4.
<b>Type E</b>	<b>Peat-rich organic floor.</b> Imported peaty turves, composed of fine pellety aggregates of black to dark brown, highly humified organic matter with a crumb-like or excremental fabric characteristic of turf that has been repeatedly mixed or bioturbated by the soil fauna (Stoops et al 2010: 256, 379). Organic matter is primary constituent and varies from well-preserved plant tissues with identifiable cell structure to red, fibrous, semi-amorphous material. Diatoms and phytoliths occasionally present. Porosity varies from 10–25% and voids comprise a mix of pseudomorphous voids indicative of root action and vughs and channels. Microstructures are weakly lenticular to crumb rugose. Pedofeatures comprise mesofauna excrements, microfabric roots and root channels (as per Goldberg & MacPhail 2006). Anthropic indicators are rare or absent. See Figures 9.7 & 9.8.
<b>Type F</b>	<b>Minerogenic foundation deposits.</b> Analogous to 'constructed floor' and prepared clay floor types of Macphail & Goldberg (2006, 2018). Coarse and fine mineral material dominates and organic matter is low. Microstructures are complex but trend towards massive. Porosity is low. See Figures 9.3 & 9.6.
<b>Type G</b>	<b>Hearth rake-out.</b> Characterised by fuel residues of charcoal and ash as well as bone and other food (cereal and char) residues. Sharp discontinuity boundaries and complex juxtaposition of sediments (see Macphail & Goldberg 2018: 376). Microstructures are complex and units are heterogenous. See Figure 9.5.
<b>Type H</b>	<b>Banded organic floor with stabling indicators.</b> Predominantly organic with horizontal layering. Characteristically homogeneous. Abundant plant tissues and organs. Occasional intercalated silt. Phosphatic yellow staining to voids and in voids spaces may be present (see Karkanis & Goldberg 2007). Anthropic indicators rare or absent. Possible dung fragments indicated by wavy material embedded in yellow phosphatic groundmass and/ or concentrations of fragmented sections of plant matter partially digested by herbivores and trampled into the deposit (see Milek 2012: 130–132). Analogous to 'stabling deposits' of Macphail & Goldberg (2006: 363–364). See Figure 9.10.

Table 9.3. Deposit types identified within thin section samples from BLoM.

assigned a type it should be noted that divergence from these criteria does occur, and the table is intended as a broad interpretive guide.

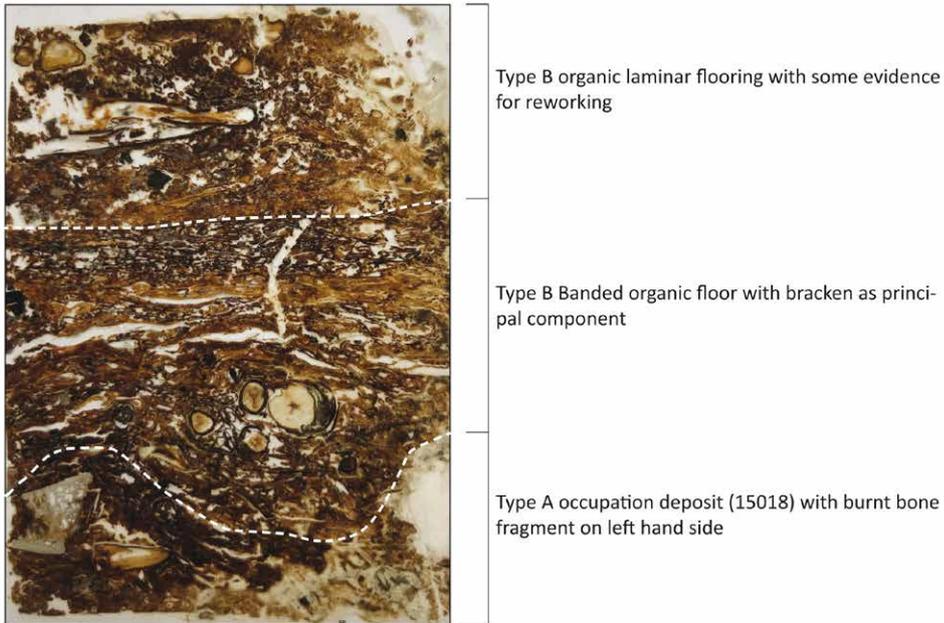
## 9.6 Discussion

The results of the micromorphological analyses presented by context, structure and phase in Chapters 3–6 have been used alongside other environmental proxies to better understand floors and interior deposits. However, these context-specific insights are just part of the micromorphological narrative and the analysis therefore needs to be considered in terms of the wider site level of observations and the post-depositional burial environments. The discussion below considers a range of themes that have arisen as a

consequence of the micromorphological analyses, starting with broad themes concerning the depositional and post-depositional environments, then site- and structure-specific themes relating to construction, maintenance, seasonality and inferred living conditions.

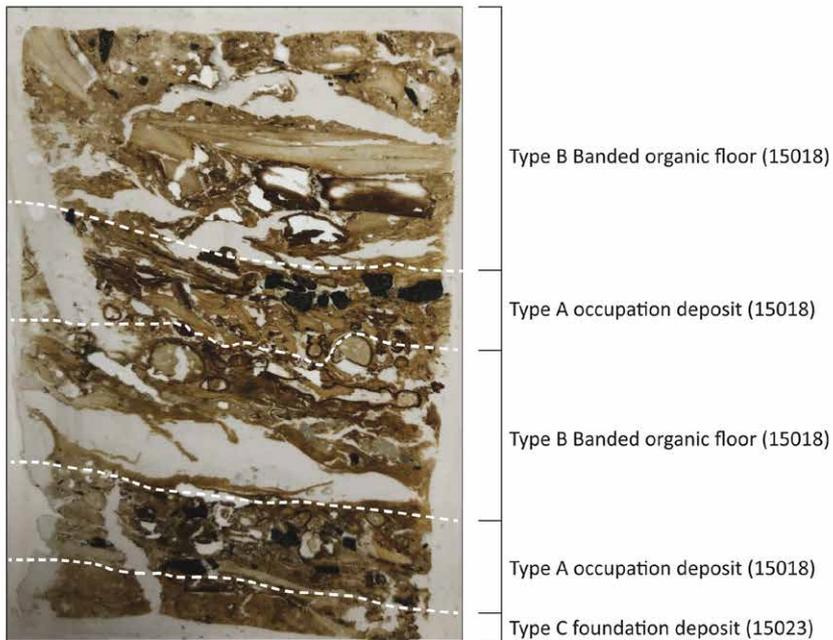
### 9.6.1 Preservation conditions

The preservation of organic material as observed in thin section at BLoM is exceptional. Waterlogging has preserved not just the lignified plant tissues but the leaves and more fragile plant tissues, in some cases with intact cellular structures which allow for identification of plants to species level (Figure 9.11, A).



0 2:1 25mm

Figure 9.1. Slide scan of sample ST3/M6/K3 showing examples of Type A and Type B flooring deposits.



0 2:1 25mm

Figure 9.2. Slide scan of sample ST3/M7/K2 showing examples of Type A, Type B and Type C deposits.

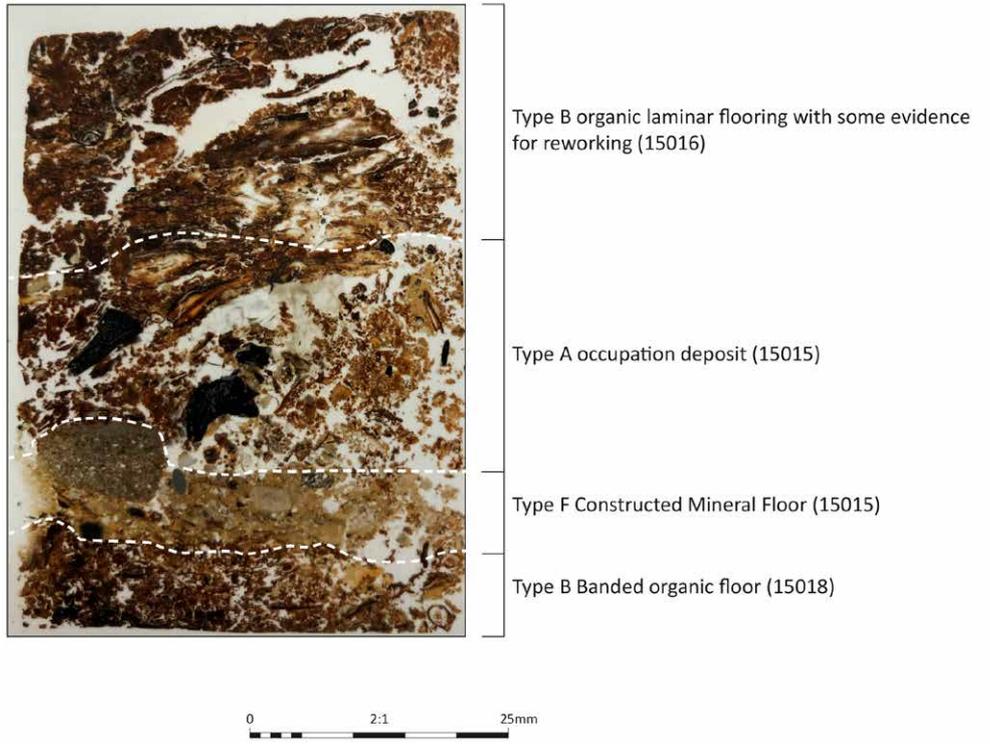


Figure 9.3. Slide scan of Sample ST3/M5/K2 showing Type A, B and F deposits.

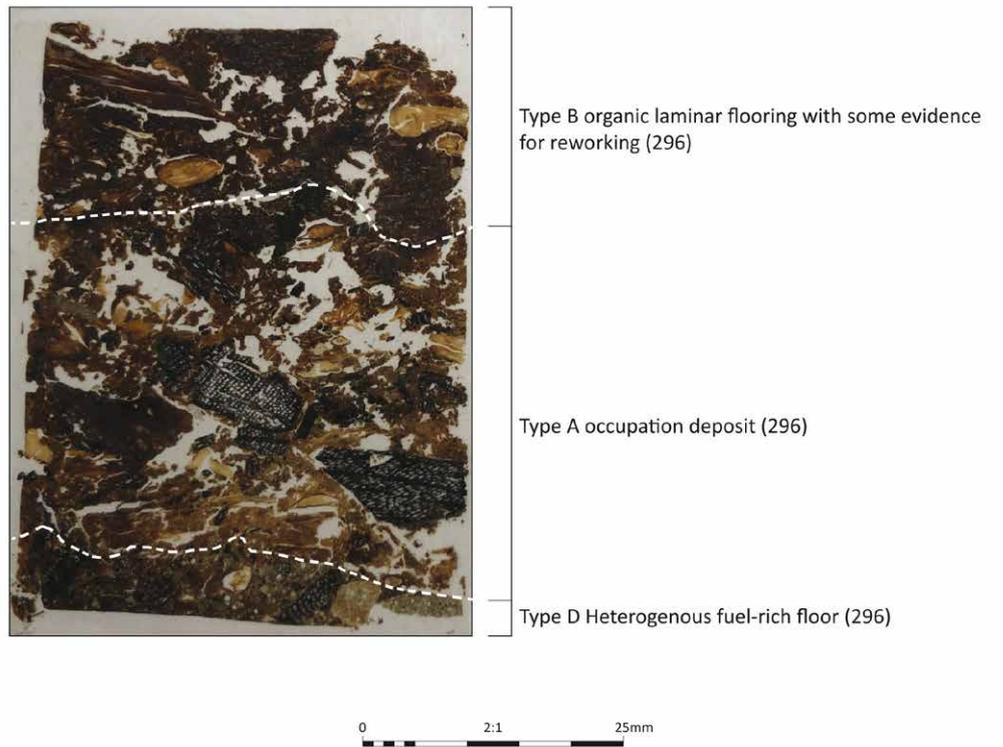


Figure 9.4. Slide scan of Sample ST2/K15 showing Type D, A, and B deposits.

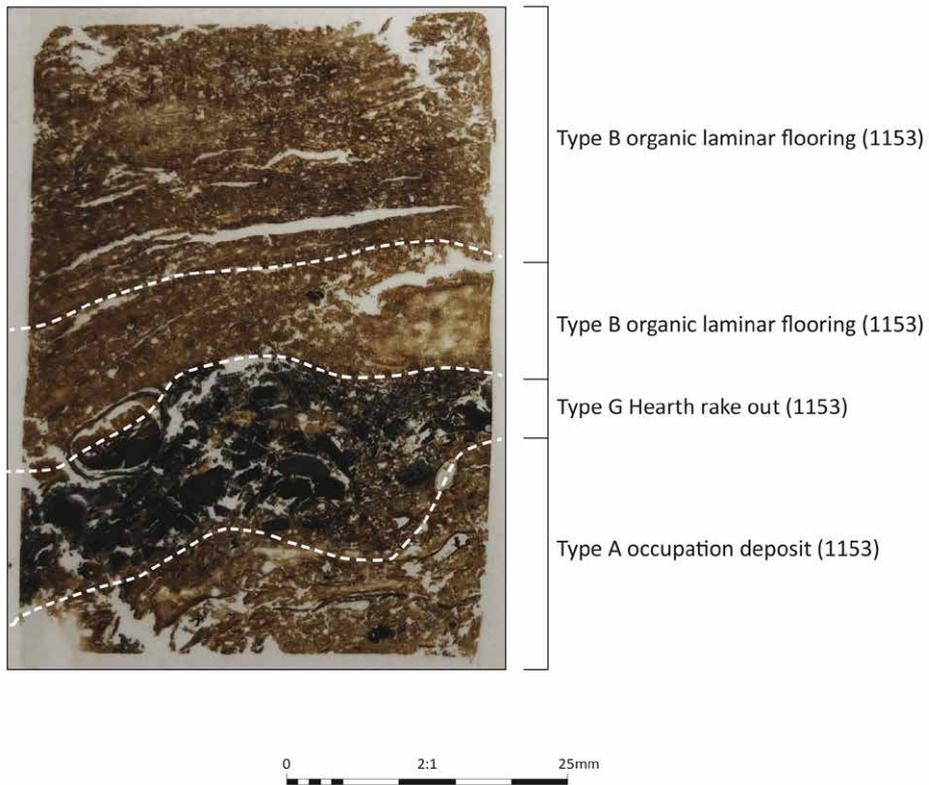


Figure 9.5. Slide scan of Sample ST3/M4/K4 showing Type A, B and G deposits.

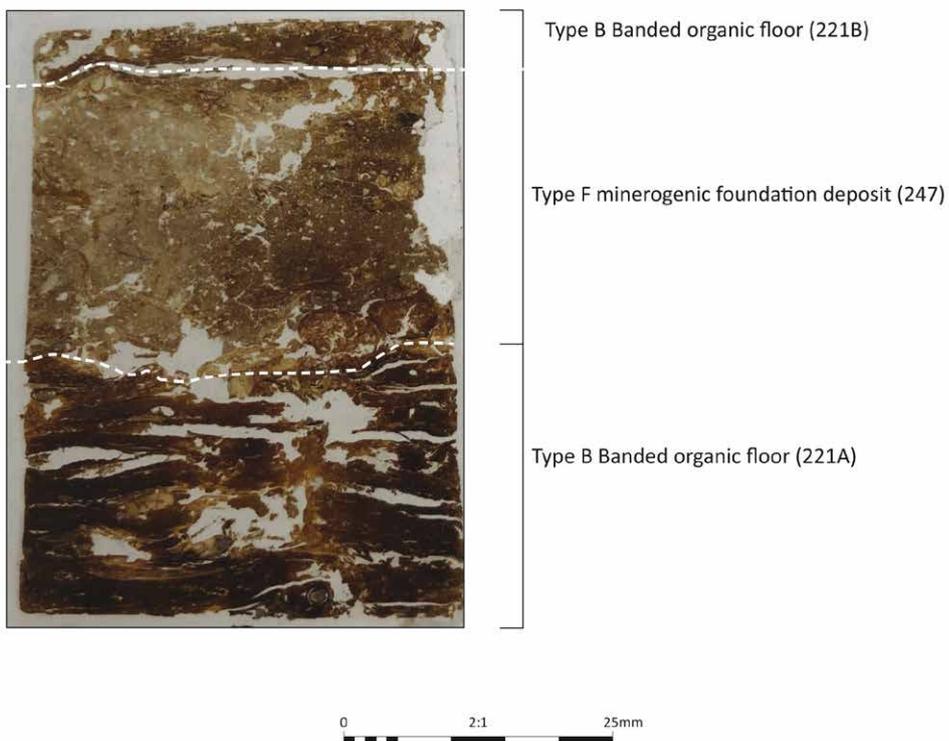


Figure 9.6. Slide scan of sample ST2/K9 showing examples of Type B and Type F deposits.

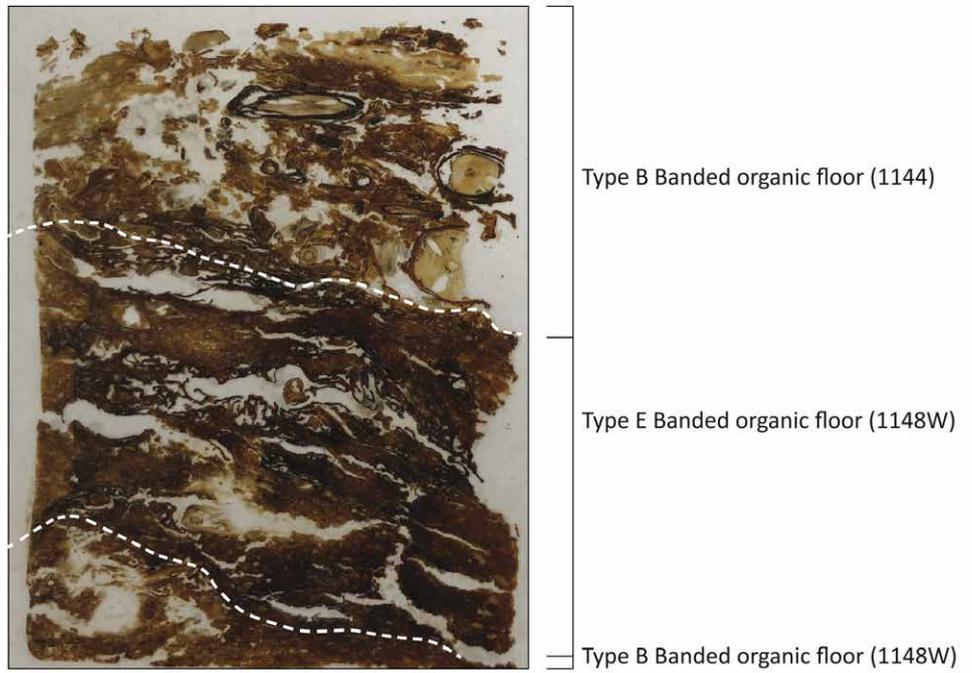


Figure 9.7. Slide scan of sample ST3/M3/K1 showing examples of Type B and Type E deposits.

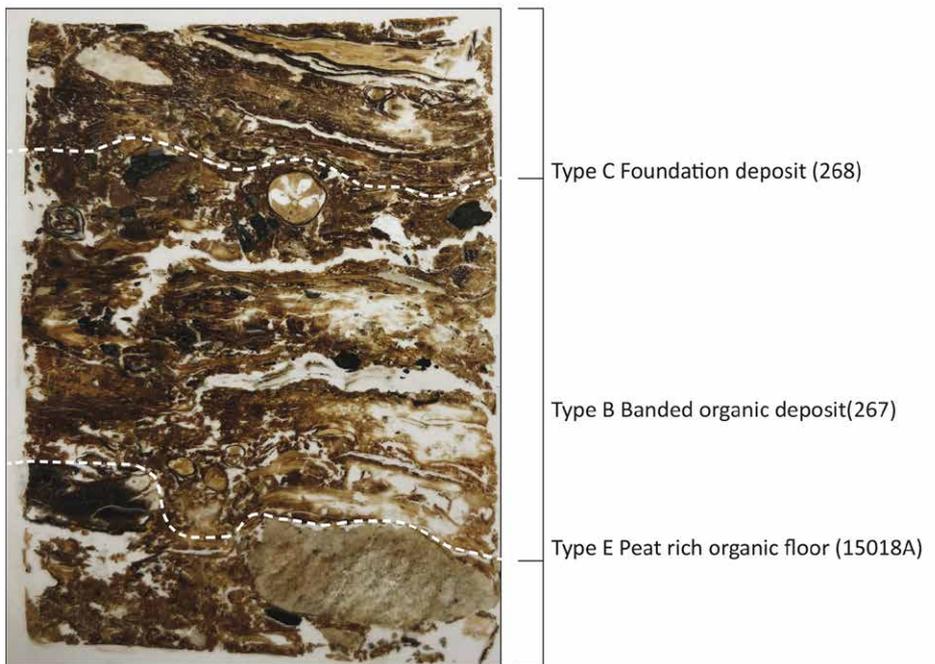


Figure 9.8. Slide scan of sample ST3/M6/K2 showing examples of Type E and Type B deposits.

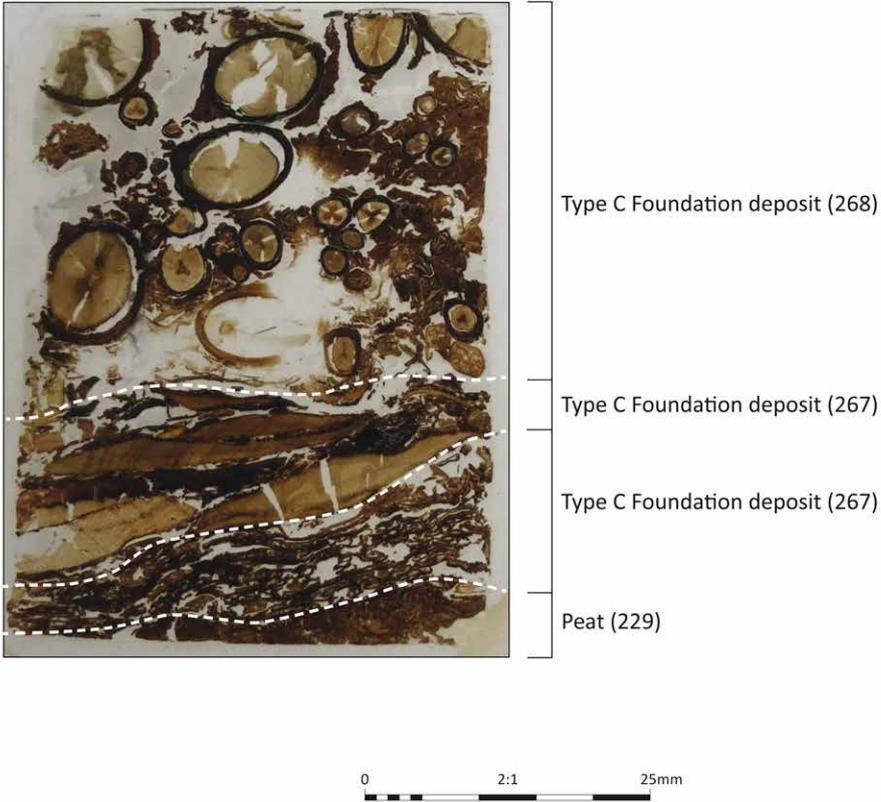


Figure 9.9. Slide scan of sample ST2/K8 showing examples of Type C foundation deposits with axial and radial cross-sections of roundwood.

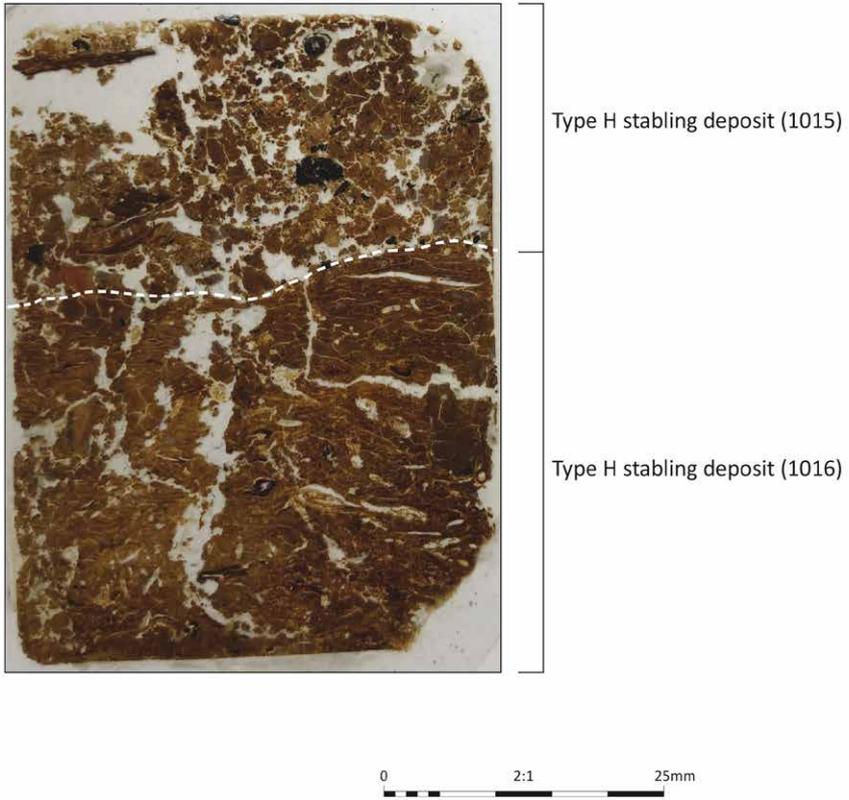


Figure 9.10. Slide scan of Sample ST4/K9 showing Type H deposits.

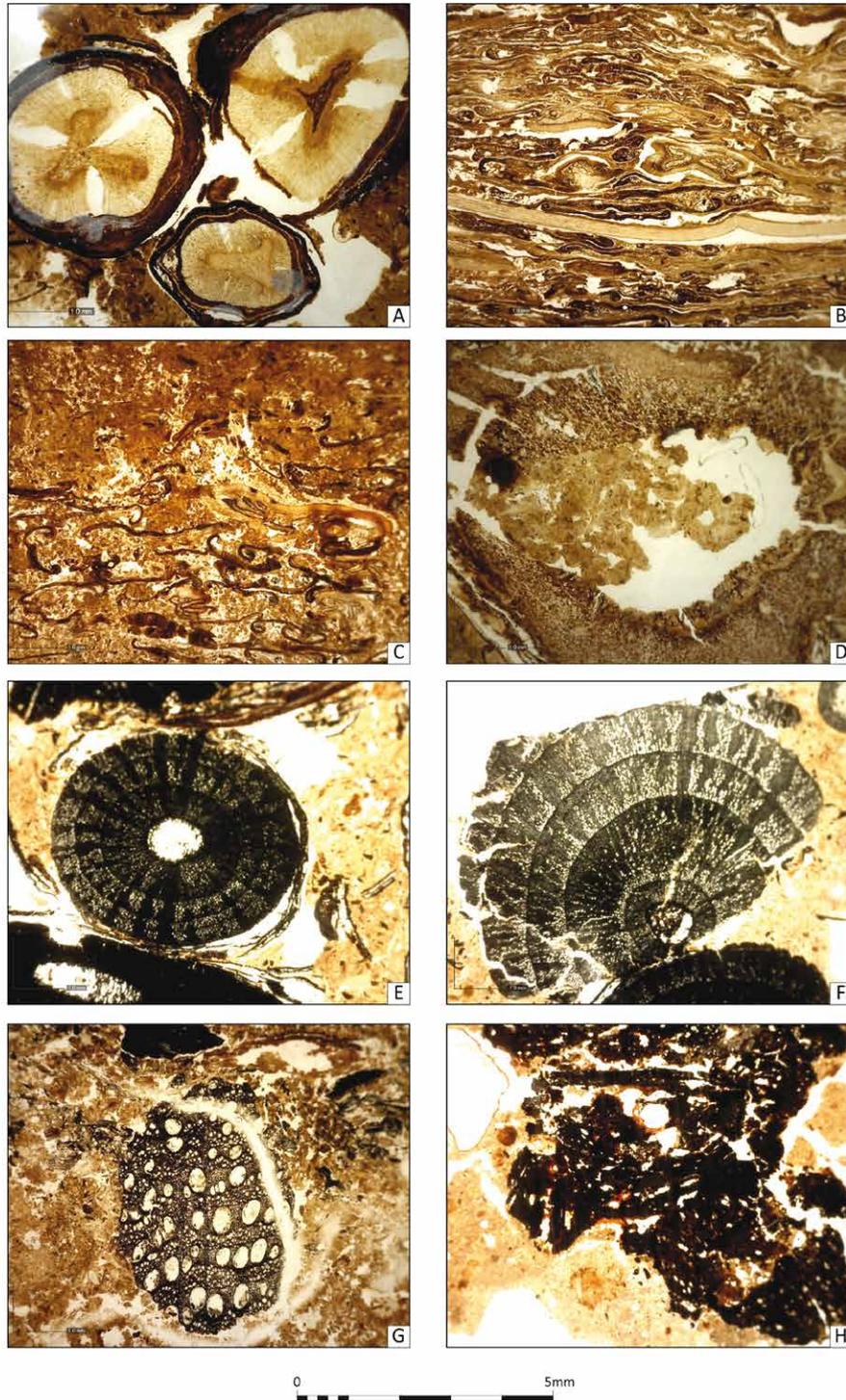


Figure 9.11. Photomicrographs in PPL. (A) Well preserved roundwood with identifiable alder and birch pith [268]; Sample ST2/K8. (B) Preserved cellular structure of bracken [267]; Sample ST2/K8. (C) Fragmentation of plant materials [734B]; Sample BA/K16. (D) Fungal mites within wood fragment [1743]; Sample ST3/M9/K2. (E) Charred hazel [1136]; Sample ST3/M1/K1. (F) Charred hazel [1136]; Sample ST3/M1/K2. (G) Charred oak [15018]; Sample ST3/M5/K2. (H) Charred peat fragment [219]; Sample ST2/K2.

The dense mass of plant materials used to construct floors at BLoM were deposited onto/ into oxygen-poor peat (and later inundated in some cases) and/ or were covered by other plant materials or sediments. Because oxygen could not reach the buried plant materials, the plants only partially decayed leaving behind identifiable cellular structure (Figure 9.11, B). In some cases (Figure 9.11, C) decay is more advanced and is indicative either of drier conditions during initial deposition and/ or of differential wetting and drying (Stolt & Lindbo 2010). In these cases organic matter is often bright orange-red or reddish in colour and retains only the phlobaphene and lignified tissues that are the most resistant parts of plants to decomposition (Fitzpatrick 1984; Stoops 2017: 395) and/ or is represented by amorphous sesquioxide staining. The preservation of the organic materials at BLoM is thus contingent upon the extent of waterlogging and differential preservation is thus at least in part a reflection of differential and sustained water saturation.

The analysis of prevailing environments presented in Chapter 17.1 reveals that the timing of the first felling date associated with BLoM (*circa* 600 BCE) corresponds with a change in hydrology to more terrestrial conditions. The evidence from BLoM indicates that the settlement was founded directly upon partly humified peat where the surface was dry but nevertheless within a wider environment conducive to peat formation. The earliest thin sections, although much later in date (*circa* 435 BCE), show evidence for terrestrial weathering processes in the form of fungal spores and mite droppings in organic tissue in elements of [221] (samples ST2/K5 and ST2/K9) and evidence for iron oxidation, humification, pedoturbation and the formation of organic detritus in [229], [253], [265] and [268] (Figure 9.11, D).

In order for such processes to take effect, the saturation level of the sediment must, at some point, have decreased. This may be a reflection of seasonal water-level fluctuations following deposition or a direct consequence of the deliberate augmentation of floors and importation of new flooring materials within the structures which would have momentarily arrested the encroachment of water. The changing hydrology of the settlement and the level of anthropogenic input are interdependent and the importation of additional plant material likely a reaction to water inundation and/ or trampling and compression. Pore spaces within many samples and the sesquioxide staining is indicative of wetting and drying processes which have served to alter and distort the sedimentary structure in some cases, although this process is by no means as extensive as observed in the micromorphological samples from the promontory crannog at Cults Loch (Roy 2018) or Must Farm (French 2024) where the organic fraction was observed to have undergone considerable oxidation and humification as a consequence of repeated wetting and drying.

Whilst some evidence for terrestrial site formation processes and organic decay has been identified in thin section, the emphasis here is on *drier* conditions rather than dry conditions and organic geochemical and palaeoecological data indicate the presence of flowing water throughout the occupation of the settlement (Chapter 17.1.4.3). This is consistent with micromorphological evidence for low energy erosion events or periodic water inundation in the form of thin bands of in-washed poorly sorted sub-angular silts and sands in void spaces within parts of [221] [224], [244] and [261] and slaking crusts in [631], suggesting the presence of shallow standing water within and around the structures at BLoM which would have led to underfoot wetness particularly in the winter months. This process is well documented in micromorphological studies from the lakeshore settlements in the Alpine (Ismail-Meyer et al 2013: 324–325) and Baltic regions (Ismail-Meyer 2014) and in wetland settlement in the Fens where Knight and Brudenell (2020: 391) note that *‘there would have been a constant need for people and things to be lifted above the wet.’*

The occurrence of degraded organic layers both above and below better-preserved layers indicates that the degradation of plant material most commonly occurred during the formation of the floors rather than post-deposition. The floors from ST2 appear to have been most affected by plant degradation, indicating that conditions within the structure were generally drier than elsewhere. Local variations in the water saturation regime of the sediment both during and following deposition may also have served to create the discrete differences in preservation and composition observed in each layer. This is particularly apparent in observed differences between samples of [1166] in ST3M2 and ST3M4 which indicate that preservation conditions for organic material were better towards the interior of ST3 closer to the hearths. This is consistent with thin section evidence from Nieuw-Dordrecht in The Netherlands where pristine preservation of organic matter above and below more degraded layers provided evidence for differences in post-depositional processes throughout the sample sequence (Van den Berg et al 2011: 161–177).

The differential decay trajectory observed across the site as summarised in Chapter 1.6 has thus influenced how well organic matter has been preserved within the analysed samples and this needs to be considered when presenting and interpreting the micromorphological evidence. This is of particular relevance when comparing the exceptional preservation of organic matter within floors from ST2 and ST3 to flooring deposits from ST1 and ST4 and the implications that this has with regard to the organic matter that may be ‘missing’ from the more decomposed sediments. The possibility that cultural layers have been partially washed away by periods of water

inundation remains. Variation within floor surfaces thus reflects external influencing factors as well as the day-to-day activities played out within the settlement.

### 9.6.2 Fuel use

Micromorphological and archaeobotanical analyses have provided evidence for use of a range of fuel types across the site (Chapters 11.5.6 & 14.2.4). Wood is considered the likely most important fuel, as evidenced by common occurrence of wood charcoal (Figure 9.11, E to G) in thin section and floatation samples and the presence of fine charcoal throughout the matrix of many internal floor deposits. It is likely that much of the original fuel detritus within the BLoM settlement would have been formed of wood ash. However, across all deposits very little intact ash was observed. Ash, and especially wood ash, is prone to diagenesis in wetland, acidic environments and is almost totally soluble (Canti & Brochier 2017) and thus it is unsurprising that it has not survived here and the observed fine and often thin charcoal layers may be all that the remains of a once much thicker ash rich deposit.

Micromorphological analysis has also provided evidence for burnt peat (Figure 9.11, H) and possible burnt dung (NW of the hearth within ST2 and close to the hearth in ST3), suggesting that both peat and dung were also used as fuel. There is evidence of burning of both peaty turves and well-humified peats at BLoM, indicating that peats at different stages of maturity were burned. The use of peat as a fuel would have involved significant management and maintenance, as peat would need to be dried for substantial lengths of time prior to being burnt. It has been hypothesised below that the peaty turf identified within ST3 was used for floor maintenance/ construction; however, the possibility that turves were being stored with the intention of drying them out for fuel cannot be ruled out. Whilst the use of well-humified peats as fuel can be difficult to detect at the macroscale, the reduced residues can be picked up at the microscale as demonstrated at the Iron Age site of Vlaardingen in the Netherlands where small quantities of brushwood were used as fuel alongside larger quantities of peat and cattle dung (Braadbaart et al 2017: 1687). Peat ash was identified E of the hearth in micromorphological samples from Mound 1 at Bornais (Milek 2012b: 6) and subsequently identified as the primary fuel at the site with wood as a secondary source (Munro & Milek 2020: 160). Burnt peat and burnt turf as fuel has been identified through micromorphological analysis of hearth rake-out (McKenzie 2020: 161) and midden (Shillito et al 2015: 2) deposits at the Neolithic Ness of Brodgar settlement.

It is possible that the alternate layers of ashy peat material from deposits adjacent to the hearths in ST2 and ST3 could represent the use of the hearth for different purposes, with the well-humified drier peat being used for higher temperature fires and the damper peaty turf for

lower temperature fires. Ethnographic studies undertaken in the Outer Hebrides have recorded well-humified peat as the dominant fuel source used for cooking and other domestic activities, whilst peaty turf and fibrous upper peat was used if the fire was needed to be kept alight overnight (Fenton 1986).

### 9.6.3 Plant use and seasonality

Combined micromorphological and archaeobotanical analyses have revealed floor deposits to consist of five principal plant components: bracken, wood, sedge, rush and turf (Figure 9.12, A to D) with smaller quantities of straw and grasses. These principal plant components were found in a variety of combinations within Type B banded organic floors with some trends/ preferences for species selection noted. For example, the Episode 1 Type B floors in ST2 comprise a mix of bracken, wood, sedge and rush whereas the Episode 2 floors are dominated by bracken, wood and turf, with sedge and rush only rarely incorporated. This variation in composition of flooring material coincides with changes in phases of occupation and thus may reflect either external environmental factors relating to seasonal and local plant availability, cultural factors relating to experimentation, or preference for different flooring materials or likely a combination of both. For example, rushes and sedge seem to dominate only in the earlier phase floors, so it is possible either that this material became over-exploited and was not as readily available for use as a flooring material by later phase occupants or that changing cultural, social and aesthetic preference made these plants less appealing as flooring materials.

The type and quantity of plant material deposited in each floor surface renewal and the rapidity with which each surface was buried following its deposition created variation in the sedimentary sequence. Large quantities of plant material were being brought into the settlement and thus it is likely that the source of this material varied both temporally and spatially, creating some of the differences observed in thin section.

Of most significance in relation to plant use and management at BLoM is the dominance of *Pteridium* (bracken) in floor deposits. Bracken has been used throughout history for a multiplicity of purposes (Campbell & Pelling undated; Rhymer 1976; Donnelly et al 2002). Depending on the use to which it was intended, bracken had to be cut or pulled in different seasons; the hard stems required for roof thatching are best obtained in the summer whereas bedding was better obtained in the autumn when the fronds are dry and brown. When used as stock bedding, bracken slowly breaks down into a rich mulch which can be used as fertiliser. Bracken has also historically been used as a fuel and as a damp-proof foundation for corn or haystacks, as evidenced by historically documented land management disputes recording conflicting approaches between those

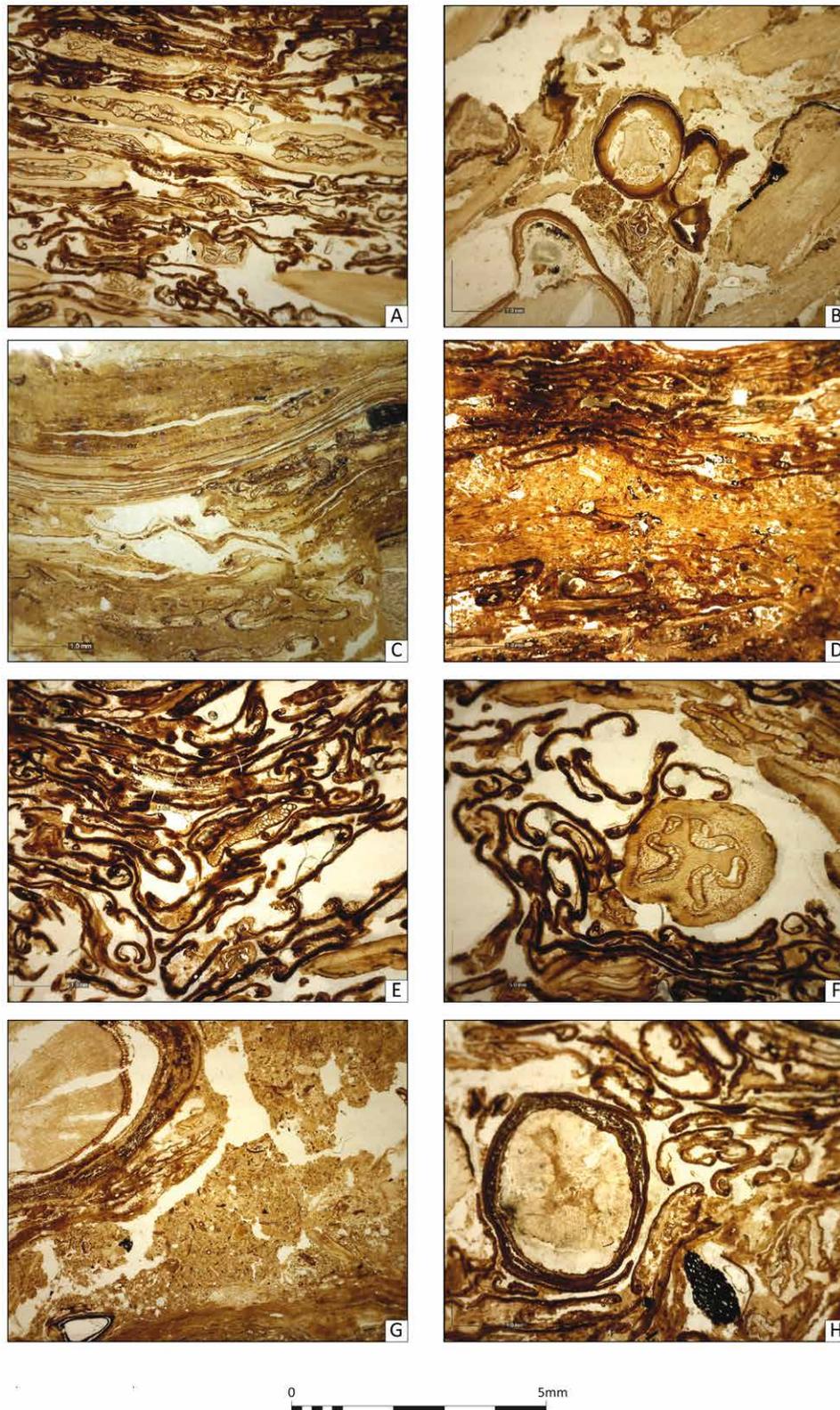


Figure 9.12. Photomicrographs in PPL. (A) Bracken in floor [244] (Type B); Sample ST2/K3. (B) Wood in floor (alder) [253]; Sample ST2/K12. (C) Sedge/ rush and bracken in floor [250] Type C; Sample ST2/K3. (D) Turf in floor [221]; Sample ST2/K2. (E) Bracken [251] & [267]; Sample ST2/K6. (F) Bracken rhizome [1728]; Sample ST3/M9/K2. (G) Sediment arranged in relation to larger roundwood [253]; Sample ST2/K12. (H) Sediment arranged in relation to larger roundwood [638A]; Sample ST6/K5.

wanting to acquire bracken for burning and others hoping to preserve it until it had dried and could be harvested for dry uses (Winchester 2006: 7–9).

Bracken is a natural insecticide (Donnelly et al 2002) and the fronds were used extensively as a packaging material for dry products such as slate and earthenware as well as for fresh foods (Smith & Green 2005). Winchester (2006) discusses the numerous village byelaws which provide evidence for use of bracken in medieval domestic economies. Of particular relevance is a byelaw from the village of Wythburn dated to 1677 which forbids the mowing of bracken prior to 30 September and the pulling of bracken prior to 25 August in order to preserve its future vigour (*ibid* 7).

Most cases of bracken in the archaeological and palaeobotanical record relate to the disposal of spent animal or human bedding, thatch or flooring. Charred bracken pinnules were present within pits associated with the Early Iron Age settlement at Nettlebank Copse, Hampshire and within the ditch fills of the Late Iron Age banjo enclosure at the same location (Campbell 2000). Micromorphological study of samples from the Must Farm Late Bronze Age pile dwelling settlement revealed many instances of a highly humified grasses/ reeds/ rushes/ bracken between calcitic clay coatings and hypothesised as deliberately made, insulated walling material (French 2024: 232). At Thorpe Lea Nurseries, Surrey bracken frond fragments preserved by waterlogging were found in a middle Roman waterhole (Robinson 2012). The insect assemblage from the same deposit was deemed to be typical of old, damp hay or straw from within a building rather than foul waste so it was concluded that this material could represent unused bedding that had deteriorated in storage. However, as demonstrated across ST2, ST3 and ST4, the floor layers are often not associated with foul waste decomposer insects (Chapter 13) and suggest maintenance of relatively clean bedding areas within the outer parts of the structure.

As outlined in Chapter 17.1.6.1, the *sed*aDNA record for White Loch of Myrton (WLoM) shows elevated levels of bracken between *circa* 500–100 cal BCE which coincides with occupation of the crannog. This is of interest as regular cutting of bracken is known to reduce both the vigour of the plant and the yield of fronds (Winchester 2006: 10) and therefore it would be expected that human activity would reduce rather than increase the occurrence in the wider landscape. Bracken was likely used as a construction or flooring material at WLoM just as at BLoM and, given the key role it played at the nearby BLoM, it is possible that this increase at WLoM reflects deliberate land management to ensure its proliferation and availability.

The pristine preservation of bracken observed within [251] and [267] (Figure 9.12, E) is indicative that the plant material was deposited very shortly after it was picked and rapidly buried, allowing for the preservation both of the plant material and the distinct layers of which it was

comprised. Further, the preservation of tightly curled fronds within [251] overlain by open/ mature fronds is indicative of deposition in the spring or early summer prior to the full maturity of the plant and provides hints as to the use of seasonally available plant material. This hypothesis is supported by archaeobotanical evidence which identified differential distribution of sporangia, attesting to seasonality as sporangia are only presented on mature fronds (Chapter 11.5.5.1). The subtle differences in the bracken used for floors thus allows us to conclude that individual sedimentary units identified micromorphologically relate to seasonal resurfacing episodes.

During Phase 4–5 in ST3 bracken used in the floor in the SE quadrant [1728] still had the rhizome attached (Figure 9.12, F); this was not observed elsewhere in the house or in the settlement. The rhizome is hard and compact and burrows so deeply into the soil it is difficult to remove without a sharp spade or similar tool (Freethy 1987: 86). The presence of rhizomes in ST3 indicates a change in land management of bracken resources. The bracken used within ST1, ST2, ST4 and ST6 was cut from above the ground whereas the bracken from ST3 was pulled directly from the ground probably using a spade or similar tool. Removing bracken in this manner is labour intensive and may indicate an attempt to deliberately clear land nearby; its incorporation into the floors may have been a by-product of wider land management strategies.

The deposits from ST4 revealed less frequent evidence for bracken as a major floor component. This may in part reflect the hypothesised use of the structure for animal stabling because, whilst bracken is commonly used for bedding, it contains a variety of toxins. Ingestion of significant quantities of bracken will produce signs of acute poisoning related to thiamine deficiency in monogastric animals and bone marrow depletion in ruminants. Bracken fronds become less toxic with age and it is important that bracken cut for animal bedding should have died back entirely to prevent ingestion of rhizomes. Large piles of bracken and plant material found outside of structures could thus represent stockpiling of bedding.

Bark and wood chips are also frequently present within floor layers with sharp edges providing evidence for woodworking. The arrangement of the wood in thin section shows a dominance in cross section of tangential roundwood revealing deliberate patterning in its deposition. Processes of compression are also identifiable through the presence of sediment from overlying layers arranged in reference to larger roundwood fragments, evidencing trampling and compression of flooring material (Figure 9.12, G & H).

#### 9.6.4 Floor construction, maintenance and inferred use of space

During the lifetime of the BLoM settlement, the internal spaces within the structures were managed through the

repeated importation of plant material, the sweeping or raking out of extinguished hearths, and the (presumed) removal and/ or burning of bedding. These different activities and their corresponding sedimentary signatures were superimposed over one another, forming the varied micromorphological features of the BLoM deposits and providing both direct and proxy evidence of floor construction, maintenance and inferred use of space. Outside of the central hearth area of each structure, the abundance of anthropic activity residues across the sample sequence is generally low, suggesting that the structures and their floors were well maintained and kept relatively free and clean of debris. Indeed, as noted by Friesem (2016: 51) floors preserved at the moment of occupation are rarely found in archaeological contexts and many human activities either do not result in residues that make their way into floor deposits or they actively remove residues from floors. Thus, we must first understand the post-depositional processes that occurred within floors and more widely across structures before we can start to understand occupation deposits and distinguish between evidence of absence and absence of evidence (Wiemann & Rentzell 2015).

Maintenance activities such as sweeping, shovelling, rakeout and repair may account for the evidence visible in thin section as demonstrated by experimental micromorphological studies (Miller et al 2017). Micromorphological and ethnoarchaeological studies of floors from an abandoned farmhouse in Iceland revealed evidence for the practice of spreading ash over organic floor surfaces to absorb moisture and odours (Milek 2012a; Milek & Roberts 2013). In Ribe, Denmark, ash had accumulated at the edge of buildings delineating the extent of sweeping whereas in other parts of the building sedimentary units had been truncated due to the removal of house floors (Trant et al 2024: 21). These studies have demonstrated that whilst maintenance activities may create identifiable patterns they can also erase or obscure evidence for daily or economic activities that once took place on the floors or may, such as the example in Iceland, provide evidence for practices that are alien to our modern sensibilities.

The compact plant matter comprising the Type B floors identified at BLoM are interpreted as floor coverings, a practice that is readily documented in anthropological (Milek 2012a) and archaeological contexts (Courty 1992; Macphail & Goldberg 2010; Hamlet & Simpson 2013; Cavers & Crone 2018; Roy 2022; Kovac et al 2024). Micromorphological analysis of floor deposits from within the Iron Age broch at Clachtoll revealed a deeply stratified series of floor deposits characterised by an accumulation of stratified plant fragments and debris including peat ash and charred peat fragments (Roy 2022: 295). At the Neolithic settlement on Eilean Domhuill, North Uist floor layers were found to contain straw, peat, bracken, ferns, twigs and

other comminuted vegetation (Dixon 1989). Vegetative matter was also incorporated into floors at the Links of Noltland, Orkney but extensive bioturbation of the deposits prevented conclusions regarding whether or not this was related to deliberate floor construction (Hamlet 2014: 341).

Micromorphological features typical of organic-rich floors include planar voids, articulated phytoliths and iron staining (see Macphail et al 1995; Matthews et al 1997; Carter 1998; Macphail 2006; Cammas 2018; Goldberg & Roy 2022). These features are typical of the Type B floor deposits at BLoM (Figure 9.2) which could also be described as anthropogenic peats, in accordance with a formation process observed in lakeshore settlements in Switzerland (Ismail-Meyer et al 2013), Lithuania (Ismail-Meyer 2014) and England (Glastonbury Lake Village – Banerjee 2016). These floors display characteristics similar to natural peat but incorporate organic materials which have accumulated at an artificially high rate due to deliberate importation into a settlement with a high groundwater table, which has preserved the organic matter. Type B floor deposits are found most frequently within ST3 with numerous units within (15018) and (1153) comprised of more than 75% organic matter and thus technically peat deposits (see Kazemian 2011) but containing accumulations of bark, twigs and leaves especially bracken in association with small quantities of occupational debris ash, bone and organic material. These layers are typically not more than a few centimetres thick and likely represent distinct occupation episodes. The durations of such episodes are difficult to define given that continuous trampling would have made the layers more compact and that repeated cleaning and refurbishment is inferred from intervening anthropogenically sterile Type E peat layers.

Type F mineral foundation deposits which are analogous to the ‘constructed floor’ types of Macphail and Goldberg (2006) are rare at BLoM, eg [247] (Figure 9.13, A) and indicate that the deliberate importation of organic material was generally preferred over mineral material. Nevertheless, occasional importation of silts and sands from outwith the site for use as foundation or sterile layers prior to the construction of organic floors is consistent with the process observed in micromorphological samples from the promontory crannog at Cults Loch (Roy 2018, 91–92), at the Neolithic settlement of the Ness of Brodgar (McKenzie 2020) and at the Iron Age dwelling at Cnip, Lewis where floors were periodically removed and new floors of clean sand laid down (Armit 2006).

The identification of trample in organic sediments in waterlogged conditions is more difficult than in a terrestrial environment owing to changes caused by water ingress and compression from burial in a wet environment which can cause swelling of sediment and eradication of trampling indicators (Ismail-Meyer et al 2013). The importation of large quantities of bracken for bedding/ flooring and

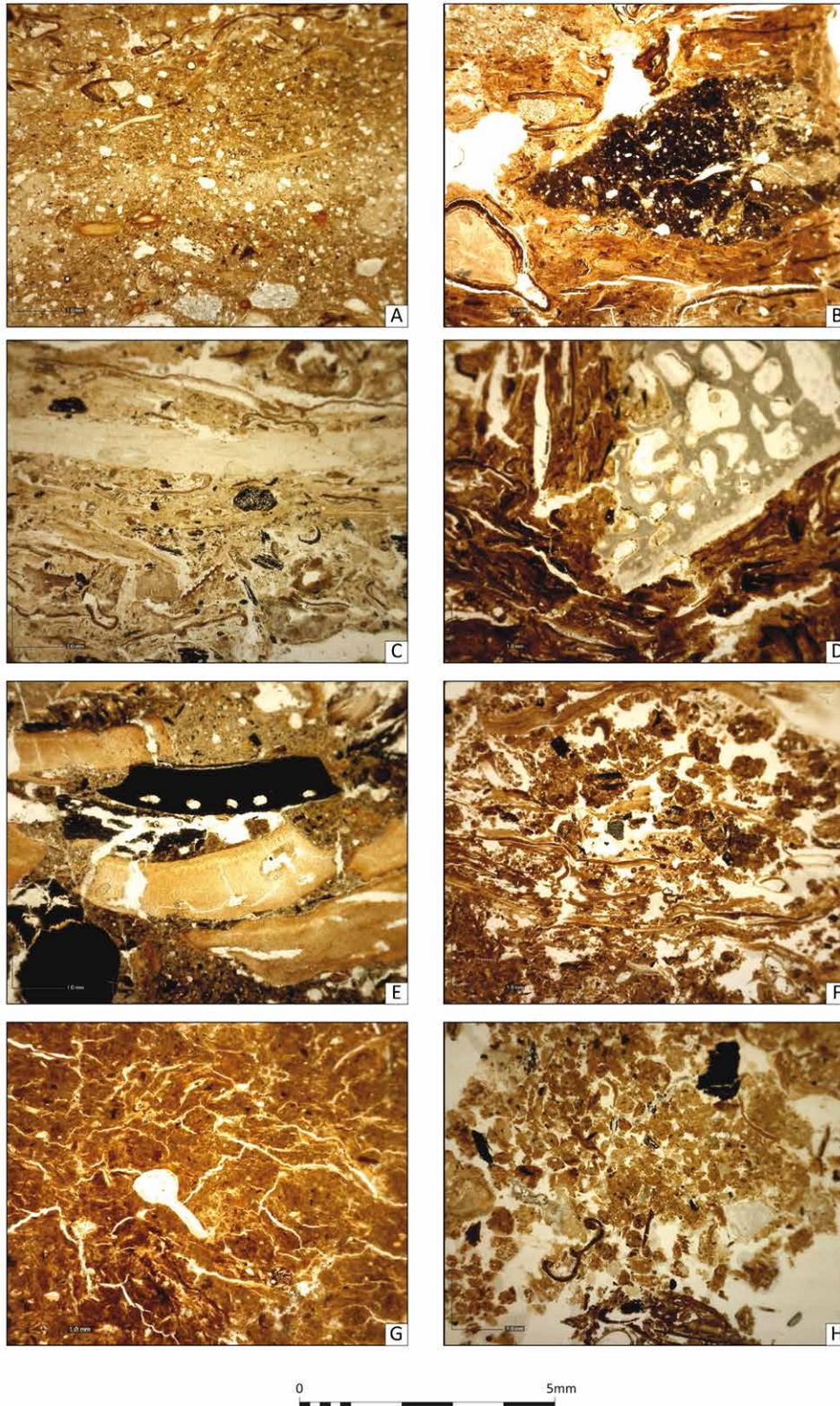


Figure 9.13. Photomicrographs in PPL. (A) Constructed massive floor [247]; Sample ST2/K9. (B) anorthic sediment fragment trampled into floor [741]; Sample B7/K4. (C) Trampled Type A floor rich in anthropic indicators [15018]; Sample ST3/M7/K2. (D) Burnt bone floor [15018]; Sample ST3/M6/K3. (E) Hazelnuts in Type G [296]; Sample ST3/M5/K2. (F) Buried turf with organo-mineral excrements [15016]; Sample ST3/M5/K3. (G) Peat Type E [621]; Sample BA/K5. (H) Faecal pellets and crumb microstructure [15018]; Sample ST3/M5/K2.

the subsequent management of the floor surfaces may also have absorbed some of the pressure exerted on the surface by trampling, a process observed during micromorphological studies of samples from the Sibudu Caves where importation of plants as bedding material was hypothesised to have reduced the amount of material reworked by trampling (Goldberg et al 2009: 120). Traces of trampling are well known from micromorphological studies carried out on terrestrial settlements (Courty et al 1989; Banerjea et al 2015; Trant et al 2024). Schwenninger (1999) used the boundary between floors at Dun Vulan, South Uist to determine whether a floor had been compacted or not, reasoning that a diffuse boundary between two floors indicated that trampling had occurred. At Links of Noltland (Hamlet 2014) and Clachtoll (Roy 2022), observed differences in porosity were used to infer different activity zones, where lower porosity generally corresponded with the most heavily trampled areas such as entrances. In discussing peat floors at Bostadh in Lewis, Tams (2003: 201) notes that the microstructure of peat does not change when incorporated into a floor but that the material becomes denser and more compacted with the increased compaction forces. As at Bostadh, the original thickness of the peat used for the floors at BLoM remains unknown, and therefore the determination of the amount of compaction through the reduction of this thickness cannot be quantified.

A number of key indicators of trample (see Ismail-Meyer et al 2013: 333; Jennings & Wiemann 2013; Trant et al 2024) have been observed at BLoM and include massive microstructures, polyconcave voids, low (<10%) porosity, fragmented and micro charcoal, linear and parallel distribution and local orientation of plant fragments where downward compression by trampling aligns inclusions parallel with the surface, eg [250], [221], [224], [251] and [261]. The formation of dusty impure clay and silt coatings as observed within [248] can also be indicative of dumping under wet conditions and the rotational movement of sediment caused by trampling (Courty et al 1989; Aspöck & Banerjea 2016). The identification of anorthic patches of loam sediment within [251] and [244] are indicative of trampling as a depositional process transporting clods of sediment from outside the structure into the structure on the soles of feet (Figure 9.13, B).

The micromorphological evidence from ST2 appears to show a clear distinction between organic layers in the inner part of the structure ([244] and [250]) with those in the outer part of the structure ([221] and 251), with those closest to the hearth revealing greater evidence for occupation. Contexts with the greatest evidence for anthropic influence (Type A floors), eg [265] (Figure 9.13, C) were located within the inner part of the structure and in closest proximity to the hearth. The archaeobotanical evidence concurs with the micromorphological evidence in this respect as cereal remains were found to be concentrated in contexts from

the inner part of the structure close to the hearth and found more rarely in the floor/ bedding layers (Chapter 11.4.1.2). Identification of burnt bone in thin sections (Figure 9.13, D) and within the animal bone assemblage (Chapter 12.1) suggest that bones were tossed into the fire after the meat was consumed, which would have had the dual effect of feeding the fire and disposing of bone waste hygienically. Similarly, hazelnut shells both burnt and unburnt, were also identified in archaeobotanical (Chapter 11.5.3) and micromorphological samples (Figure 9.13, E) derived from Type G deposits close to the hearth. Spatial variation within contexts such as [221] also demonstrates a decreasing level of anthropogenic activity away from the hearth (*cf* ST2/K5 and ST2/K9). Samples taken from the entrance deposits within ST2 exhibit greater proportions of anthropic indicators within the Type A floor layers of [296] located closer to the centre of the structure (ST2/K14) when compared with Type B deposits from the outer part of the structure (ST2/K15). This trend is also consistent with micromorphological studies conducted on floor deposits at Bostadh, Cladh Hallan (Tams 2003: 200) Clachtoll Broch (Roy 2022: 295) and with multi-elemental studies conducted on the floor deposits from the Iron Age roundhouse at Meillionydd, the Iron Age cellular house at Orosaigh, South Uist and the Norse longhouse at Bornais, South Uist (George 2024).

### 9.6.5 Peat and peaty turf as construction and flooring material

The excellent levels of preservation at BLoM have provided evidence of the importation and wide use of locally sourced peat and peaty turf in Type E deposits. The use for construction of readily available sediments from the vicinity of the settlement site has been demonstrated by numerous micromorphological studies (Macphail 2007; Friesem et al 2017; Cammas 2018; Kovacs et al 2024).

The presence of turf or buried turf can be recognised micromorphologically from its characteristic crumb-like or excremental fabric, fine pelley aggregates of black to dark brown, highly humified organic matter indicative of turf that has been repeatedly mixed or bioturbated by the soil fauna (Macphail & Goldberg 2010: 591; Stolt & Lindbo 2010: 379; Wilson & Righi 2010: 256; Friesem et al 2017) (Figure 9.13, F). In some cases the structure and excrements appear finer up the profile, another characteristic of turf (see Macphail & Goldberg 2010: 591; Huisman & Milek 2017). The insect assemblages from ST2 and ST3 are also consistent with importation of peat and/ or turf (Chapter 13.4.7).

Despite its high water content, peat has a significant sheer strength because of its fibrous nature even when highly decomposed (Lindsay et al 1988). Non-woody wetland areas such as the marshes and peat bogs found around BLoM are especially suitable environments from which to extract turf for construction because the dense

root mat and the high organic content relative to mineral content give it more coherence, make it more water absorbent, and give it better insulating properties than dry turf (Huisman & Milek 2017: 133).

The Type E peat deposits (Figure 9.13, G) most frequently found in ST3 but also in ST2 resemble natural peat deposits with very limited evidence for anthropogenic activity or alteration, save for fragments of charcoal which are indicative of human activity in general proximity and rare burnt bone which may have been mixed in from overlying units. These deposits appear to have been subject to varying degrees of reworking as indicated by faecal pellets and patchy rugose crumb microstructure as noted in several units within [1153] [1148] and [15018]. For example, Units 1 and 4 of ST3/M5/K3 [15018] were both found to contain evidence for reworking by soil microfauna in the form of faecal pellets and a crumb microstructure (Figure 9.13, H). This is at odds with the clear sedimentary boundaries observed which indicate a rapid burial. It thus seems likely that the reworked soil-like structure was inherent within the turf prior to deposition within the structure and thus likely that the peat was derived from open ground where it was subject to soil formation processes.

The preponderance of peaty turf within the floors in ST3 provides insight into the use of space within the structures which can be paralleled with historically documented examples. Accounts of small-scale dwellings and structures from the 19th century record the importance of peat and turf sods as a building and flooring material. Walker (2006: 32) notes the use of turf as ‘furniture’ forming internal benches and possible interpretations of turf identified micromorphologically at Lair in Glen Shee include an internal turf feature such as a bench or stool (Reid et al 2023a). An account of a turf-built house in Fetlar, Shetland in the 1860s notes that the most important features of the house was *‘the bed, which took up a good half of the floor space. It was built of a kind of raised dais of wood and sods, over which heather or straw was spread, then sacking’* (cited in Fenton 2008: 66). Turf was identified as a component of numerous thin sections samples from structures at Must Farm Late Bronze Age pile dwelling settlement and hypothesised to have derived from turf used as a roofing material as well as in floors and as wall insulation (French 2024: 227). Huisman and Milek (2017: 113) note that domestic structures in which walls and roofs are made from turf are largely restricted to treeless northern landscapes. We must therefore consider that peats had a functional role within the structures beyond floor surfaces and that they may have been used to create raised sitting or sleeping areas. Indeed, analysis of micromorphological deposits from Inuit houses in Canada has revealed that areas known to have been used for sleeping contained very few anthropogenic residues because they were covered by animal skins or twigs which acted as a barrier for the

deposition of anthropogenic residues (Couture et al 2016). This absence of anthropogenic residues in hypothesised sleeping areas is consistent with micromorphological evidence from the outer areas of ST2 and ST3.

In discussing micromorphological samples from peat floors within the Iron Age roundhouse at Bostadh in Lewis, Tams (2003: 190) argues that a peaty turf might have been preferred over a machair turf due to the higher organic content which would allow it to retain its structure for a greater length of time, and therefore require a lower level of maintenance or replacement than a less organic turf. Micromorphological analysis of floor deposits from Clachtoll broch in Assynt identified heath-like plant materials and peaty turf as a primary constituent of several floors, indicating that they may have been deliberately imported to level and insulate the floor (Roy 2022: 295).

Turf was also employed as a construction material in the ramparts. Micromorphological study of Rampart 1 revealed that the turf had been inverted or tilted, resulting in repeating soil horizons and very sharp boundaries between humic and mineral horizons (BA/K10, BA/K6, BA/K7 and BA/K8 – see Figure 9.14).

### 9.6.6 Stabling

Discussions regarding use of space within prehistoric roundhouses frequently hypothesise the use of peripheral space for stalling of livestock (Hingley 1990: 132; Pope 2007: 221) and indeed the overwintering of cattle/ sheep in peripheral space at Cladh Hallan has been hypothesised on the basis of micromorphological identification of herbivore dung (Smith et al 2021: 83). It has been established above that micromorphological evidence from contexts in the outer areas of each structure tends to accord with the general hypothesis that the hearth was the focus of activity whilst the outer areas were used for storage or sleeping (Figure 9.14, B & C). Theories regarding the use of peripheral areas for livestock stabling tend to assume only a small proportion of the total peripheral area would have been reserved for the housing of livestock and thus the identification of stabling deposits within the periphery is predicated upon them having been taken from an area used for this purpose.

Byre deposits have been identified micromorphologically in a wide number of studies including livestock enclosures in Israel (Shahack-Gross & Finkelstein 2008) and from Roman, Late Saxon and medieval London (Macphail & Goldberg 2006: 245), including both *in situ* floor accumulations in stables and as dumped byre waste. Experimental stabling deposits from Kenya (Shahack-Gross et al 2003) and the United Kingdom (Butser Ancient Farm) have also been studied micromorphologically (Macphail et al 2004). These deposits are described as highly organic with horizontally oriented plant fragments and excremental material.

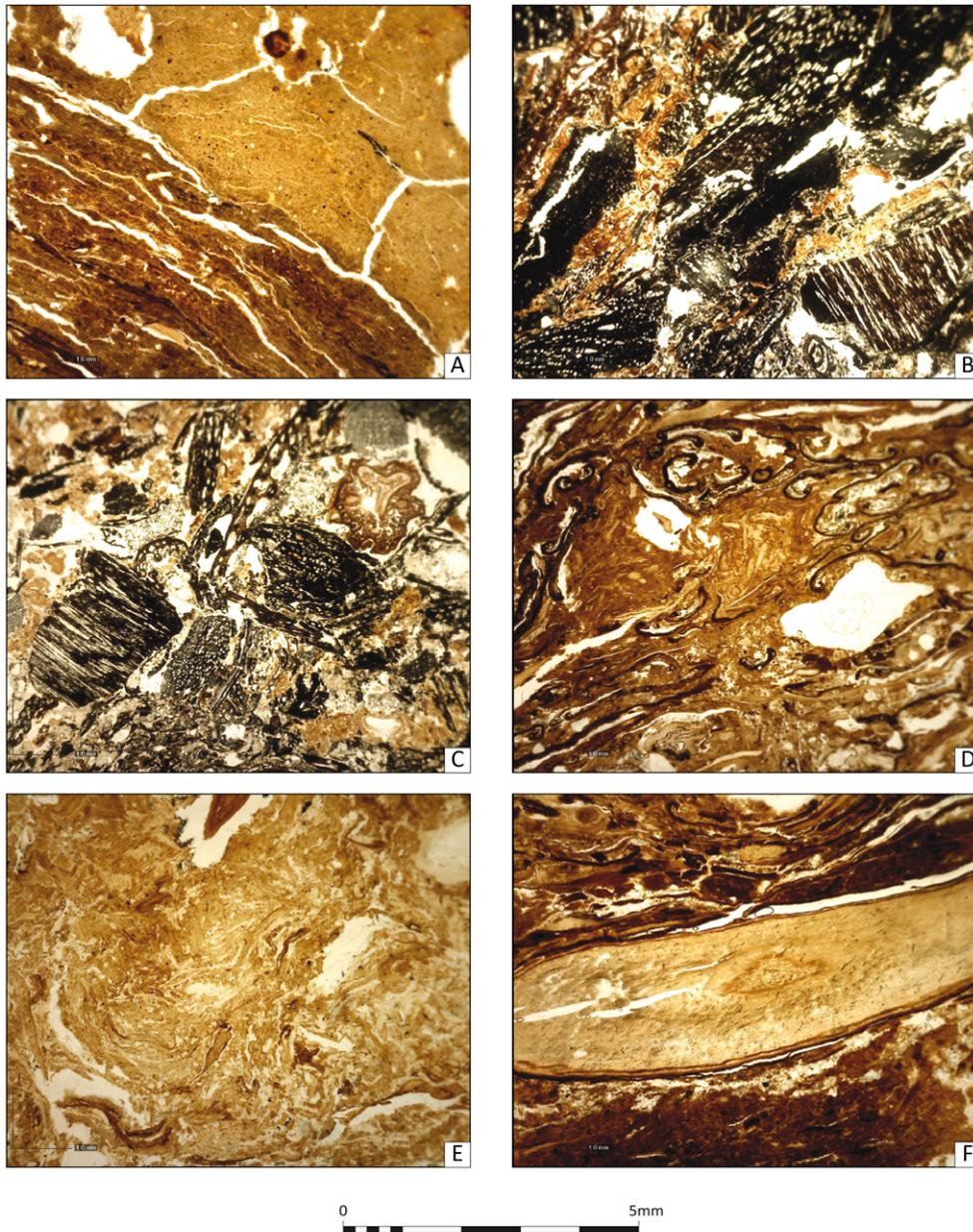


Figure 9.14. Photomicrographs in PPL. (A) Inverted/ tilted curves with sharp boundaries [621]; Sample BA/K7. (B) Hearth rakeout [249]; Sample ST2/K14. (C) Hearth rakeout [249]; Sample ST2/K11. (D) Probable dung stabling deposit Type H [1015]; Sample ST4/K6. (E) Elongated plant fragments probably stabling deposits [1015]; Sample ST4/K6. (F) Planar voids in trackway deposits [759]; Sample TR2/K2.

Trampling produces a laminar structure where elongated plant tissues reorient perpendicular to the force of trampling, resulting in fibres being oriented horizontally or sub-horizontally (Shahack-Gross 2017). These features are common characteristics of trampled floor deposits including those from BLoM (Figure 9.14, D) and cannot on their own be used as evidence of stabling. Accordingly, we need further data to distinguish stabling or byre deposits from occupation floors. Cellulose calcitic features (dung spherulites, calcium oxalate crystals) and calcium

phosphate which would assist in dung identification are absent at BLoM due to their likely solution in the acidic waterlogged environment (see Canti 1999; Milek 2012a: 130). Clear insect evidence for stabling is also largely lacking across the site; assemblages associated with floors in ST2, ST3, ST4 and ST6 are indicative of a degree of foulness within the substrate, but in almost all cases the proportions represented are considered unlikely to suggest the presence of significant quantities of dung (Chapter 13.4.1). The archaeobotanical and animal assemblages similarly provide

only limited evidence for stabling within the structures (Chapters 11.5.2.5 & 12.1.5.8).

Herbivore dung is often identified micromorphologically as finely layered excrement consisting of poorly digested brown to dark brown relatively long (several mm) plant fibres and high phytolith content (Courty et al 1989; Macphail et al 2004; Macphail & Goldberg 2010; Bronniman et al 2017). Omnivore dung is orange or yellow in colour with low phytolith contents and generally contains small fragments of bone (Shillito & Matthews 2013; Bronniman et al 2017; Elliot & Matthews, 2024). Research into stabling deposits by Milek (2012a: 130–132) has shown that whilst herbaceous plant tissue embedded in amorphous organic matter can be readily identified as possible herbivore dung, it may not be possible to distinguish between plant tissues representing dung and those representing reworked and trampled hay deposits. The accurate identification of herbivore dung remains in thin section is thus not straightforward and frequently requires other techniques such as portable x-ray fluorescence (pXRF) gas chromatography mass spectrometry (GC-MS) and environmental scanning microscopy with energy dispersive x-ray spectroscopy (ESEM-EDX) (Elliot & Matthews 2024) and/ or biomolecular analysis of sterols and bile acids (Shahack Gross et al 2003; Portillo et al 2020: 40). Analysis of faecal lipid biomarkers at BLoM (Chapter 10) has indicated the presence of lipid livestock in ST2, ST3 and ST4 with evidence strongest in ST2. Small fragments of possible herbivore dung are present in all structures which could have been trampled into the deposits on the soles of feet or hooves. The possibility that small numbers of livestock may have been overwintered within the peripheral areas of the structures cannot be ruled out on the basis of micromorphological evidence but it is considered unlikely that they were housed in the specific locations within ST2 and ST3 from which thin section samples were removed (Figures 3.18, 3.20, 3.21, 3.48 & 4.9).

Micromorphological evidence from ST4 included a much greater proportion of possible herbivore dung fragments most likely derived from ruminants or horses and consisting mainly of poorly digested plant fragments (Figure 9.14, E) and it is from ST4 that the greatest number of Type H deposits were identified. Other indicators of stabling deposits such as fly pupae (see Kenward & Hall 1997) have been recovered from flotation samples (Chapter 13) and indicate the presence of foul conditions within ST4 which, combined with micromorphological evidence, suggest the presence of livestock within the structure. Neither the insect nor the lipid biomarker results suggest greater evidence for stabling in ST4 and thus it may be coincidental that the sampling locations coincided with an area of higher livestock activity.

### 9.6.7 Trackways

Routes between and within settlements develop specific types of use-sediments and at BLoM the micromorphological pedofeatures have yielded data on the nature of depositional environments. Pedofeatures typical of track sediments present within the BLoM samples include secondary iron and phosphate concentrations, fabric and excremental pedofeatures (biological activity possibly associated with insects working dung). The presence of different anthropogenic inclusions within [738] (herbivore dung and dung residues, bone and burned debris) provide evidence for nearby occupational activities. The sediment from the trackway is very compact and much of the anthropogenic material is fine sand to medium sand-size charcoal. This fine-sorting is typical of trampled surfaces, and pseudo layering is expressed by horizontal organic matter and pseudomorphic planar voids (Figure 9.14, F). Pedofeatures formed by mesofauna such as earthworms and dung beetles and their burrows (see Macphail et al 2004; Macphail & Goldberg 2006) can be considered proxy indicators of the presence of stock and may indicate the use of the track to move animals as well as people into the site. The dense horizontal bedding of fine mineral material is also comparable to other floor surfaces, where this characteristic has been attributed to the gradual accumulation and compaction (via trampling) of domestic debris and fine mineral material transported across the site on hooves or on the soles of feet. There is also commonly developed evidence of wet trampling in the textural pedofeatures and occasional micropanning. The presence of clay coatings and voids within the track contexts is indicative of water mobilisation and reflects the exposed 'outdoor' nature of this feature.

### 9.6.8 Inferred living conditions and implications for roundhouse studies

Perhaps the most significant outcome of the wider programme of micromorphological study at BLoM has been the insight it has given us into the everyday lives of the occupants and the investment required to maintain and insulate structures which appear at least in size and form to be relatively typical of the period in Scotland. Examining the floor deposits at the microscale with reference to the limited time period during which the site was occupied allows us to hypothesise that the resurfacing episodes visible within the floors relates to annual and seasonal maintenance activities.

Throughout Britain and Ireland there is evidence that communities were prepared to and capable of settling in wetlands (Brown et al 2005; Cavers & Crone 2018; Knight & Brudenell 2020). The sediment sequences at BLoM are remarkable not only in terms of their level of organic preservation but also in the evidence that they preserve

regarding the persistent effort required to make wetland settings habitable and perhaps, at times, even comfortable. This in turn requires us to consider the sediment sequences that may be missing from comparable but less well-preserved wetland and terrestrial sites. Because the preservation of plant material at BLoM is so exceptional, it has not been broken down or compressed in the same way as material laid down in aerobic conditions would do and thus it is likely that several metres of occupation deposits at BLoM would be the equivalent of a few centimetres on a dryland site. This has far-reaching implications for micromorphological studies where thin bands of decomposed plant materials may be representative of once much thicker floors.

### 9.6.9 Reflections

Micromorphology remains a highly subjective form of data collection; it is a semi-qualitative technique that extracts observational non-numeric data (Macphail & Goldberg 2018). The unique challenges of BLoM with its organic rich deposits made it very difficult during excavation to identify, in plan, deposits which were clearly visible in section. If microscale analysis had not been undertaken on these sectioned deposits, then the wealth of information that has been discussed here could have been easily missed. Nevertheless, the extent to which some features are picked up as an apparent accident of sampling has to be acknowledged. Inevitably, in a site so restricted by placement of structural timbers, the positioning of samples is often determined at least in part by where they can be physically and practically taken. Spatial differences within the same context are also highlighted. Samples ST3/K1 and ST3/K2 taken through [1763] only centimetres apart reveal how the character of a sediment can rapidly alter.

Multi-season excavations such as BLoM afford us the benefit of hindsight and the opportunity to apply lessons learned from previous seasons. The ability to revisit interpretations made after a single season of excavation before the specific composition of plants and preservation that is now so familiar became clear has been invaluable. It has allowed us to identify patterns across the site that repeat in structures. The large sample size also allows us to identify not only what is unusual in the context of wider Scottish Iron Age settlement but also what is unusual with reference to this specific site. In other words we have been able to establish a standard or 'type suite' for the site which allows us to identify and question deposits that deviate from this. We find instances of the remarkable which on another site may be considered mundane or ordinary; for example the constructed Type F clay floor [247] identified within ST2 becomes, in the context of the wider sample sequence, an unusual method of floor surfacing whereas on another site, or with a smaller sample size, it may have been considered the standard method of floor construction.

As discussed above, in relation to the use of bracken, the analysis of the samples from across the settlement has demonstrated that even within the same tightly defined settlement and limited timeframe and with similar if not identical environmental conditions, different choices were made concerning flooring materials and methods. This suggests that the choice of organic flooring materials may reflect variation in knowledge as well as cultural or social choices. This is consistent with micromorphological analysis of samples from Borsodivánka in Hungary where floors made from fine sediment with plant temper were observed to have been replaced by floors made from loamy sediment without temper. Similarly at Százhalombatta and Kakucs, the floor surfaces were found to have been scraped clean and there was a lack of build-up between the subsequent floor horizons in many of the identified renewal phases indicating complete floor removal (Kovacs et al 2024: 18).

Despite a relatively large number of thin section samples, the micromorphological analysis at BLoM has justified our unquenchable thirst for more samples. An even larger sample size and spatial coverage would have allowed further nuances and identification of patterns in spatial variation but, as ever, this had to be balanced against available time and budgets.

Despite the acknowledged limitations of micromorphology, the use of the technique remains invaluable (Karkanas & Goldberg 2007; Wiemann & Rentzell 2015) and this is particularly true of a site such as BLoM where excavation and bulk sampling results in inevitable loss or amalgamation of some aspects of the bioarchaeological, artefactual and sediment residues.

The finely stratified organic deposits which were difficult to differentiate in the field could not be separately excavated and thus by necessity have been bulked together. This is a common situation faced by micromorphologists and the specific actions and timescales represented in samples are often irreversibly grouped and homogenised at excavation stage (see Matthews et al 2014: 251). Rather than disarticulating sedimentary evidence from its original context, micromorphology provides the opportunity to observe sediments and their components at a microscopic level in their original position and in relation to each other. It also considers evidence of microscopic taphonomic disturbances and formation processes that would be lost in a single evidence set, such as with charcoal extracted by flotation.

As with any archaeological occupation sequence, it is likely that the sediments preserved and examined micromorphologically present only a partial record of those originally deposited and quantities of organic floor deposits and waste are likely to have been removed through the periodic act of waste disposal and cleaning. Indeed, recent geoarchaeological investigation

undertaken by Reid et al (2023b) has demonstrated that, even with poorer preservation, inferences regarding floor maintenance activities can still be made if a variety of techniques is employed and provided understanding and acknowledgement of post-depositional processes occurs.

The analytic methodology employed at BLoM in which monolith samples were sub-sampled for micromorphology, macroplant analysis and faecal steroids in the laboratory, allowed for the opportunity to excavate and examine at the macroscale deposits that were then analysed using a range of different techniques. This was particularly valuable with regards to coarse organic plant remains which owing to their spectacular preservation could be directly compared against modern reference samples and cross-referenced between the macro- and micro-scales to ensure correct identification. Integrated micromorphological and macroplant analysis has contributed to identification of a greater range of plant materials and their inter-relationship than would be possible from their study in isolation.

As a direct consequence of the sampling strategy employed at BLoM a more detailed sampling was adopted at the Iron Age wetland settlement of Hyndford to ensure that key stratigraphic and spatial relationships could be sampled (O'Connell 2021). As at BLoM, the samples of floor surfaces from Hyndford have proved to be both highly organic and excellently preserved and thus the type suite established during the study of the BLoM samples will prove an invaluable comparator and will further advance our understanding of Iron Age settlement in Scotland. Future research on such sites will require more integrated sampling and application of geochemical techniques to understand more fully the spatial and temporal variation in household management and floor maintenance, an approach advocated by recent work undertaken by Reid et al (2023b) and George (2024). With regard to integrated contextual approaches, it is apparent from BLoM that integration is a multi-stage process and where the site has allowed multi-proxy investigation of the same contexts this is where the most confident consensus of interpretation has been achieved.



# Faecal steroid biomarkers

Helen Mackay and ACG Henderson

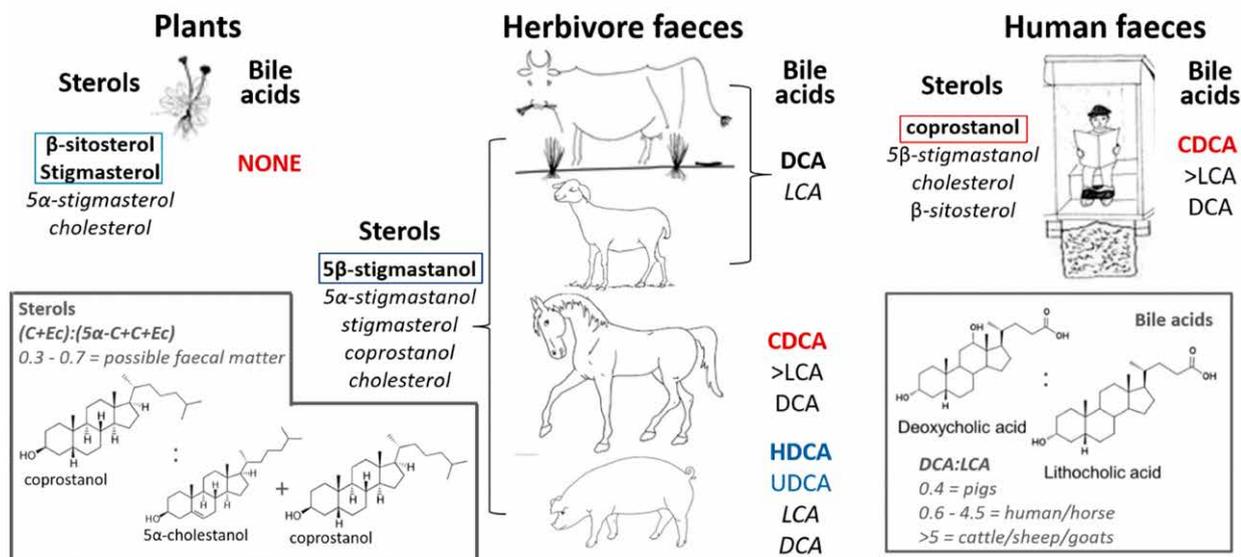
## 10.1 Faecal lipid biomarker analysis

Lipid biomarkers are molecular fossils produced by specific organisms that are often well preserved within sedimentary archives. In this chapter we target a specific class of lipid biomarker compounds, termed 'faecal steroids', which are deposited in the environment via the excrement of higher invertebrates and can therefore provide an independent line of evidence for the presence of humans and animals. Different organisms have different characteristic faecal steroid compositions that vary based on their food sources, digestive processes and gut bacteria (Leeming et al 1996). Diagnostic ratios of faecal steroid compounds (5 $\beta$ -stanols, bile acids) can identify faecal input and discriminate between species (Bull et al 2002; Prost et al 2017; Figure 10.1).

Faecal source identification is facilitated by information contained in both the stanol and bile acid profiles (eg Bull et al 2002; Prost et al 2017). Bile acids are exclusively produced within vertebrate faeces (Hofmann & Hagey 2008), whilst 5 $\beta$ -stanols (termed faecal sterols) are primarily derived from faecal origins but can also be produced in small amounts from the reduction of unsaturated sterol compounds within the natural environment (eg Gaskill & Eglinton 1975). Stanol presence is therefore not a definitive marker of faecal matter; however, ratios of stanols produced by plants (termed phytosterols) and those produced primarily during the digestive processes (faecal sterols) are effective in identifying faecal input (eg Grimalt et al 1990; Bull et al 1999; Prost et al 2017).

Faecal input in soils and sediments can originate from different source organisms, which generates a mixed steroid signature. In such instances, teasing apart the different source organisms is complex, but it is possible by using diagnostic steroid ratios, as well as the presence of diagnostic bile acid compounds (Table 10.1, Figure 10.1).

Therefore, the dominant faecal source can be identified in sediments, but the presence of other sources is not precluded. Whilst sedimentary ancient DNA (*sedaDNA*) is more comprehensive in identifying the presence of multiple animals compared to faecal steroid biomarkers (Brown et al 2025), steroids are currently unique in their ability to directly identify the presence of human faecal waste in sediments, can indicate the intensity of animals, and they are better preserved over longer time periods, with stanols shown to survive for millions of years (eg Mackenzie et al 1982). Early applications of faecal biomarkers focused on the use of stanols to identify concentrated faecal waste from sewage effluent (eg Gaskell & Eglinton 1976; Walker et al 1982; Vivian 1986). The success of tracing faecal input using faecal biomarkers in the modern environment led to a range of archaeological applications, such as the identification of a Roman latrine (eg Knights et al 1983), the characterisation of coprolites and manure input (eg Evershed et al 1997; Bull et al 2001; Prost et al 2017; Zocatelli et al 2017; Ledger et al 2019; Shillito



Adapted from: Prost K, Birk JJ, Lehdorff E, Gerlach R, Amelung W (2017) Steroid Biomarkers Revisited – Improved Source Identification of Faecal Remains in Archaeological Soil Material. PLOS ONE 12(1): e0164882. <https://doi.org/10.1371/journal.pone.0164882>

Figure 10.1. Overview of the sources of sterols and bile acids and example diagnostic faecal indicator ratios used within this study. CDCA = chenodeoxycholic acid, DCA = deoxycholic acid, LCA = lithocholic acid, HDCA = hyodeoxycholic acid, UDCA = ursodeoxycholic acid, C = coprostanol, Ec = epicoprostanol, 5a = 5a-cholestanol.

Faecal indicator	Ratio	Threshold values	Source
Presence of faecal matter	<b>Stanol ratio 1:</b> (coprostanol + epicoprostanol) / (5α-cholestanol + coprostanol + epicoprostanol)	>0.3 indicates possible faecal input >0.7 confirms faecal input	Bull et al (1999); Prost et al (2017)
Differentiation between herbivore faeces	<b>Stanol Ratio 2:</b> (epi-5β-stigmastanol/ 5β-stigmastanol) + (epicoprostanol/ coprostanol)	<0.8 and an absence of CDCA = cattle/ sheep <0.8 + CDCA = goat/ goose >1.2 + CDCA = horse	Prost et al (2017)
Differentiation between pigs and/ or geese, humans and/ or horses and ruminants	<b>Bile acid ratio 1:</b> deoxycholic acid (DCA)/ lithocholic acid (LCA)	<0.4 = pigs and/ or geese 0.6–4.5 = human and/ or horses >5 = cattle, sheep and/ or goats	Prost et al (2017)
Presence of pigs		HDCA present	Prost et al (2017)

Table 10.1. Diagnostic faecal steroid ratios and indicators used in this study. CDCA = chenodeoxycholic acid, HDCA = hyodeoxycholic acid.

et al 2020) and the identification of faecal inputs in archaeological soils (eg Simpson et al 1998; Bull et al 1999; Harrault et al 2019) and lake sediments (eg D’Anjou et al 2012; Brown et al 2021, 2022). Faecal steroid analyses of archaeological settlement deposits have primarily focused on characterising animal stabling deposits (eg Hjulström & Isaksson 2009; Herrera-Herrera et al 2024), although their ability to provide direct evidence of human faeces has also been demonstrated at the Neolithic site of Çatalhöyük, Turkey (Shillito et al 2011a & b). The effectiveness of using faecal steroids to characterise both human and animal faecal input in UK wetland settlement occupation deposits has, however, not yet been comprehensively explored.

The aims of the faecal lipid biomarker analysis at BLoM were to: (i) test the effectiveness of faecal steroids analysis in wetland settlement deposits, and (ii) identify the presence of animals and/ or dung on site to assist with the characterisation of the nature and function of BLoM ST2 and ST3. The specific objectives of the research were to:

- Characterise the presence of animals and/ or dung within the ST2 and ST3 roundhouse structures and midden deposits.
- Identify spatial and temporal differences in the persistence of animals and/ or dung within the roundhouses.
- Determine the extent to which animals were associated with the functions of ST2 and ST3.

## 10.2 Faecal steroid methodology

### 10.2.1 Sampling strategy

Faecal steroid samples were extracted from monolith tins obtained from the BLoM settlement during the 2015, 2018 and 2019 excavations, with a total of 71 samples extracted for analysis. Two monolith tins were obtained from ST2, representing the inner (ST2/M3) and outer (ST2/M1) areas of the roundhouse, and an additional monolith tin ( $M_{ex}$ ) was obtained *circa* 5 m outside of the roundhouse entrance from contemporary archaeological deposits (Mackay et al 2020). Nine monolith tins were obtained from ST3 and one monolith tin was also obtained from the deposits in the Episode 1 ditch terminal (Chapter 3.1.5). Samples were extracted from the monolith tins at depths corresponding to assigned contextual changes and at other prominent visual changes within the cores.

### 10.2.2 Faecal steroid analysis

Sterols and bile acids were analysed following the protocol outlined in Mackay et al (2020). Briefly, lipids from *circa* 1.5 g of sediment were solvent extracted (DCM:MeOH, 2:1, v/v) using microwaved assisted extraction (Kornilova & Rosell-Melé 2003). Lipid extracts were saponified (using 5 M NaOH) to ensure all bound lipids were extracted and these were then separated into sterol and bile acid fractions using silica gel column chromatography. Once trimethylsilylated, the sterol and bile acid fractions were analysed by gas chromatography mass spectrometry (GC-MS) and quantified using internal standards (5 $\beta$ -pregnan-3 $\alpha$ -ol and hyocholic acid). The presence and source of faecal matter inputs are identified primarily based on diagnostic stanol and bile acid compounds and ratios (Table 10.1). Faecal matter input is confirmed by the presence of bile acids, since they are exclusively of excremental origin, and/ or faecal stanol ratio 1 values >0.7 (*sensu* Bull et al 1999; Prost et al 2017).

## 10.3 Faecal steroid profiles at BLoM: implications for human–animal interactions

### 10.3.1 ST2 faecal steroids results

A full detailed account of the ST2 faecal steroid results (Figure 10.2) is presented in Mackay et al (2020). The results are summarised here to facilitate wider settlement comparisons between ST2 and ST3.

The stanol and bile acid profiles from ST2 detect faecal input in all but two samples: [224] in ST2/M1 and 18 cm in  $M_{ex}$  (Figure 10.2). Ratios of detected bile acids (DCA:LCA) identify the ST2 faecal source organisms as ruminants (cattle, sheep and/ or goats), pigs and human and/ or horses. Ruminant dung is the most frequent source of faecal matter within ST2, and the signal is more persistent in the inner

section of the roundhouse (ST2/M3) than the outer section (ST2/M1) (Figure 10.2). Faecal matter from pigs and humans and/ or horse are identified in some samples from both the inner and outer sections of ST2 based on the presence of hyodeoxycholic acid (HDCA), diagnostic of pig faeces, and chenodeoxycholic acid (CDCA), diagnostic of human and/ or horse faeces (Prost et al 2017). Discrimination between horse and human faecal signals from concentrated faecal waste is possible using a combination of sterol and bile acid distributions (Prost et al 2017); however, it has not been possible in the sedimentary samples analysed in this study due to inconsistencies in the presence of bile acids, which may be related to differences in the amount of faecal input and/ or sedimentary matrix effects that can influence the biomarker extraction efficiencies. While evidence for human and/ or horse faeces is detected in  $M_{ex}$  outside of the roundhouse, there is no evidence of ruminant or pig faeces in this outside area (Figure 10.2).

The first detection of faecal material in ST2 occurs during Phase 1, registering earlier in the inner section of the structure than the outer section (Figure 10.2). The initial bile acid ratios in both the inner and outer sections of the roundhouse originate from humans and/ or horses, before the signal becomes mixed with input from humans and/ or horses (CDCA), pigs (HDCA) and ruminant input (DCA:LCA ratio). The DCA:LCA ratio in Phase 2 indicates the presence of ruminant faecal matter and this is the only faecal source detected during this phase in the inner structure (ST2/M3). However, the source of faecal matter in the outer structure (ST2/M1) switches to a human and/ or horse dominated signal in later contexts of Phase 2.

### 10.3.2 ST3 faecal steroids results

The presence of faecal matter in ST3 was intermittent and varied both spatially (between monolith tins and quadrants) and temporally (between contexts and phases) (Figures 10.3–10.5). Faecal inputs in ST3 most frequently originated from horse and/ or humans, with occasional occurrences of dung originating from ruminants and pigs.

There is no evidence to support a persistent faecal signature in ST3/M1 or ST3/M4 in the SW quadrant (Figure 10.3). Only one sample from ST3/M1 (deposited during Phase 7) contains evidence of faecal input via the presence of the bile acid DCIRCA. The faecal origin of this sample cannot be identified owing to the low bile acid concentrations and the lack of diversity in the bile acid compounds present. Whilst the presence of DCA is sufficient to confirm the presence of faecal matter, the stanol ratio does not register faecal input in this sample. In contrast, the stanol ratios from two of the four samples analysed from Phase 3 of ST3/M4 support the presence of faecal matter; however, the source organism cannot be identified owing to the lack of detectable bile acids. The results from both ST3/M1 and ST3/M4 therefore contain discrepancies

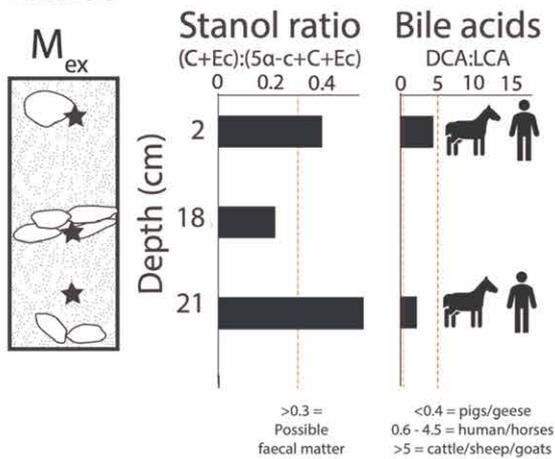
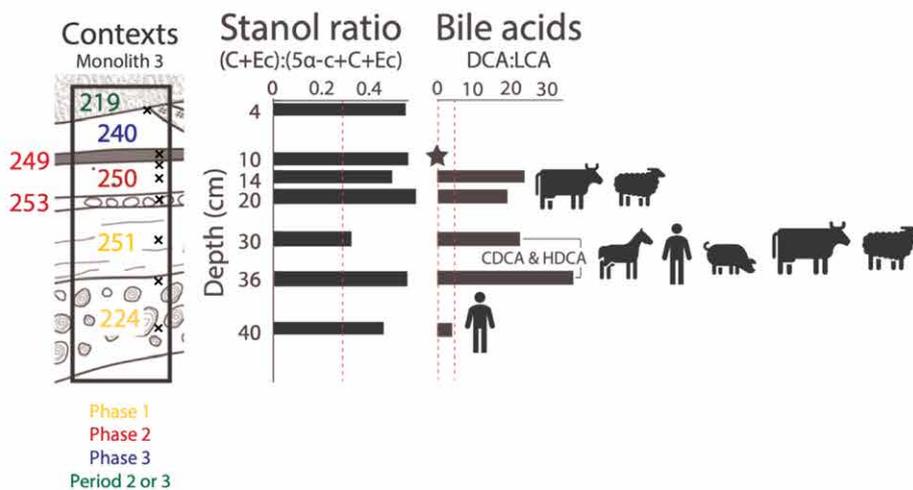
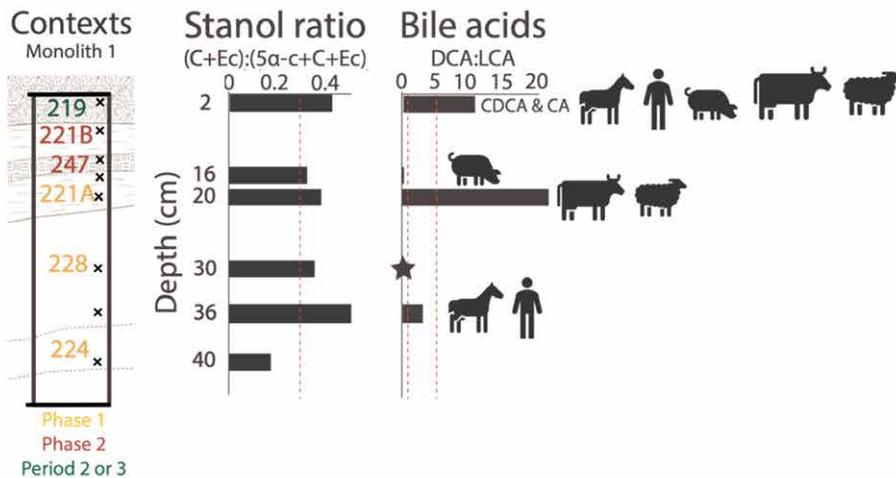


Figure 10.2. ST2 M1 (outer), M3 (inner) and M<sub>ex</sub> (outside roundhouse entrance) steroid characteristics. Contexts are coloured by assigned phases (Phase 1: yellow; Phase 2: red; Phase 3: blue; Period 2 or 3: green). Star symbols in bile acid graphs highlight where DCA was present in isolation, therefore whilst the diagnostic source value cannot be calculated, faecal matter is present within the sample. Samples containing chenodeoxycholic acid (CDCA), cholic acid (CA) and hyodeoxycholic acid (HDCA) are also indicated using bile acid abbreviations. Black crosses in the stratigraphies of Monoliths 1 and 3 indicate the depth at which samples were obtained and analysed (note that samples were obtained from the centre of the cores rather than the sides as labelled here to ensure context labels are visible). Black stars in M<sub>ex</sub> indicate depth of samples from external control core.

between the faecal sterol and bile acid ratios. The reason for these discrepancies is unclear. It is unlikely to be related to the type of excreta deposited since both stanols and bile acids are present in urine and faeces. Rather, it may reflect complications related to matrix effects of the organic-rich sediments, which can mask the faecal stanol signature because of the abundance of plant stanols or chemical interactions between the bile acids and the organic matter

and/ or water within the deposits that may interfere with their mobility, preservation and/ or extraction.

Whilst ST3/M1 has minimal detected faecal inputs, ST3/M2, which contains earlier but adjacent deposits, has a persistent faecal signature based on the presence of bile acids in all samples analysed. Concentrations of bile acids are low in two of the three samples analysed from [1153], Phase 3 of ST3/M2, thus preventing the identification of

their faecal source. The bile acids do, however, reveal faecal input in the latter stage of [1153] Phase 3, which is dominated by a human and/ or horse origin (Figure 10.3). The dominant human and/ or horse faecal origin persists throughout samples analysed from contexts [1154] and [1148] of Phase 4 and [1144] and [1142] of Phase 6. The presence of faecal matter in Phase 4 varies within the samples analysed from the SW quadrant since it is present in ST3/M2, but not ST3/M4.

There are some similarities in the steroid samples analysed from the SW quadrant (Figure 10.3) and the N half (Figure 10.4), namely that the dominant source of faecal matter detected originates from humans and/ or horses and that the persistence of faecal matter inputs within and between monolith cores varies. Four of the nine samples analysed from Phase 2/3 in the N half contained faecal input as identified through the presence of bile acids. Most of these samples were analysed from ST3/M8 (n = 3) rather than ST3/M7 (n = 1). The stanol and bile acid faecal signature is absent from early stages of Phase 2/3 in the N half, but it is present in later samples and traced to a human and/ or horse origin using bile acids. The entirety of ST3/M7 corresponds with context [15018A] from Phase 2/3, therefore the initial absence and later presence of human/ horse bile acids input represents a change in depositional input and, perhaps use, during this context.

Eight samples were analysed from Phase 4 in the N half and bile acids were detected in all except one of the samples, demonstrating a persistence of faecal input. The faecal source varied during Phase 4 and included dung from ruminants, pigs, but most often humans/ horse. All samples analysed from ST3/M6 correspond with [15018B] from Phase 4; therefore, differences in depositional environments and uses of the structure likely occurred during this context, as was the case for Phase 2/3 [15018A]. In contrast, ST3/M5 has a persistent human/ horse bile acid signal despite the samples originating from across Phases 4–6.

Faecal input is only detected in one of the seven samples analysed from the SE quadrant via the stanol data (Ratio 1 values >0.7, Figure 10.5). This sample was obtained from context [1728A] in Phase 4. No bile acids were detected, which limits the identification of the faecal source. However, stanol ratio 2 (Table 10.1) indicates the faecal matter originates from herbivore dung (<circa 29% with no HDCA present).

### 10.3.3 Faecal steroids results from the Episode 1 midden deposit

Faecal stanol ratios of samples analysed from the midden deposit associated with the ditch defences of Episode 1 indicate faecal matter is present in two of the three samples (Figure 10.6). There is no evidence of faecal deposition in the sample from context [18027], but samples

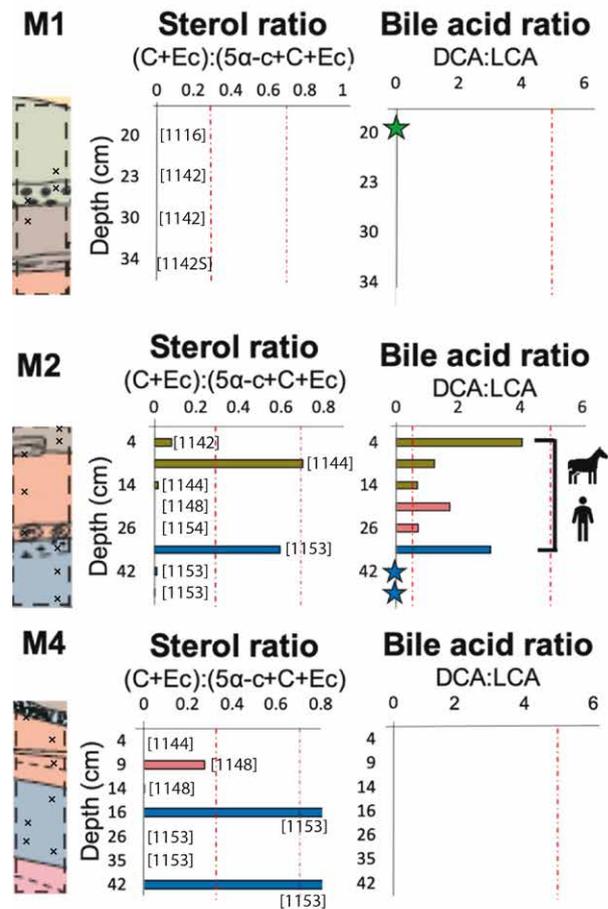


Figure 10.3. ST3 SW Quadrant (Trench 11) faecal steroid ratios (sterols and bile acids) of samples obtained from M1, M2 and M4 (coloured by corresponding phases: green = 7, brown = 6, pink = 4, dark blue = 3). Dashed red lines indicate ratio boundaries: Sterol ratio >0.3 indicates possible faecal matter and >0.7 confirms faecal matter presence; Bile acid ratio <0.4 represents pigs/ geese, 0.6–4.5 represents humans and/ or horses and >5 represents cattle, sheep and/ or goats. Green star in bile acid ratios represents the presence of DCA in low abundance. Black crosses in monolith stratigraphies represent depths of samples analysed (all samples were obtained from the centre of the cores – the crosses are offset from centre here to improve readability).

analysed from contexts [18026B & 18026A] both contain evidence of ruminant dung, likely originating from cattle and/ or sheep based on the steroid distributions detected (Figure 10.6).

### 10.3.4 Faecal steroid insights into the conditions and use of ST2 and ST3

The faecal profiles from the samples analysed from ST2 and ST3 differed both in terms of persistence of faecal input as well as diversity of faecal sources, suggesting that these structures were used in different ways and had different

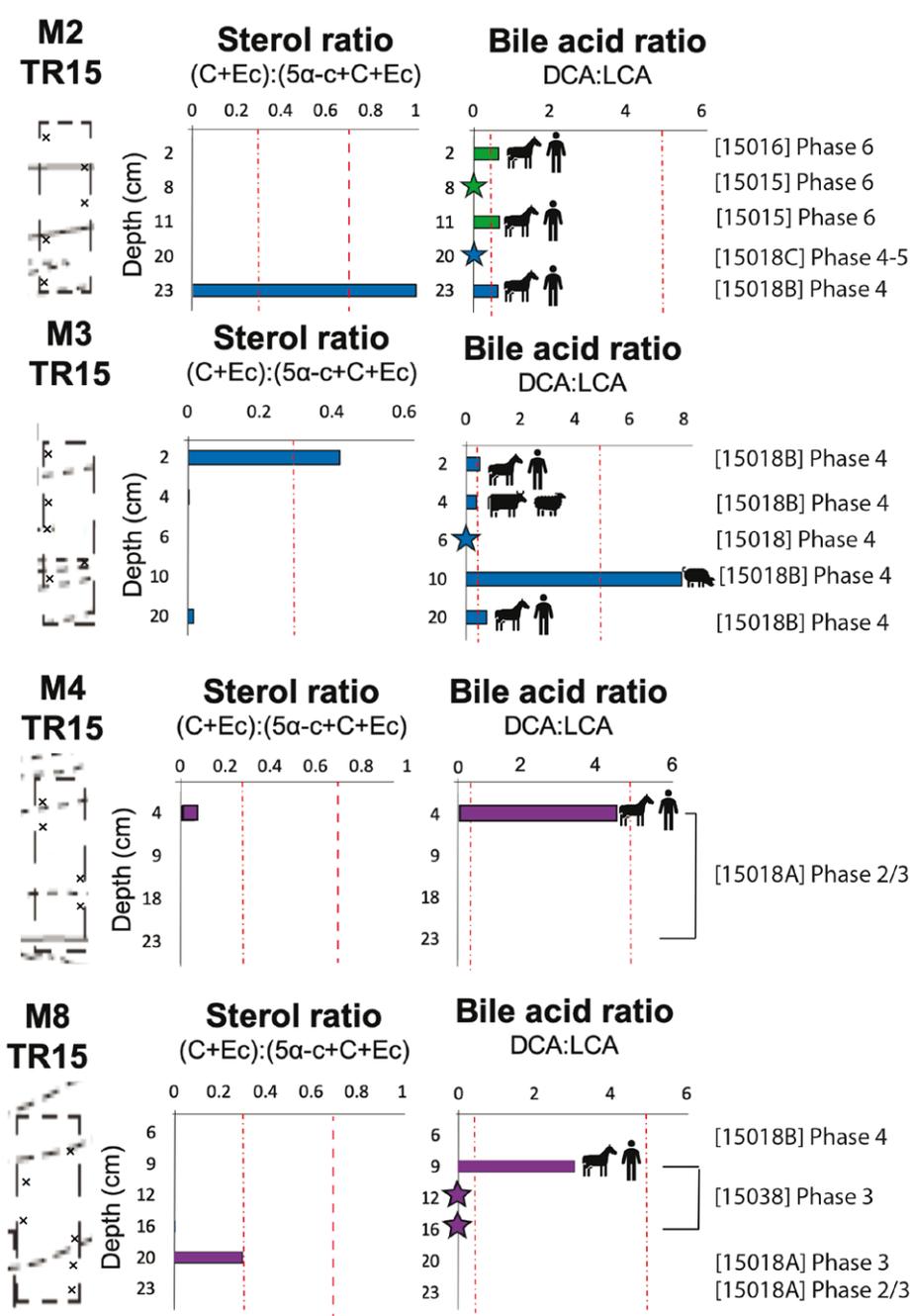


Figure 10.4. ST3 N half (Trench 15) faecal steroid ratios (sterols and bile acids) of samples obtained from M5, M6, M7 and M8 (coloured by corresponding phases: 2–3 = purple, 4–5 = blue, 6 = green). Dashed red lines indicate ratio boundaries: Sterol ratio >0.3 indicates possible faecal matter and >0.7 confirms faecal matter presence; Bile acid ratio <0.4 represents pigs/geese, 0.6–4.5 represents humans and/ or horses and >5 represents cattle, sheep and/ or goats. Star in bile acid ratios represents the presence of DCA in low abundance. Black crosses in monolith stratigraphies represent depths of samples analysed (all samples were obtained from the centre of the cores – the crosses are offset from centre here to improve readability).

characteristic internal conditions. Faecal steroid inputs were more prevalent in ST2 than ST3, indicating that internal conditions of ST3 were characterised by less faecal waste than ST2. Ruminant and pig faecal input was detected in the samples analysed from inside ST2 (ST2/M1 and ST2/M3), but not in the monolith core obtained from the contemporary deposits outside of ST2 ( $M_{ex}$ ). Only human and/ or horse faecal matter was detected outside the structure in  $M_{ex}$ . The absence of ruminant and pig dung detected outside of the structure suggests that dung in

ST2 was likely deposited *in situ*, rather than via the process of trampling and transporting dung from external locations. The faecal signal inside ST2 may reflect dung being brought into the roundhouse, eg as a source of fuel (supported by the presence of possible burnt dung in micromorphological samples and an increased prevalence in dung fragments identified micromorphologically proximal to the hearth), and/ or from keeping animals inside the structure (discussed in detail in Mackay et al 2020). In contrast, ST3 contained a weaker ruminant faecal input signature and an increased

### ST3 SE quadrant, Monolith 1

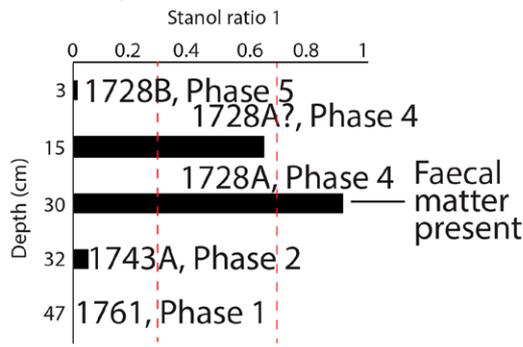
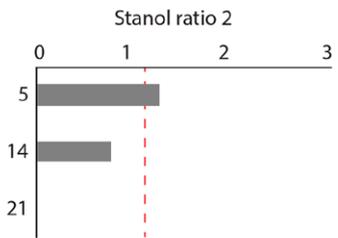
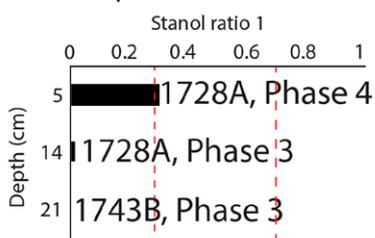


Figure 10.5. ST3 SE quadrant faecal steroid ratios (sterols). Dashed red lines indicate ratio boundaries: Stanol ratio 1 >0.3 indicates possible faecal matter and >0.7 confirms faecal matter presence; stanol ratio 2 <0.8 and an absence of CDCA represents cattle/ sheep, <0.8 with the presence of CDCA represents goat/ goose and >1.2 with the presence of CDCA represents horse.

### ST3 SE quadrant, Monolith 2



### Midden deposit (part of Episode 1 defence)

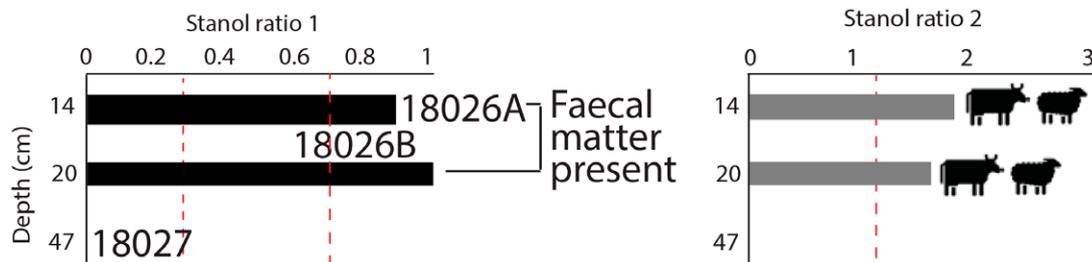


Figure 10.6. Midden deposit (Episode 1 defence, Trench 18) faecal steroid ratios (sterols). Dashed red lines indicate ratio boundaries: Stanol ratio 1 >0.3 indicates possible faecal matter and >0.7 confirms faecal matter presence; stanol ratio 2 <0.8 and an absence of CDCA represents cattle/ sheep, <0.8 with the presence of CDCA represents goat/ goose and >1.2 with the presence of CDCA represents horse.

persistence of human/ horse faecal input compared with ST2. The steroid data do not support a regular presence of ruminants nor their dung deposits inside ST3, and the origin of the horse and/ or human signal in ST3 may reflect trampled faecal matter. Based on the faecal steroids findings from ST3, it is unlikely the structure was used to house animals. The flimsy nature of the superstructure, the presence of a relatively rich assemblage of discarded artefacts including evidence for metalworking suggests that ST3 may have been used as a workshop, as well as a domestic habitation.

ST3 also exhibits more spatially heterogenous faecal input than ST2. For example, there are clear differences in the detected sources of faecal matter between the SW quadrant and the N half of the house: human and/ or horse faecal matter is the only source detected within the SW quadrant, whilst the N half contains a dominant human and/ or horse signal as well as signals of ruminant and pig faecal matter. The faecal steroid results support differences in the use, activities and perhaps levels of cleanliness of these different areas of the roundhouse, which are

defined by the radial divisions identified in the structure (Chapter 4.2.13.2).

The faecal steroid signature in the SE quadrant of ST3 differs from the N half and SW quadrant, since there is an absence of detected bile acids in the SE quadrant and only a ruminant signal is detected from the stanols. These faecal steroid results add further weight to the suggestion that different areas of the roundhouse had different functions. The lack of bile acids detected in both the SE quadrant of ST3 and the midden deposits associated with Episode 1 could be driven by differences in the composition of the bulk sediments, which influences matrix effects and chemical interactions with bile acids and/or conditions that support elevated levels of decomposition in these deposits, enhancing the breakdown of bile acids compounds. Further research into the taphonomy of bile acids alongside the analysis of additional decomposition indicators and sedimentary properties would facilitate greater insight into bile acid behaviour in wetland sediments.

The heterogenous nature of dung deposition in ST3 is clearly demonstrated through comparisons of monolith cores containing samples from the same contexts and phases, which were obtained from different locations within the structure. For example, ST3/M2 and ST3/M4 in the SW quadrant overlap in terms of the timing of deposition (Phase 3 and 4, [1148] and [1153]), but were obtained *circa* 4 m apart in areas separated by a radial division. These cores have contrasting steroid profiles since there is no faecal input detected in ST3/M4, despite it being prevalent in ST3/M2. The faecal steroid data obtained from ST3 highlights the highly localised and well constrained nature of the dung deposits in this structure, since they differ not only between trenches, but also within them. The lack of homogeneity in the ST3 faecal deposits, suggest that activities and conditions in the SW quadrant were confined to distinct areas that were structurally separated by the radial divisions.

The faecal steroid profiles also differ between contexts and phases contained within the monolith cores obtained from the same location, indicating the use and/or conditions within the roundhouses changed over time. Whilst faecal input was generally persistent throughout all phases of floor deposits of ST2, the faecal source changed from human/ horse dominated in the early deposits of Phase 1, to a mixed ruminant-dominated source from the later stages of Phase 1. The faecal steroid data therefore provides insight into when the change in the association of domesticated animals with the roundhouse took place. In contrast, early deposits from ST3 do not contain steroid evidence of faecal input. The earliest detection of faecal input in ST3 originated from humans and/or horses in the later stages of Phase 2/3, and persists and dominates throughout Phases 4–6 of ST3, before becoming

largely absent in Phase 7. Other evidence of more putrid conditions from Phase 3 include the detection of pockets of fly pupae from [1153]. The faecal steroid data highlight that a change in the conditions or use of ST3 took place in the later stages of Phase 2/3 when the floor deposits first began incorporating faecal matter and again towards the end of Phase 6, when the faecal signature weakens.

One of the limitations of this faecal steroid data from BLoM ST2 and ST3 is the lack of sufficient evidence to distinguish between human and horse faecal matter. Separation of these two sources is possible when working with single source samples (eg Prost et al 2017). However, the resolution of the data obtained from the wetland occupation deposits of BLoM is reduced since the faecal input often originates from multiple source organisms, which have different steroid signatures, and the steroid distributions are influenced reduction reactions within the sedimentary environment that can complicate the interpretation of faecal signatures. Dung identified micromorphologically was herbivorous in nature but was present in only very small quantities and samples were removed from only a fraction of the overall context in each case (Chapter 9.6.6). No horse bones or teeth have been identified in ST2 or ST3; therefore, whilst horse dung remains a possible faecal steroid source within the flooring deposits of ST2 and ST3, human faecal input is more likely. This example highlights the complementary nature of the ecofact and lipid biomarker research, and the strength of applying multiproxy analysis to refine characterisation of the mammalian presence and activity.

The results from the different post-excavation analyses (eg ecofact, micromorphology and entomology) are in agreement for many of the samples analysed from BLoM; however, there are some instances when faecal input is identified by the steroid biomarkers but no supporting evidence is detected. For example, within ST3/M2, horse and/or human faecal steroids are detected in [1154], but there is no other evidence of dung from the ecofact analysis and conditions are reported as generally clean, with no charcoal, one burnt bone fragment and some charred cereal remains. The combination of these results support the interpretation of the presence of low amounts of faecal matter in this deposit and demonstrates that the faecal steroid approach is highly sensitive to the detection of faecal inputs, compared with more traditional post-excavation analytical approaches.

The combination of the multiproxy post-excavation analyses is also effective at developing a detailed understanding of the composition of the deposited material. For example, the midden material deposited in the Episode 1 ditch visually resembles the deposition of stabling material owing to the high abundance of orange and black organic material and its strong stench during excavation and sampling. Two of the three

samples analysed from this area ([18026A] and [18026B]) contained herbivore faecal signals, indicating these deposits likely originated from stabling and/ or flooring waste that contains herbivore dung. This is supported by the micromorphology of this deposit, which contained characteristics of stabling waste. The sample obtained from [18027], located towards the bottom of the monolith core, did not contain any faecal steroids, which indicates there is no dung incorporated in this section of the midden. These results suggest there are differences in the type of dumped material over time in the midden deposit. The spatial heterogeneity of the midden deposits is not assessed here since analyses focused on a single monolith core representing temporal change in one location.

#### **10.4 Implications for faecal steroid analysis in wetland archaeology**

The faecal steroid profiles developed from BLoM are the first examples of the application of lipid biomarkers to characterise faecal inputs from *in situ* wetland occupation deposits. The results presented here demonstrate that steroid compounds are generally well preserved in these types of settlement deposits, and they can successfully provide evidence for the presence of animals and/ or their dung within prehistoric structures. The resolution of the faecal source identifications from the wetland occupation deposits are at times more limited compared with archaeological studies focused on self-contained faecal sample material, such as coprolites. The achievable resolution here likely reflects the mixed signal of faecal sources, sample matrix complexities associated with the high organic matter content in the wetland occupation deposits and the lack of detectable bile acids in some samples. Insufficient bile acids concentrations and/ or preservation levels were also encountered in analyses of coprolites from waterlogged Switerbant Culture Sites in the Netherlands (Kubiak-Martens et al 2022). Investigation into post-depositional movement and/ or preservation of bile acid in wetland sediments is therefore required to advance faecal source interpretations and understandings of the sensitivities of faecal steroids in wetland settings. Nevertheless, faecal steroid analysis at BLoM has been successful in tracing a range of different faecal source including ruminants, pigs, and humans/ horses associated with the roundhouse structures. Faecal steroid analysis therefore can successfully identify more varied sources of dung from wetland occupation deposits than more traditional archaeological approaches, such as entomology, micromorphology and macrofossil analyses.

The findings from BLoM have demonstrated the ability of faecal steroids to deepen our understanding of the use of space within prehistoric structures. The faecal steroid results have provided direct and independent evidence of

the differences in the activities and conditions associated with the ST2 and ST3 roundhouses, such as the stronger association with animals in ST2 and the improved cleanliness (less faecal input) in ST3. We have also demonstrated the ability of faecal steroids to characterise small or transient deposits of dung. The analysis of multiple monolith cores from different areas of the roundhouses spanning different phases of the settlement have also showcased the high degree of heterogeneity of faecal deposits both within and between the structures. These findings therefore highlight the use of space within the roundhouse structures was highly variable, both spatially and temporarily.

The combination of multiproxy post-excavation analyses at BLoM has been especially effective at developing a more detailed interpretation of the occupation deposits. For example, the combination of lipid biomarker and entomological analyses has been effective at narrowing down faecal source identification, and the combination of lipid biomarkers and macrofossils has successfully distinguished between naturally occurring and anthropogenic deposits. More multi-proxy comparisons, alongside more modern reference studies, could assist with methodological refinement of faecal steroids within wetland occupation deposits. There is clear potential to test the sensitivity of the plant dominated sterol ratios and refine diagnostic ratio boundaries of faecal sources within these often-organic rich sediment matrices. Greater methodological insights yielded from future studies may assist with separating the human and horse faecal signature, which was found to be a limitation of the approach at BLoM. However, considering the contexts sampled here and the lack of evidence of horse on the site it is likely that the assignation of stanol and bile acid ratios to human/horse probably represents human input rather than horse.

Our research at BLoM emphasises the potential of faecal steroids within wetland occupation deposits as direct, independent lines of evidence for the presence of humans and animals. Faecal steroids can advance understandings of the types of activities and the use of space within settlements, as well as the ways in which they vary in both space and time. These analytical tools have even been shown to be effective when faecal inputs are minimal or transient and may therefore not be captured by other more traditional forms of post-excavation analysis. The findings from this study also demonstrate the exciting potential for the expansion of faecal steroid applications to advance understandings of other wetland settlements and paves the way for future research to test the effectiveness of this approach in other types of sedimentary environments such as dryland occupation deposits.



# Plant macrofossils

Jackaline Robertson

## 11.1 Introduction

A large and impressive macroplant assemblage was analysed from the occupation of the settlement at BLoM. The ecofacts were preserved through both anaerobic conditions and carbonisation which allowed for the recovery of many fragile plant remains that do not normally survive within a typical Scottish Iron Age assemblage. These finds were gathered from a series of bulk samples and monoliths collected during excavation.

The aim of this study is to understand the relationship the BLoM community had with the plant resources they used to sustain their way of life during the relatively short occupation of the settlement and how this compares to other sites in both Scotland and Northern England. To answer this, several research questions were applied to the macroplant assemblage. This involved studying the agricultural husbandry practised, the resources gathered for food, medicine, building material and fuel, identifying activity areas within the excavated area from the deposition of macrofossils and understanding the ecological development of the surrounding landscape.

## 11.2 Methodology

A total of 230 samples were submitted for analysis from 111 waterlogged deposits, 83 standard bulk samples and 36 monoliths. The sediment types varied, with those collected from the lower deposits noticeably more organic and better preserved, whereas those from the upper levels tended to have a larger clay component. This observation was particularly noticeable within the monoliths. All three sample types were processed in laboratory conditions using a suitable methodology designed to retrieve both ecofacts and artefacts (Kenward et al 1980). None of these samples required pre-treatment prior to processing, but it was noted that the more humic and peaty waterlogged deposits took longer to break down.

A sub-sample of 0.5 kg to 2.5 kg of sediment was extracted from the 111 waterlogged deposits and was gently disaggregated by hand to minimise damage to fragile ecofacts. Once the sediment was broken down, the wash overs were fed through a stack system of 4.0 mm, 2.0 mm, 1.0 mm and 300 µm sieves. The wash overs were stored in distilled water and sorted using a Leica stereo microscope at magnifications of x10–x55. The heavy fraction was air dried at room temperature and sieved using a stack system of 4.0 mm, 2.0 mm and 1.0 mm sieves. The waterlogged ecofacts were stored in distilled water in coldstore.

The 83 standard bulk samples were processed in their entirety by machine. The wash overs were captured in 1.0 mm and 300 µm sieves. The dried wash overs were analysed using a Leica stereo microscope at magnifications of x10–x55. The dried residues were divided into manageable fractions using a stack system of 4.0 mm, 2.0 mm, 1.0 mm and 300 µm sieves. The residue fractions were then scanned by eye and with a magnet.

The 36 monolith samples were excavated in the laboratory by teasing apart the sediments. This was done to identify sections indistinguishable during excavation and to understand how certain plants had been used to form distinct layers. The results of the monoliths are combined with the corresponding bulk samples. Once the sediment was extracted from the monolith it was processed by hand using the same methodology as described for the waterlogged samples.

Macrofossil identifications were confirmed using modern reference material and seed atlases (Hervey-Murray 1980; Lousley & Kent 1981; Jermy & Tutin 1982; Hubbard 1984; Tomlinson 1985; Dickson 1987; Freethy 1987; Zohary & Hopf 1994; Cappers et al 2006; Jacomet 2006; Cappers & Neef 2012; Cappers & Bekker 2013; Schulz 2018). The preservation of the carbonised cereal remains was varied and these were assessed for morphological damage (Hubbard et al 1990). Many of the herbaceous plant stems were not easily identifiable but, given the substantial number of loose sedge nuts and rush seeds intermixed within these layers, it was assumed that many of these derived from the same species.

The puffballs were preserved entirely through anaerobic conditions and were identified to species by Dr Roy Watling using keys and texts (Pegler et al 1995). A sub-sample of four puffballs were selected for species identification with the remainder subjected to a visual scan. The puffballs were gently cleaned by hand using distilled water. A small piece of the interior fruit body, the gleba, was removed from four randomly selected puffballs so that the individual hyphae were available for species identification using a high-power microscope. Those puffballs which were intact were measured (Table 11.1).

The results are presented in full in catalogues in the site archive. Nomenclature for plants follows Stace (2010) and the Latin, common name and plant parts are recorded in the tables.

### 11.3 Overview

The macroplant assemblage was composed of cereals, nuts, fruits, building materials, woodland, turves, fuel and weeds. These finds were deposited by a variety of taphonomic pathways such as through human agency, both deliberate and accidental, and naturally from plants that grew in the vicinity. By identifying the methods by which plants were deposited at BLoM it was possible to identify species selected for food, building material and fuel while also recognising spatial activities within the settlement and separate these from invasive plants that grew wild in the surrounding landscape.

Preservation of the macroplant assemblage was varied and ranged from poor to excellent. The waterlogged finds from the lower deposits were better preserved than those collected from the upper contexts which had experienced longer periods of aeration. The preservation of the

carbonised finds also varied. Many of the cereal caryopses had experienced extended periods of heat exposure within hearths that caused some vitrification and morphological distortions to the external structure of the grain. There were also several small-scale fire episodes that resulted in patches of flooring becoming burnt and this material was noticeably fragile as a direct consequence.

The crops were varied and were recovered in both a waterlogged and carbonised state. The species were oat (*Avena* sp.), six-row hulled barley (*Hordeum vulgare* L.), two-row hulled barley (*Hordeum distichon* L.), naked barley (*Hordeum* var *nudum* L.), bread/ club wheat (*Triticum aestivum/compactum* L.), emmer (*Triticum dicoccon* Schrank ex Schübl) and spelt (*Triticum spelta* L.). Due to poor preservation, it was not always possible to identify the wheat more fully. This was because in the absence of certain morphological features or chaff it was difficult to accurately separate these species (Renfrew 1973: 59; van der Veen 1992: 22). In those circumstances when they could not be clearly identified, emmer and spelt were instead grouped together within a single category as emmer/ spelt.

The waterlogged cereal remains were recovered from 41 deposits and consisted of caryopses, bran and chaff fragments which were semi quantified using an abundance scale per litre. The species present were oat, two-row hulled barley, barley, emmer, emmer/ spelt, spelt and wheat. The only species not observed within the waterlogged assemblage was six-row hulled barley, naked barley and bread/ club wheat. The carbonised crop assemblage was composed of oat, six-row hulled barley, two-row hulled barley, naked barley, barley, bread/ club wheat, emmer, spelt and wheat. The carbonised cereal remains were fully quantified by counting the total numbers of grains and chaff per litre. These totalled 7,934 remains formed of spikelets, caryopses, chaff and straw fragments present in 146 contexts.

When trying to understand the role of the crops it is recognised that combining the waterlogged and carbonised cereal results is potentially misleading as both assemblages were quantified using different methodologies. To avoid creating a bias within the analysis it was decided that the waterlogged and carbonised results would be presented separately. This was done in an effort to better understand the dietary and economic importance of the cereal species and whether this changed throughout the short occupation of the settlement. Therefore, the results for measuring the relative importance of crops from both the waterlogged and carbonised assemblages were calculated separately by percentage for each context, structure and episode. This was done to avoid over-inflating the importance of any one cereal group.

A large component of the assemblage included hazelnut (*Corylus avellana* L.) with both waterlogged and carbonised shells dispersed amongst 129 deposits collected from all periods of occupation. Hazelnuts were a valuable resource

at BLoM gathered for food. There is evidence they were stored and roasted in large caches within certain deposits and that the nuts were processed on a large scale with the residual shells trampled into floor surfaces or recycled as a fuel resource. There is also evidence that hazelnuts were incorporated within the flooring as accidental inclusions of the wood assemblage.

There was evidence for the exploitation of wild fruit which included crowberry (*Empetrum nigrum* L.), blackthorn (*Prunus spinosa* L.), raspberry (*Rubus idaeus* L.) and blackberry (*Rubus fruticosus* agg.). Raspberry formed the largest component and was noted in 35 contexts with blackberry present in 12, blackthorn in 11 and crowberry in one. Except for the crowberry which was waterlogged the remainder of the fruits were preserved through both anaerobic and carbonisation conditions. These finds were mostly scattered amongst the structures, hearth deposits and entrance ways with some noted in the palisade.

A wide range of plants were selected for the building resources regularly incorporated into the flooring materials. The most common species utilised were a range of sedges (*Carex* L.), rush (*Juncus* L.) and bracken (*Pteridium aquilinum* (L.) Kuhn). Preservation of this material was exceptional which made it possible to identify some of the sedge and rush to species. The sedge was a mix of white sedge (*Carex canescens* L.), glaucous sedge (*Carex flacca* Schreb.), hairy sedge (*Carex hirta* L.) alongside smaller concentrations of lesser-pond sedge (*Carex acutiformis* Ehrh.), grey sedge (*Carex divulsa* Stokes) and common sedge (*Carex nigra* (L.) Reichard). The rush was jointed rush (*Juncus articulatus* L.), toad rush (*Juncus bufonius* L.) and hard/ soft/ compact rush (*Juncus inflexus/effusus/conglomeratus* L.). Other species included spike rushes (*Eleocharis* R. Br.), wood club-rush (*Scirpus* L.) and wood rushes (*Luzula* DC.). This material was concentrated within the structures and was routinely used to create surfaces.

The woodland material was composed of wood fragments, roundwood, worked offcuts, twigs, bark, seeds, catkins, leaves, buds and thorns. The species were alder (*Alnus glutinosa* (L.) Gaertn.) downy birch (*Betula pubescens* Ehrh.), birch (*Betula* L.), hazel (*Corylus avellana* L.) and willow (*Salix* L.). These remains were dispersed throughout the settlement except for the willow leaves that were concentrated within and around the bowl in ditch midden [18027]. Much of this wood and bark was deliberately used as an additional floor material alongside the sedge, rush and bracken with the remainder disposed of in convenient locations on site as unneeded woodworking waste. The seeds, catkins, leaves and thorns were inclusions within the wood and were accidentally deposited within these contexts. The only notable exception to this was the willow leaves which appear to have been collected deliberately and purposely disposed of within the ditch midden.

The weed assemblage was large in both number and species diversity. It was mostly preserved through waterlogging with a much smaller number of carbonised finds. The taphonomic pathways by which the weeds came to be incorporated within the BLoM assemblage is varied. Many of the weeds are described as accidental inclusions as some were already growing on site and became trapped as the structures, palisades and trackways were constructed directly on top of them. Weeds were also introduced as inclusions of the crops and woodland brought to the settlement for food and building material. It is also likely plants were trampled into surfaces on the feet of the inhabitants and livestock or were blown in by the elements. Some of these weeds do have recognised economic uses and many have been exploited for food, beverages, medicine and building materials. It is therefore probable that some of these plants were deliberately collected when seasonally available and brought to the settlement to be used in these capacities.

A total of 26 whole puffballs and seven fragments were recovered from eight contexts. The bulk of these finds came from ST3 in which 29 puffballs were dispersed amongst five deposits. The other four puffballs were noted in the midden [800], trackway deposit [18003] and in deposit [1023] in ST4. Four waterlogged puffballs from ST3 were identified as three brown puffball (*Bovista nigrescens*) and one deceiving bovist (*Bovista aestivalis*). Preservation of the puffballs ranged from adequate to excellent.

The results are briefly summarised below by episode and structure. Only those contexts with significant assemblages in terms of size and identifiable fragments are described in detail.

## 11.4 The assemblage

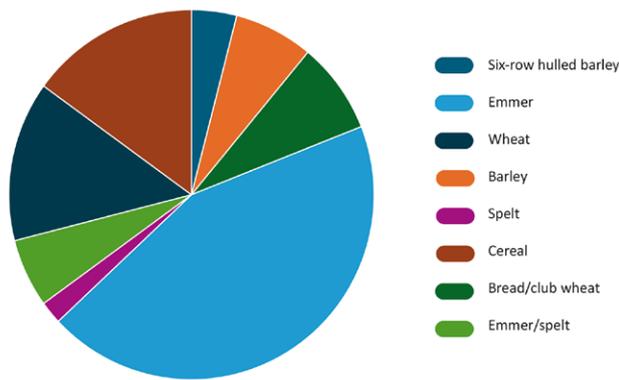
The assemblage is summarised below by structure or feature.

### 11.4.1 Episode 1

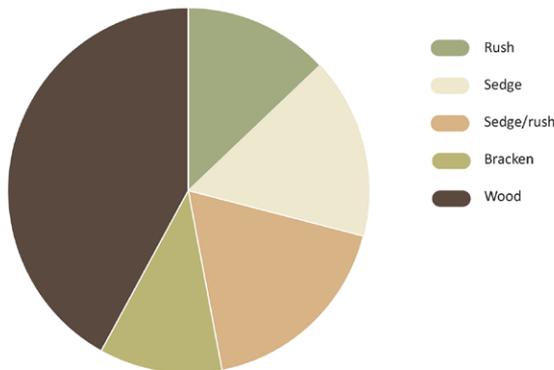
#### 11.4.1.1 ST1: Summary (Figure 11.1)

Waterlogged plant remains were present in 21 contexts. The waterlogged assemblage was dominated by building material followed by hazelnut shell, fruits, weeds and moss. The building material favoured in ST1 was layers of sedge, rush, bracken and wood which tended to be better preserved within the lower foundations and floors associated with Hearth 1. The upper floors were noticeably less well preserved and more likely to be decomposed. The weeds were concentrated within the lower deposits and were from plants that grew in this location prior to construction.

Carbonised plants were recovered from 19 deposits and were composed of cereal, nuts and fruit along with smaller amounts of building materials, weeds and moss. The cereals totalled 161 caryopses, 32 spikelets and 109 chaff fragments. The species were emmer (44%), wheat (14%), bread/ club



Carbonised crops



Waterlogged flooring materials

Figure 11.1. ST1: crops (carbonised %) and flooring materials (waterlogged %).

wheat (8%), barley (7%), emmer/ spelt (6%), six-row hulled barley (4%), spelt (2%) and cereal (15%). The presence of both caryopses and chaff indicates that some processing of crops occurred within this structure. There were also six hazel nuts, 289 hazelnut fragments and 12 raspberry seeds. The food remains were concentrated around the floors and deposits associated with Hearth 2 whereas Hearths 1 and 3 were more regularly maintained and kept cleaner. It is also possible the cereal chaff and hazelnut fragments were recycled as kindling within the hearths. There were also fragments of peat and dung suggesting that both were used as a fuel source within this building.

Analysis of both the waterlogged and carbonised assemblage revealed that the building materials used to construct the floors in ST1 remained consistent throughout its occupation. While the upper layers were more decomposed and less well preserved there was still enough evidence to demonstrate that the plant resources

selected for building were the same. During the occupation of ST1 the plant diet was varied and involved access to multiple resources in the form of crops, nuts and fruits. It was clear that emmer was favoured but that other species such as bread/ club wheat, spelt and hulled barley also had a more minor dietary role. The presence of chaff represented by all the cereal species except for oat demonstrates that at least some of these crops were grown locally and processed both at the site and within the roundhouse.

#### 11.4.1.2 ST2: Summary (Figure 11.2)

Waterlogged plant remains were recovered from 33 deposits including building materials, food and weeds. The flooring materials used were varied and were a mixture of layers of sedge, rush, bracken and wood that had formed well preserved but compressed laminated layers that peeled apart during processing. Evidence of turves was noted in two deposits, and it seems this material was used specifically for wall packing and to furnish the entranceway. The weeds tended to be concentrated within those deposits with large volumes of flooring and it is likely they were accidentally collected alongside the plants deliberately chosen for construction. Crops such as wheat (27%), oat (5%), barley (5%), emmer (5%) and cereal (58%) were focused within seven deposits associated with occupation surfaces around the hearth and outer walls. Nuts and fruits were present in 10 deposits associated with ST2.

The carbonised macroplant assemblage was recovered from 35 contexts and consisted of cereal, nuts, fruits, flooring, weeds and peat. The crops consisted of 375 caryopses, eight spikelets and 31 chaff fragments identified as emmer/ spelt (26%), wheat (17%), barley (15%), six-row hulled barley (3%), emmer (10%), bread/ club wheat (2%), naked barley (1%) and cereal (26%). There were 65 hazelnut shell fragments, two blackthorn and one raspberry seed. The building material was concentrated within three contexts and represents plants that were burnt *in situ*.

The 24 weeds were a mix of oraches (*Atriplex* sp.), fat-hen (*Chenopodium album* L.), black-bindweed (*Fallopia convolvulus* (L.) Á. Löve), pale persicaria (*Persicaria lapathifolia* (L.) Delarbre), grass (*Poaceae* sp.), buttercup (*R. acris/repens/bulbosus* L.), sheep's sorrel (*Rumex acetosella* L.) and common chickweed (*Stellaria media* (L.) Vill.). These were largely concentrated within two outer wall deposits. These may have been introduced to the structure as accidental inclusions within the crops, building materials or grew nearby and were trampled into the surface. There is no evidence to suggest the weeds were deliberately collected and stored in this structure. Burnt peat was recorded in nine samples and this resource was used as a fuel source.

Both the waterlogged and carbonised macroplant assemblage from ST2 demonstrate that the plant resources used for constructing floors and wall packing remained

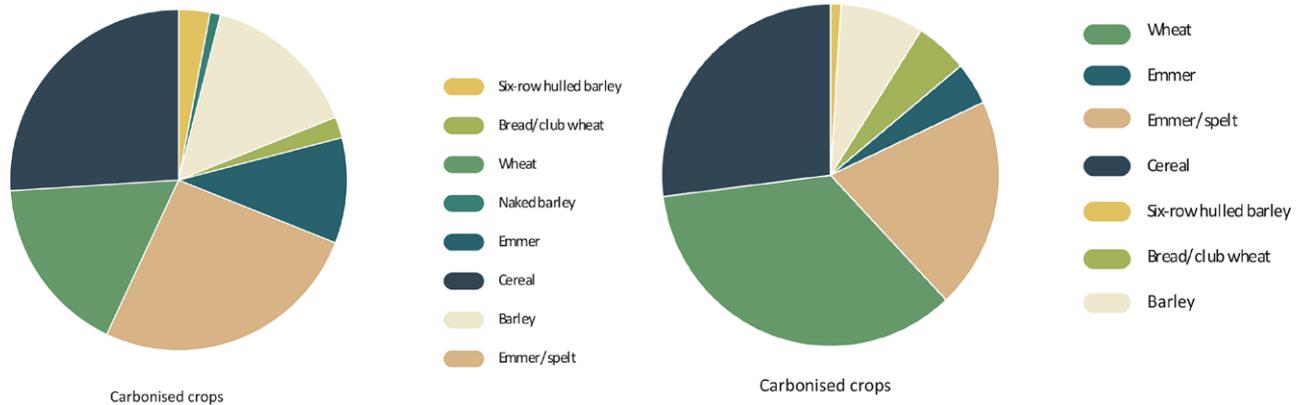


Figure 11.3. ST5: crops (carbonised %).

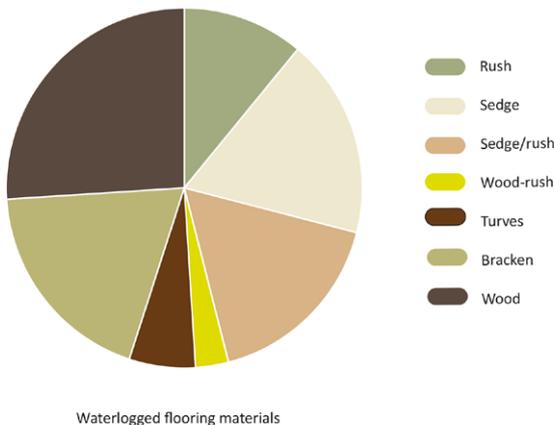
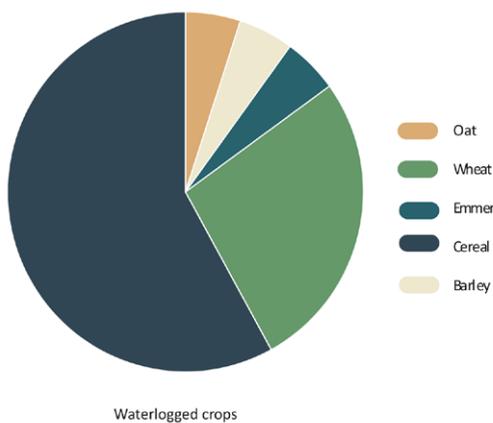


Figure 11.2. ST2: crops (waterlogged & carbonised %) and flooring materials (waterlogged %).

consistent throughout its occupation. In terms of diet the crops and wild resources consumed are the same as those recovered from ST1. The only noticeable difference was that oats, naked barley and blackthorn were identified within ST2, but these were absent from ST1. This may simply reflect

differential preservation rather than a change in diet. As with ST1, some food processing occurred in this structure, and this appears to have been a domestic habitat.

#### 11.4.1.3 ST5: Summary (Figure 11.3)

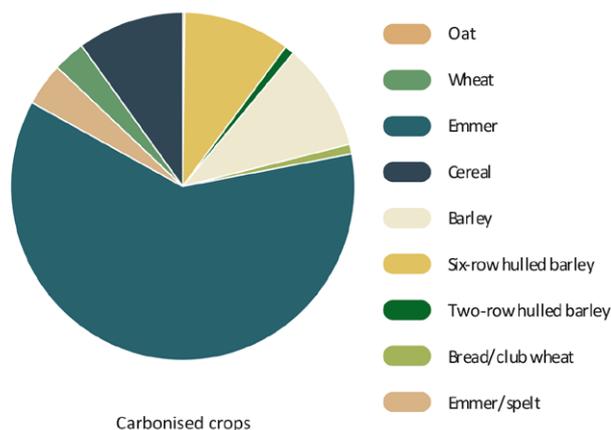
The finds from ST5 were all carbonised and made up of 157 caryopses, 17 hazelnut shell fragments and one weed that were dispersed amongst three deposits. The crops were wheat (35%), emmer/ spelt (20%), barley (8%), bread/ club wheat (5%), emmer (4%), six-row hulled barley (1%) and cereal (27%). As only three samples were collected from this structure the results are somewhat limited when compared to the other roundhouses but they do indicate that food preparation took place in the structure.

#### 11.4.2 Episode 2

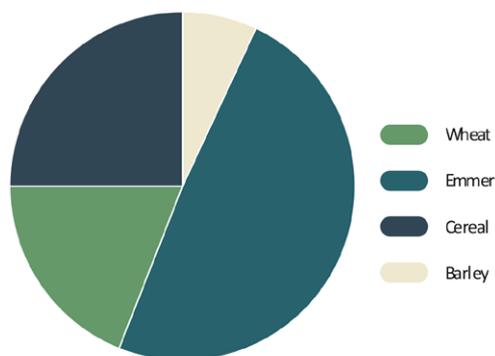
##### 11.4.2.1 ST3: Summary (Figure 11.4)

The waterlogged plant assemblage was recovered from 48 contexts composed of building materials, food, food processing waste and weeds. The flooring material used within ST3 was formed of well-preserved laminated layers of bracken and wood with some evidence for the presence of turves. Sedge and rush were also noted but these were only ever a marginal inclusion within the floors. This was a noticeable change from ST1 and ST2 which used a larger variety of plant resources within their roundhouses. As with the other structures the weeds were concentrated within those deposits with large volumes of flooring material. While it is probable many weeds were accidentally collected alongside the bracken and wood, some could have been deliberately gathered to act as additional insulation within the flooring material.

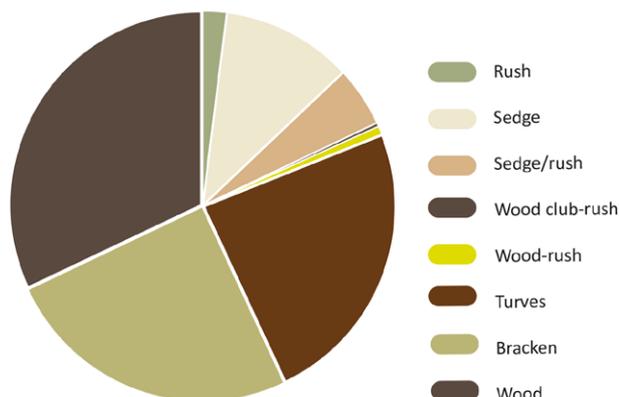
The crops were a mix of caryopses, bran, chaff and straw in 23 deposits. The species were emmer (49%), wheat (19%), barley (7%), and cereal (25%). The caryopses and chaff were scattered amongst the floor deposits whereas the bran was generally localised within the original ground



Carbonised crops



Waterlogged crops



Waterlogged flooring materials

Figure 11.4. ST3: crops (waterlogged & carbonised %) and flooring materials (waterlogged %).

surface deposits. Hazelnuts and shell fragments were found in 24 deposits both within and outside the structure. Of particular interest was four of the external deposits particularly [1145] which contained substantial quantities of hazel which is representative of the disposal of large-scale processing waste of this food resource. Fruits such as, blackthorn, raspberry and blackberry were scattered amongst 10 floor deposits. It appears that crop processing occurred on a small scale within the structure alongside the large-scale processing and disposal of hazelnut fragments.

Carbonised macroplant was recovered from 54 contexts and the largest component was crops formed of 64 spikelets, 4,056 cereal caryopses, 393 chaff fragments along with straw which was semi-quantified. The species were emmer (61%), six-row hulled barley (10%), barley (10%), emmer/spelt (4%), wheat (3%), two-row hulled barley (0.9%), bread/club wheat (0.9%), oat (0.2%) and cereal (10%). These finds were concentrated around the hearths and the surrounding floors. Hazelnut shells were retrieved from 45 contexts. These were concentrated around the hearth deposits, and it is possible this is a mix of domestic food debris and kindling whereas the larger caches are processing waste from when the nuts were roasted in preparation for storage or prior to being separated from the shell. Traces of blackthorn were noted in a range of deposits. Flooring material included bracken and heather along with sedge and rush. The weeds were only a minor component.

Both the waterlogged and carbonised macroplant assemblage when analysed in conjunction with each other demonstrate that the plant resources exploited throughout the many phases of occupation of ST3 remained consistent. The major difference between ST3 and the other roundhouses was that bracken and wood alongside turf were preferred for flooring, with plants such as sedge and rush having a secondary role. In terms of diet the food consumed within ST3 was also consistent with both the earlier and contemporary buildings on site. Emmer was clearly preferred and the occupants also exploited a range of wild nuts and fruits. The presence of bran and fruits suggests perhaps that human and/or animal faecal matter was intermixed within some of the deposits (but see Chapter 9.6.6) indicating that the general living conditions in specific areas within ST3 were perhaps fouler when compared to other locations within the structure.

#### 11.4.2.2 ST4: Summary (Figure 11.5)

Waterlogged finds composed of flooring material, crops, nuts, fruit, weeds, moss and puffballs were present in 14 samples. The floors were constructed using mostly bracken and wood and on occasion sedge and rush. In this respect the ST4 surfaces were built using similar materials as those in ST3 with an emphasis on bracken and wood, with sedge and rush being of marginal importance. Heather was noted in two contexts and could be evidence of turves. The waterlogged

food remains were cereal, nuts and fruits. The cereals were mostly emmer chaff (43%) and wheat (43%) along with smaller concentrations of two-row hulled barley caryopses (14%) in five floor deposits. The crops could have derived from small scale processing of grain or disposal of crop waste within specific locations in ST4. Raspberry and blackberry were scattered amongst five deposits, and it was also recorded that large numbers of fly puparia were present, indicating that some of the surfaces may have contained significant quantities of faecal matter or other unhygienic organic matter such as decomposing food left to rot and were very foul. The weeds are interpreted as accidental inclusions of the building material. The puffball fragments were mature and so unlikely to have been collected for food but may have been retained for other purposes including as tinder and for medical plasters.

The carbonised finds included 73 spikelets, 322 caryopses and 24 chaff fragments in nine deposits including floors and hearths. The cereal species were emmer (57%), six-row hulled barley (13%), wheat (10%), two-row hulled barley (3%), bread/club wheat (2%), barley (2%) and cereal (13%). The cereals were clearly concentrated within a single floor deposit [1012] which accounted for 85% of the carbonised crop assemblage present in ST4. A further 19 hazelnut shell fragments were scattered amongst eight contexts. Plant stems were noted in [1008] along with bracken, stems, wood fragments and peat recorded within two samples [1018] and [1023]. The floors within ST4, when compared to those in ST1 and ST2, were noticeably dirtier and more unkempt. It appears that food and other debris accumulated on the surfaces which created more foul areas which then had to be continually refurbished.

#### 11.4.2.3 ST6: Summary (Figure 11.6)

Waterlogged macroplants were recovered from six deposits. The largest component was building material made up of sedge, rush, bracken and wood that formed compressed layers that were particularly rich in deposits [635] and [657]. Cereal caryopses and chaff were only noted within [657] and the species were emmer (22%), wheat (22%), spelt (14%), emmer/spelt (14%) and cereal (28%). Hazelnut shell and raspberry were scattered amongst two contexts. Other finds included weeds and moss which were likely inclusions within the flooring material.

Carbonised material was present in nine contexts collected from inside the structure. The assemblage was formed mostly of cereals along with some hazelnut shell fragments, building material and weeds. The crops numbered 26 spikelets, 1,169 caryopses and 36 chaff fragments identified as emmer/spelt (92%), emmer (5%), barley (0.8%), bread/club wheat (0.7%), two-row barley (0.2%), wheat (0.2%), six-row hulled barley (0.1%), spelt (0.1%) and cereal (0.9%). There were 441 hazelnut shell fragments scattered amongst seven contexts. Burnt flooring material was observed in [657].

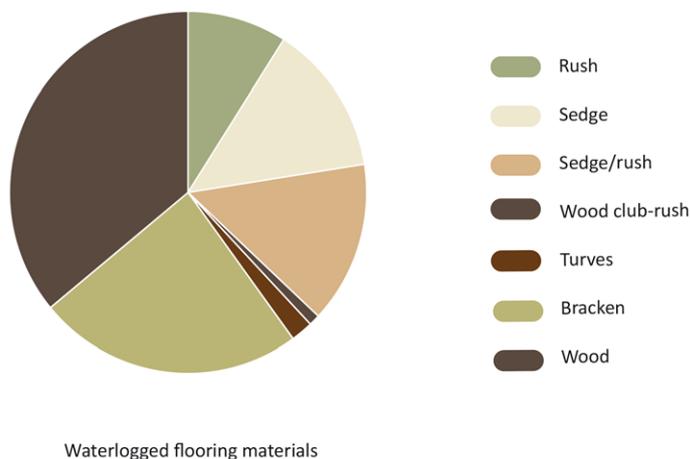
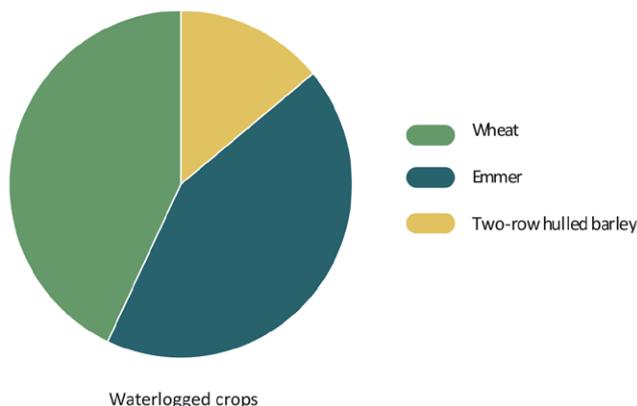
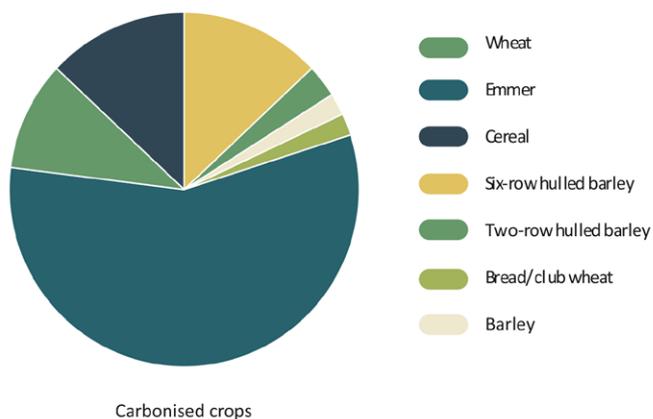


Figure 11.5. ST4: crops (waterlogged & carbonised %) and flooring materials (waterlogged %).

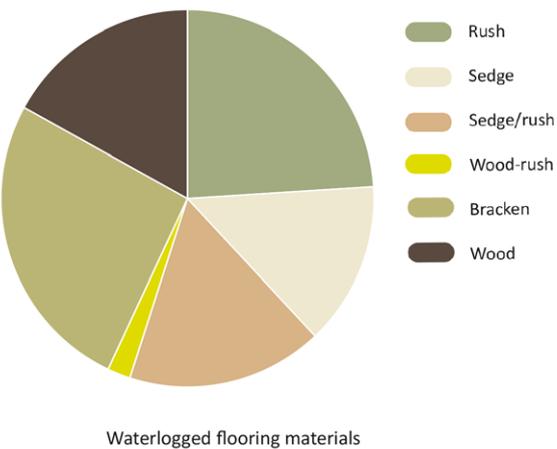
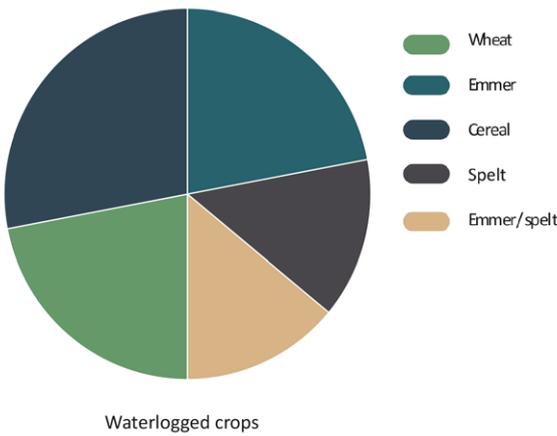
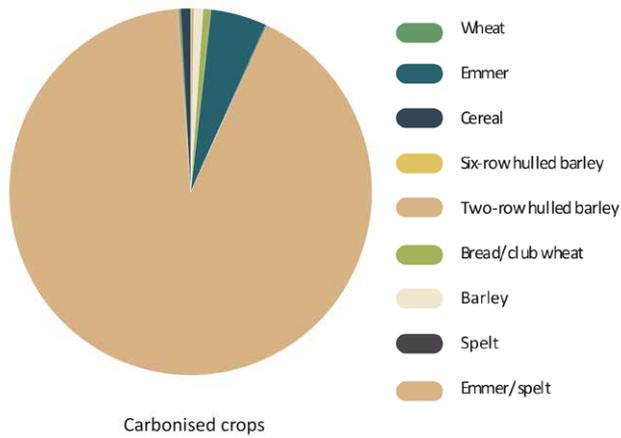


Figure 11.6. ST6: crops (waterlogged & carbonised %) and flooring materials (waterlogged %).

## 11.5 Discussion

### 11.5.1 Taphonomy

To fully appreciate the role of the macroplant assemblage at BLoM it is important to understand where and in what quantities it was found, and what this reveals about the nature of deposition, ie whether it was deliberate or accidental. To gather as much information as possible from both the waterlogged and carbonised assemblages the plants were categorised by type and analysed accordingly. They were classified as crops, nuts, fruits, building material, woodland, turf and weeds. Analyses of these categories made it possible to identify the role these many species had throughout the occupation of BLoM and how this may have changed over time.

Both waterlogged and carbonised cereals were more frequently encountered within Episodes 1 and 2 with only infrequent inclusions of charred finds in Episode 3. Carbonised cereals were found in all six roundhouses, but waterlogged cereals were present in only ST2, ST3, ST4 and ST6. Both waterlogged and carbonised crops were discarded within the Episode 1 ditch midden. Marginal inclusions of both waterlogged and burnt cereals were recorded in the Episode 1 trackway and Palisade 1. During Episode 2 traces of burnt cereals were present in the trackway along with some in the Episode 3 trackway, Rampart 2 and Palisade 3.

The grain caryopses and chaff recovered from the roundhouse hearths and surrounding floor deposits were typically designated as food processing waste or cooking debris. Cereals noted in the internal floors but located furthest from the hearths were viewed as signs of food debris trampled into surfaces during general cleaning. The cereals located in the external deposits represent background noise of human movement across the settlement, as food and domestic debris was transported to structures or refuse areas and was ultimately spilled and trampled underfoot.

Waterlogged and carbonised hazelnut shells were an abundant find at BLoM in Episodes 1 and 2 with smaller quantities retrieved from Episode 3. The excellent level of preservation is because of the density of the shells which allowed them to survive in the favourable conditions that existed at BLoM. As with the cereals the hazelnut shells from the structures tended to be associated with the hearth deposits with smaller quantities gathered from floor surfaces. This is because hazelnuts were dried and roasted within the structures with some of the shells subsequently recycled as a kindling material. This led to fragmented shells being left *in situ* within the hearths, with some subsequently trampled into the floor surfaces as components of general domestic refuse.

Of note was the presence of large dumps of hazelnut shells in Episode 2 in external deposits [743], [1139], [1145], [1146] and [1715] located outside ST3. These provide the

clearest evidence of the deliberate and long-term disposal of food processing waste associated with extracting the nuts from the shells. Shells were also noted in external deposits such as the trackways, ditch midden, Palisade 1, Rampart 2 and Palisade 4 but, as with the cereals, these were interpreted as background noise within the overall assemblage.

In contrast to the crops and nuts the fruits were very much a minor inclusion, but this is probably because this food resource tends not to survive well within most archaeobotanical assemblages because of their fragile structure. Fruit remains were recorded in Episodes 1 and 2. These were focused within ST1, ST2, ST3, ST4 and ST6 with smaller inclusions in the ditch midden, Palisade 1, the trackways and surface [744].

The fruits tended to be associated with the hearth deposits and the surrounding floors. This indicates the occupants may have consumed berries in their raw state while sitting around the hearths with some later being incorporated alongside other domestic debris that was tracked into the surrounding floor surfaces. Carbonised seeds were recovered from ST1, ST2, ST3 and ST6 suggesting that this resource was also cooked prior to consumption. Raspberry and blackberry could also have been inclusions within faecal matter and could reflect the presence of trace amounts of human and animal excrement within the roundhouses and external features.

Building material was a major component of the waterlogged assemblage with only minor amounts recorded as carbonised finds. Floors constructed using sedge, rush, bracken, wood and peat turves were recorded in ST1, ST2, ST3, ST4 and ST6. There were clear differences in the make-up of these floors, with laminated layers of sedge, rush, bracken and wood favoured in ST1, ST2 and ST6 while wood, bracken and peat were preferred in ST3 and ST4. This could either reflect what materials were available at the time of construction or that as the site developed attitudes to plant selection adapted to satisfy specific building requirements.

The floors in each structure were regularly maintained and kept relatively clean. Occasionally old flooring was discarded within the ditch midden during Episode 1 and sections of burnt floors from ST3 were disposed of outside the building in external deposits such as [1137] and [1139]. Old flooring was also burnt in the hearths, but the *in situ* patches of burnt flooring probably represent accidents rather than the deliberate destruction of old floor layers.

The woodland material was mostly preserved through waterlogging but there is some evidence of charring. The wood brought to BLoM was used primarily for construction and fuel, but unwanted offcuts and fragments were recycled as a flooring material. The associated inclusions of buds, leaves, thorns and bark were all accidental but their incorporation alongside the wood led to them becoming a regular component of the material used to refurbish the

roundhouses. The exception is the willow leaves found in and around the wooden bowl in the Episode 1 ditch midden which seem to have been deliberately gathered for a specific purpose.

The settlement was constructed on a peaty surface, but additional turf material was imported to the site throughout its occupation. Fragments of peat and sometimes heather were noted in ST1, ST2, ST3, ST4 and ST6 in varying quantities. The turves were likely used for flooring and wall cavity packing especially within ST3 and ST4. Turves were probably also used as a fuel source with fragments of burnt peat noted in the hearths. Turf was also incorporated within sections of the trackways in Episode 1 and 2, probably as surfacing. During Episode 1, turves were regularly disposed of within the ditch midden and these are probably the remnants of old flooring and building material.

Understanding the taphonomy of the weeds is complex as there is a variety of pathways by which they became incorporated within the settlement. The weeds grow in a range of habitats and undoubtedly many grew on this site prior to the initial construction and continued to grow alongside the occupants as the settlement developed. Consequently, many species were accidentally trapped within both the roundhouses and external features as construction took place, floors were refurbished and people and animals tracked them into surfaces as they moved around the settlement. These plants could also have been brought in by the elements. Other species would have been introduced as agricultural contaminants and, as crop processing occurred on site, these weeds would regularly end up reworked into the hearth and floor deposits. It is also likely weeds were deliberately collected for use as a food source, medicine and building material. By studying the contexts in which the weeds were present and the quantities in which they were found, it has been possible to provide some understanding of their role at BLoM.

In terms of overall preservation, analysis revealed that the waterlogged deposits from ST1 and ST5 were noticeably less well preserved than those from ST2, ST3, ST4 and ST6. This was in part because the ST1 deposits were closer to the surface and consequently were more prone to periods of extended aeration which adversely affected the recovery of organic finds (Chapter 1.6). The limited excavation of ST5 has created a bias in the recovery of macroplants rather than truly reflecting the level of preservation of this structure. Of all the deposits analysed it was noted that those collected from ST2, ST3 and the ditch midden were the best preserved. This was due to the rapid and continual build-up of material which prevented the lower layers in these deposits from decomposing. The preservation of the plants through carbonisation was varied as it ranged from poor to excellent.

## 11.5.2 Cereal crops

The crops were mostly composed of caryopses and chaff along with more infrequent inclusions of bran and straw fragments. The caryopses and chaff formed one of the largest components of both the waterlogged and carbonised assemblages (Figures 11.1 to 11.6). Cereals were noted in all episodes of occupation but were concentrated within Episodes 1 and 2 with only marginal inclusions in Episode 3. These finds accumulated from small-scale crop processing and cooking debris, the resulting waste from which was routinely incorporated into the hearths and floors while smaller concentrations were found in the external deposits, presumably discarded through both deliberate and accidental disposal as the occupants moved throughout the settlement.

### 11.5.2.1 Wheat

The wheat species were emmer, spelt and bread/ club wheat. Emmer was the dominant crop throughout the entire occupation of the site, accounting for 39% of the waterlogged assemblage and 44% of the carbonised cereals. By contrast spelt and bread/ club wheat were only present in very small quantities; spelt accounting for 1% of waterlogged and 4% of carbonised finds, and bread/ club wheat accounting for 1% of waterlogged and 1% of carbonised finds. Due to poor preservation some carbonised caryopses were recorded as emmer/ spelt (22%). The rest of the assemblage was described as waterlogged (24%) and carbonised wheat (5%).

#### Emmer

Emmer was present in all three episodes of occupation. In Episode 1 the waterlogged (19%) and charred emmer (31%) were scattered amongst ST1, ST2, ST5, the ditch midden, trackway and Palisade 1. In Episode 2 the waterlogged (45%) and carbonised (48%) emmer were concentrated in ST3 with smaller quantities in ST4, ST6, the trackway and in Rampart 1. A small amount of charred emmer (10%) was recorded in the Episode 3 trackway.

#### Spelt

Spelt caryopses and chaff were a very marginal component of the BLoM assemblage, but trace amounts were noted in Episodes 1 and 2. In Episode 1 there were carbonised (0.5%) finds in ST1. In Episode 2 both waterlogged (2%) and carbonised (0.1%) finds were present within ST6. A small quantity of carbonised spelt (0.4%) was also retrieved from deposit [611], sediment that had accumulated outside the palisade.

#### Bread/ club wheat

Carbonised bread/ club wheat (5%) in Episode 1 were scattered amongst ST1, ST2, ST5, the palisade and trackway. In Episode 2 waterlogged (2%) and carbonised bread/ club

wheat (1%) were dispersed amongst ST3, ST4, ST6 and in the trackway. Charred bread/ club wheat (1%) was also present in deposit [611].

### 11.5.2.2 Barley

The cereals identified as barley were a mixture of six-row hulled barley, two-row hulled barley and naked barley. Where preservation allowed it was possible to separate six-row and two-row hulled barley based on the morphology of the rachis internodes and the proportions of symmetric to asymmetric grains (van der Veen 1992: 23). Six-row hulled barley was only recovered in a carbonised state (6%) alongside waterlogged two-row hulled barley (1%) and carbonised two-row hulled barley (0.8%).

Identifying naked barley is potentially problematic as hulled barley in certain circumstances mimics the appearance of naked barley if the growing conditions or preservation of the grain are poor (Holden & Boardman 1998: 99). This is caused by the failure of the grain to adequately fuse to the enclosing lemmas and paleas giving it the misleading appearance of the naked variety (Holden & Boardman 1998: 99). At BLoM most of the barley caryopses had not suffered extensive morphological distortions and it is therefore unlikely that any of the barley species were misidentified, and that the numbers recorded are an accurate reflection of their significance within the settlement. It was possible to confidently recognise naked barley (0.1%) within the assemblage. The barley that could not be identified further were recorded as either waterlogged (5%) and charred (7%) where appropriate.

#### Hulled barley

Carbonised six-row hulled barley was present in Episode 1 (3%), Episode 2 (8%) and Episode 3 (1%) and were scattered amongst the six structures and rampart deposits.

Carbonised two-row hulled barley (0.3%) was recorded in Episode 1 in the ditch midden and trackway. In Episode 2 waterlogged (1%) two-row hulled barley was recovered from ST4 while carbonised (0.7%) finds were scattered amongst ST3, ST4 and ST6. Some indeterminate waterlogged barley caryopses and chaff which are probably of the hulled variety were also dispersed amongst the structures.

#### Naked barley

Background traces of naked barley were recorded in Episode 1 (0.2%) in ST2 and Episode 2 (0.1%) in hearth [279].

### 11.5.2.3 Oats

In the absence of any floret bases it was impossible to identify if the oats belonged to the cultivated or wild variety. Waterlogged oats (4%) were present in ST2 in Episode 1. The carbonised finds were in Episode 2 (0.1%) in ST3, and in the post-ST2 Hearth 6.

#### 11.5.2.4 Crop selection

Analysis of the cereal assemblage demonstrates that emmer was the principal crop throughout the occupation of BLoM. The popularity of emmer was probably due to a combination of both environmental and cultural factors. The SW of Scotland has a mild windy oceanic climate that is both warmer and drier than other parts of Scotland (Bown et al 1982: 7). Emmer also provides better yields on light clay loams that are well drained (Renfrew 1973: 66; Jones 1981: 106). This crop has been known to outperform other cereals on more marginal land and may have been cultivated to ensure against times of potential famine (Holden et al 2008: 252–261). As emmer is also a hulled species the chaff would act as protection against damp environments and help to repel insect attacks making it a sensible choice for those living on a wetland site. Wheat species are also traditionally preferred over barley because of their higher nutritional value and baking qualities (Zohary & Hopf 1994, 18). Emmer flour would have been turned into bread, gruel and porridge with grains possibly kept for brewing a high-quality beer (Renfrew 1973: 66; Zohary & Hopf 1994: 39). While there was no evidence of brewing at BLoM the emmer grain was likely reserved solely for human consumption.

Although spelt was observed in all three episodes it only occurred in small quantities. This may be because it was more difficult to successfully cultivate in larger yields to justify the efforts and resources expended, or it was simply an arable weed of the main emmer crop. If spelt did have a dietary role at BLoM it is also possible that it was not grown nearby but was instead imported from another settlement and is an example of a trade good. The presence of chaff indicates that it was an unprocessed grain suggesting that if it was imported its original growing location was not too distant from BLoM. This is because the logistics of transporting unprocessed crops over long distances is much more difficult compared to moving processed or partly processed grain. Nor was there any evidence of arable weeds associated with regions outside this landscape.

Spelt has previously been recorded in small quantities at Cults Loch crannog (Robertson 2018a: 85), Dorman's Island (Robertson 2011: 87), Oakbank, Loch Tay (Miller 2002: 43), Port Seton (Miller et al 2000: 46) and possibly at Carronbridge (Boardman 1994: 270). Successfully cultivating spelt requires specific growing conditions which may not have existed on a sustainable scale around these sites to produce large yields. Analysis of Iron Age macroplant assemblages in northern England revealed that, in some regions and settlement types in the Tees lowlands, spelt had begun to replace emmer as the primary crop by around 300 BCE (van der Veen 1992: 73–74). It is therefore possible that some settlements in SW Scotland either tried to cultivate spelt on a very small scale locally or imported this crop from settlements in

northern England via established trade routes. As spelt is now recognised at several Scottish prehistoric sites this could be evidence of a short-lived attempt to cultivate a wider variety of crops. Regardless of how spelt came to be at BLoM it is obvious this cereal did not have a long-term agricultural role nor was it of any real dietary importance during any episode of occupation.

Bread/ club wheat may have enjoyed a similar dietary role as spelt at BLoM. Given the quantities observed it is clear this crop had a marginal dietary role, but its continued presence throughout the occupation suggests it was either cultivated by the settlement as a secondary crop or was imported as a trade item from another site. Like the spelt it is also possible that the bread/ club wheat was simply an agricultural weed that grew alongside the emmer. The presence of chaff also suggests that if this unprocessed crop was imported it did not come from any significant distance.

Bread/ club wheat was originally interpreted as a relatively rare find (Haggarty & Haggarty 1983: 37; Toolis 2021b: 250–251). However, the species has now been recovered from multiple sites in SW Scotland. Bread/ club wheat was noted at Buiston crannog, Ayrshire (Holden & Boardman 2000: 152), at Cults Loch crannog (Robertson 2018a: 84–85), Rispaing Camp (Haggarty & Haggarty 1983), Fox Plantation (Alldritt unpubl: 40) and Dorman's Island (Robertson 2011: 87). The evidence demonstrates that several Iron Age communities in the SW either cultivated this species locally on a small scale or perhaps traded for this crop with settlements in northern England where it was more widely grown.

Both six-row hulled barley and two-row hulled barley also appear to have had a minor agricultural and dietary role within this community. Barley was a favoured crop for many Iron Age Scottish communities as it is better able to withstand poorer soil conditions that are not as favourable for wheat (Jones 1981: 105; Zohary & Hopf 1994: 55; Dickson & Dickson 2000: 231–233;). Hulled barley was also favoured as they are less susceptible to mould than other species (Bond 2007a: 157; Summers & Bond 2015: 264;). As neither hulled barley variety was recorded in large quantities in any episode this indicates that barley very much had a secondary dietary role to emmer throughout the occupation of the settlement. The hulled barley was probably consumed by the human occupants, but it is also likely some was used as animal feed for the livestock.

Naked barley is a free threshing crop which typically makes it easier and quicker to process than the hulled varieties although it is more prone to disease especially if stored in damp environments. This may explain why naked barley, which was an important crop at many other Iron Age sites (Dickson 1994: 135), was of no real significance at BLoM as the wetland habitat would have proven inhospitable to successfully storing this crop. It is much more likely naked barley was either a weed contaminant

of the emmer or was perhaps a traded food item. Unlike the other barley and wheat crops there is no surviving evidence that naked barley was ever processed within any of the structures.

At other Iron Age sites where both hulled and naked barley are found together, it is sometimes argued that they had differing roles within the economy. Naked barley is normally preferred for human consumption whereas hulled barley tends to be reserved for brewing and animal feed (Summers & Bond 2015: 264). Naked barley was such a minor inclusion at BLoM that it is unlikely to have had any definitive role.

Oat was either a very marginal crop which had a temporary dietary role or was an invasive weed introduced accidentally as a by-product alongside the wheat and barley. As with the naked barley there is no surviving evidence that oats were processed within any of the structures. If oats were deliberately cultivated, then they were probably used to feed the human occupants and livestock, but their overall dietary contribution was negligible, and the evidence is more suggestive of them being simply a weed.

Evidence of diverse crop exploitation has been recorded at Port Seton, East Lothian (Miller et al 2000: 70) and in many of the settlements in the SW including Cults Loch (Robertson 2018a), Dorman's Island (Robertson 2011: 87), Fox Plantation (Alldritt unpubl: 40), Uppercleuch (Scaife & Clapham 1993: 66), Carronbridge (Boardman 1994: 270), Rispaing Camp (Haggarty & Haggarty 1983: 37) and Dunragit (Toolis 2021a: 350). At all these sites a greater range of crops were cultivated when compared to their more northerly mainland counterparts, for example at Kintore, Aberdeenshire (Holden et al 2008: 252), Clachtoll Broch, Assynt (Robertson 2022a: 229) and Crosskirk Broch, Caithness (Dickson & Dickson 1984, 155), all of which were much more dependent on barley cultivation. This is because settlements in these more northerly locations were dependent on choosing crops able to survive in the poorer climate and growing conditions.

Sites located in the SW tended to embrace a more diverse agricultural policy where both wheat and barley were grown alongside each other. There is also evidence that where growing conditions permitted many communities preferred wheat over barley. The notable exception was Woodend Farm, Annandale (Alldritt 2000: 250) where only barley was recovered. This variability in crop exploitation in the SW of Scotland is due to several factors such as better climate, growing conditions and perhaps site status. This allowed settlements in the SW to experiment with crop production and allow them to choose species based on cultural and dietary preference.

The agrarian economy practised at BLoM along with other sites in the SW appears to have more in common with their Iron Age counterparts in northern England (Hall & Huntley 2007: 43–50). Analysis undertaken at three

sites in Northumberland, Chester House, Murton and Dod Law reveal that the crops cultivated were a mix of hulled barley, emmer and spelt (Huntley 1995: 38–40). In North Yorkshire at Stanwick, Rock Castle and Scotch Corner hulled barley and spelt were economically important (*ibid*). Emmer was present at Scotch Corner while bread wheat was recorded at both Rock Castle and Scotch Corner (Huntley 1995: 40). At Thorpe Thewles in Cleveland, spelt and six-row hulled barley were the two main crops, with emmer and oat both described as a weed (van der Veen 1987: 94). The remains of oat in the form of caryopses and chaff were noted at five sites, Chester House, Thorpe Thewles, Stanwick, Rock Castle and Scotch Corner, but in all instances these inclusions were a minor component of the assemblages (Huntley 1995: 38–45). Overall, those communities to the N of the River Tyne favoured emmer whereas those to the S preferred spelt (van der Veen 1992: 159; Huntley 1995: 40; Huntley 2006: 141). Bread wheat and rye were also recorded in those settlements S of the Tyne (Huntley 2002: 85).

In summary cereals recovered from BLoM demonstrate that emmer was the principal crop with hulled barley, spelt and bread/club wheat possibly grown as companion crops. The economic role of both naked barley and oat is unclear but if they were consumed these two species were of little import and are more likely to have been arable weeds. Environmental considerations may have driven some of the crop selection criteria at BLoM, ie the preference for hulled crops because of the damp environment, but it would also appear that some cereals were selected to satisfy the dietary preferences of the occupants. This was also true of other prehistoric communities in the NE of England where socio-economic, cultural differences and status influenced what crops were cultivated rather than being entirely controlled by environmental considerations (van der Veen 1992: 158; Haselgrove 2002: 63–64; Welfare 2002: 57).

The major advantage of diversified agrarian farming is that if one crop failed for any reason, then the community had access to a replacement harvest. Both emmer and spelt are autumn sown crops whereas barley which ripens earlier can be sown in the spring (Miller 1997: 185). This would allow the BLoM populace to practise a risk management strategy and spread their manual labour throughout the year. This pattern of crop exploitation remained consistent throughout the occupation of the settlement. The BLoM crop assemblage is representative of a small-scale producer and consumer site which supported a subsistence farming community which was labour intensive. This type of crop husbandry was on a par with their neighbours in northern England, particularly those settlements N of the River Tyne in practising a more varied approach to agriculture with emmer as the principal crop.

### 11.5.2.5 Harvesting, crop processing and storage

The community had access to both suitable land and agricultural technology to support the successful cultivation of cereal crops. As the settlement was constructed directly on a damp peaty islet the wheat fields must have been some distance from the settlement; this may explain why cultivated *Avena/Triticum*-type pollen was not found in the offsite core near BLoM during the settlement period (Chapter 17.1.5.1) especially as cereal pollen tends not to travel over long distances (Huntley 2006: 135). *Avena/Triticum*-type pollen was found in the WLoM cores during the settlement period so the wheat fields may have lain closer to WLoM. Barley pollen was recorded in the catchment area during the settlement phase probably because this crop can grow in poorer soil conditions and may have been grown in the more marginal land surrounding the settlement. The evidence indicates that land suitable for cultivating a variety of different crops was available in the surrounding landscape throughout all episodes of occupation.

The recovery of an iron ardshare tip from a bow ard in ST1 (Chap 15.12) gives some insight into the agricultural husbandry practised at BLoM (Reynolds 1987: 28–29). Ards can typically cope with a wide variety of soil types including those surrounding BLoM (Rees 1984: 77). The ard was likely pulled either by the human inhabitants or by the cattle whose presence is recorded in the faunal assemblage (Chapter 12.1). The presence of cattle, sheep/goat and pig means that animal manure would have been readily available for fertilising the fields under cultivation. This would have been important as those weeds identified as typical agricultural contaminants (see below) tended to prefer sandy soils and a source of manure would be required to maintain the continued fertility of the fields under cultivation.

The presence of chaff, culm nodes, straw fragments and arable weeds demonstrate that crops were either uprooted directly from the soil or the stems were cut low to the ground. These were then gathered into bundles to be transported for storage and processing. This method of cropping allowed for the straw to be collected which was a valuable resource typically used for animal feed, thatching, flooring and fuel (Smith 1999: 332). Analysis shows that straw was not a significant component of the flooring and hearth deposits at BLoM. Instead, the straw may have been largely reserved for winter fodder for the livestock or used as roof thatch. Straw was only noted in ST3 and the near absence of chopped up straw fragments within the floor layers suggests that animals were not stabled long term within any of the structures excavated at BLoM. Nor did any recognisable roof sections survive so it was not possible to confirm if straw was used as thatch.

The crops would then have to be threshed, raked, winnowed, sieved and dried before they could be stored

or eaten (Hillman 1984: 132–133). The accumulation of waterlogged caryopsis and chaff around the hearths demonstrates that grain was processed on a small scale in the roundhouses during all episodes of occupation. The carbonised cereals were also concentrated in and around the hearth deposits, and these were a mix of spoiled crop processing and cooking waste. Before cereals can be processed or stored they must be fully dried, so it is probable that some of the carbonised finds were accidentally burnt at this stage. It is also likely chaff was used as kindling and hence was found carbonised in the hearth deposits. Hulled crops require additional processing to de-husk the grains and this demands specific agricultural tools such as stone grinders and pounders (Chapter 15.1).

Large-scale crop processing produces large quantities of dust and normally requires a substantial floor space. For this reason, crops were normally threshed and winnowed outside in a breeze or if it did occur in an inside location the building usually had multiple doors or air vents to allow for a cross breeze (Smith 1999: 332). If large-scale crop processing was undertaken at BLoM, it must have occurred elsewhere. However, there was evidence for the small-scale processing of crops within the roundhouses suggesting the occupants practised a subsistence economy which focused primarily on the day-to-day handling and consumption of cereal resources as and when required.

There is no conclusive surviving evidence that any of the structures were used for storing unprocessed crops or caches of processed grain. There is perhaps some evidence for the storage of a small quantity of processed grain in at least one deposit [15038] in ST3 although the evidence is somewhat ambivalent, and these finds could simply have accrued accidentally. It is possible specific locations within the settlement were used for storing small caches of grain or more likely that it was left in bags hanging from the rafters in the roundhouses. This would render this resource more easily accessible when needed but there is no evidence that unprocessed or processed crops were stored in any significant quantities within any of the structures or external features. This may be because either the evidence has not survived within the archaeobotanical record or that unprocessed grain was stored elsewhere and brought to the settlement only when needed to be processed on an *ad hoc* basis within the roundhouses.

The main advantage in storing crops in an offsite secure location is that they could have been kept in a drier environment as many of the BLoM structures would have experienced periods of damp. Grain must be stored in dry conditions because if allowed to become damp it becomes susceptible to mould and prone to pest attacks making it inedible or unusable for the following growing season. For this reason, once the grain was processed it was probably consumed rapidly on site rather than being left in storage for any length of time. The absence of any large-scale

storage facilities coupled with evidence for small-scale processing on a daily basis reinforces the idea that the BLoM populace practised a hand to mouth economy throughout the occupation of the settlement. This ties in with the evidence from northern England where settlements in the N continued with small-scale labour-intensive crop husbandry similar to that at BLoM whereas those settlements S of the Tyne increased their arable output and improved their agricultural status (Haselgrove 2002: 64).

### 11.5.3 Nuts

Hazelnuts had a pivotal dietary role throughout the occupation of the settlement with copious quantities of shells found in both a waterlogged and carbonised condition (Figure 11.7).

Fragments of shells were prevalent in all three episodes but were particularly of note in Episode 2 when there was evidence that semi-industrial processing of this resource occurred on site with processing debris discarded in external deposits associated with ST3 (ie [743]). However, it must be remembered that hazelnut shells are a common find at most prehistoric archaeological sites, the shells surviving easily because they are dense and are typically charred during roasting or recycled as a kindling material (Bishop 2019: 1). This can lead to hazelnuts being overrepresented within many macroplant assemblages but, given the excellent preservation at BLoM, it is unlikely that the importance placed on hazelnuts within the interpretation has been overstated.

The presence of both waterlogged and charred hazelnuts indicates that this food resource was probably eaten both raw and roasted. Roasting supposedly improves the flavour, makes them more digestible and the nuts more easily ground into flour for cooking (Bishop et al 2013: 3). It is therefore possible many of the carbonised shells are debris from this process. The nuts may also have been either air-dried or roasted prior to storage (Bishop et al 2013: 37–38). Raw hazelnuts could also have been left close to the hearths or stored in bags tied from the rafters within the roundhouse to air dry. No actual storage area holding unprocessed nuts was excavated but there were large quantities of shell processing waste in both a waterlogged and charred condition to signify this activity occurred regularly during Episode 2. While hazelnuts were recorded in both Episodes 1 and 3 there was not the same evidence to signify that mass processing of this resource took place in either the earlier or later occupations.

Both the waterlogged and carbonised hazelnuts were mostly fragmented, but a small number of whole shells were also observed. The edges of some of the carbonised shell fragments had a noticeably smoother edge which contrasted with the majority which displayed a typically rough and discontinuous contour. This pattern of breakage suggests that those shells with a smooth edge

only fragmented after exposure to heat, whereas those with a rougher edge had been broken prior to charring (López-Dóriga 2015). This demonstrates that most of the nuts had been extracted prior to burning with only a small number left intact, either because they were overlooked during processing or were deemed inedible. At least some of these shells were then disposed of in the hearths, either as debris or recycled as kindling.

A small number of hazelnuts displayed clear evidence of morphological distortions which were probably due to either early harvesting or was a failure of the nut to fully develop. Hazelnuts can be deliberately collected when immature to maximise the size of the overall harvest, especially if the human occupants were in competition with the local wildlife which would also be exploiting this resource (Bishop et al 2013: 36). There was evidence that several shells had suffered from rodent or beetle infestations as the nut had been extracted through a small circular hole leaving the shell otherwise intact. There is, however, no evidence that any of these hazelnuts were deliberately harvested in large quantities in an unripe condition. Instead, the presence of small quantities of immature hazelnuts alongside a much larger number of fully ripe examples, suggests that there were differences in ripening times between hazel trees within the woodland environment surrounding BLoM which is not uncommon (Talalay et al 1984: 348).

Hazelnuts were a valuable nutritional food resource and were traditionally gathered as part of a community event normally around September to October when they are in season (Dickson & Dickson 2000: 258; Bishop et al 2013: 36). The nuts tend to form at the top of slender branches out of easy grabbing distance (Dickson & Dickson 2000: 258). The presence of unripe hazelnuts within the assemblage suggests that at BLoM the hazelnuts were collected over a longer period. Unripe hazelnuts quickly lose their flavour, are susceptible to becoming mouldy and are difficult to process as the nut adheres more closely to the shell so it is unlikely they were deliberately gathered in this state (Bishop et al 2013: 37).

While there is some evidence of pest attacks on hazelnuts at BLoM it is not serious enough to have warranted the occupants to adopt the deliberate strategy of early harvesting. This approach would ultimately have created extra work in processing for much less reward as the nut would be less enjoyable to eat and more prone to mould especially in the damp confines of the settlement. Nor was there any evidence that any of the hazelnuts were deliberately allowed to sprout once harvested. The exploitation of this resource focused on gathering ripe hazelnuts that were ready to be stored for the winter and consequently would have been more easily processed as and when required.

Hazel wood was an important source of both building material and fuel throughout the occupation of BLoM



Figure 11.7. Nuts and fruits (waterlogged & carbonised) from all structures.

(Chapter 14.2) and the hazel woodland must have been deliberately and successfully managed to create a continual supply of both wood and nuts throughout the occupation of the settlement (Chapter 17.2.3.1). The quantity of hazelnut fragments found on site indicates that they played a significant role in the diet of the inhabitants throughout its occupation.

#### 11.5.4 Fruits

The fruit assemblage was composed mostly of waterlogged raspberry and blackberry alongside much smaller inclusions of blackthorn and crowsberry (Figure 11.7). The only carbonised finds were raspberry and blackthorn.

Both raspberry and blackberry seeds were noted in ST1, ST2, ST3, ST4, ST6 with raspberry also present in the rampart, trackway and palisade in both Episodes 1 and 2. Carbonised raspberry was noted in ST1, ST2 and ST6. The fruits are normally abundant and are seasonally available from late summer onwards (Dimbleby 1978: 33–32). The soft fruits can be turned into jams, preserves, syrups, vinegars and wines (Lang 1987: 49–53). Raspberry was used to soothe fevers and ease delivery in the final stages of pregnancy although, if taken in the early stages, could cause a miscarriage (Hatfield 2007: 284). Blackberry was also believed to help cure sores, piles, coughs and colds (Dickson & Dickson 2000: 53; Hatfield 2007: 37). A small

number of carbonised raspberry and blackberry seeds were recovered from hearth deposits. These fruits may have been exposed to heat prior to consumption or alternatively were inclusions within faecal matter that was recycled as a fuel source within the hearths. The continued presence of raspberry and blackberry in Episodes 1 and 2 demonstrate these two fruits were regularly available throughout the settlement's existence.

A small number of waterlogged crowberry seeds were noted in one deposit in ST4 in Episode 2. The berries are described as scarcely edible but have long been collected as a food resource and do become more palatable if made into jellies (Lang 1987: 152; Smith 1999: 331). Crowberry typically grows alongside heather so, while it is possible the crowberry was gathered for food, the seeds could also represent accidental inclusions brought in with the turf material used for building and fuel (see below). As this species was only recovered from a single deposit, if it was deliberately gathered for food it only ever had marginal role.

A small number of waterlogged blackthorn stones were noted in the rampart, trackway and ST3 along with carbonised finds in the trackway, ST2 and ST3 in Episodes 1 and 2. The fruits are edible if somewhat bitter but do become more palatable if dried, especially if they are collected after the first frost as this makes the skin softer (Lang 1987: 102; Dickson & Dickson 2000: 281). They can also be used as a drink flavouring and for producing a dye (Hatfield 2007: 28). Blackthorn can also be used to treat a variety of medical conditions including asthma, scabies, sore throats, fluxes, haemorrhages, toothache, upset stomachs and inflamed eyes in both humans and animals (Lang 1987: 102; Dickson & Dickson 2000: 281; Hatfield 2007: 28). The continued presence of blackthorn during Episodes 1 and 2 even in small numbers demonstrates this fruit was deliberately collected when seasonally available.

### 11.5.5 Vegetables

Evidence of vegetables and herbs tends to be better recognised within waterlogged assemblages because those parts of the plants usually eaten such as the leaves or shoots rarely survive when carbonised (Zohary & Hopf 1994: 181; Miller 1997: 201). Even though there was a large and varied waterlogged plant assemblage at BLoM it was still difficult to distinguish between plants that may have been deliberately collected for food and those which were simply weeds incorporated into the flooring material. Certainly, there was no surviving evidence within any of the structures or external features which suggests that vegetables were deliberately grown, stored, cooked or disposed of within these areas. However, if wild plants were gathered only as and when required, this would leave little recognisable evidence of their importance to this economy even in such a well preserved ecofactual assemblage.

While there was no definitive evidence for the deliberate collection of vegetables and herbs to supplement the diet many of the weeds recorded at BLoM are edible. This included fat-hen (*Chenopodium album* L.), common chickweed (*Stellaria media* (L.) Vill.) and common nettle (*Urtica dioica* L.), which have a high food value, are rich in vitamin C and if gathered as a dietary supplement could have been used to add flavour to other food items such as cereals and pottage (Hatfield 1970: 34, 54 & 81; Renfrew 1993: 24; Miller 1997: 202;). Additionally, the seeds, leaves, shoots, tubers from orache (*Atriplex* L.), burdock (*Arctium* L.), cabbage/ mustard (*Brassica/Sinapis* L.), hemp-nettles (*Galeopsis* sp.), nipplewort (*Lapsana communis* L.), knotgrass (*Polygonum aviculare* L.), black-bindweed (*Danthonia decumbens* (L.) DC.), yellow water-lily (*Nuphar lutea* (L.) Sm.), pale persicaria (*Persicaria lapathifolia* (L.) Delarbre), wood club-rush (*Scirpus* L.) and corn spurrey (*Spergula arvensis* L.) have all been used as food resources (Hatfield 1970: 28; Renfrew 1973; Dimbleby 1978: 28–30; Smith 1999: 331).

These plants could easily have been collected when seasonally available (Holden & Boardman 1998: 101). Certainly, the roots and tubers of many plants can be gathered all year round but to maximise their carbohydrate content and size they are normally best selected after they have flowered but before the new shoots emerge (Bishop et al 2022). Fat-hen, common chickweed and nettle were recovered in such large numbers in a waterlogged condition from the roundhouses that this could represent discarded food refuse. Smaller inclusions of carbonised fat-hen, black-bindweed and pale persicaria were noted in some of the structures and, while these could be accidental inclusions within the processed grain or burnt floor layers, they could be evidence of cooking refuse. However, given the small size of the carbonised weed assemblage this conclusion is speculative.

It is possible that many of these plants were deliberately cultivated in small garden kitchens surrounding the roundhouses as this would give the occupants immediate access to this food resource (Hatfield 1970: 81). On the other hand, many of these weeds probably grew directly on the site through all periods of occupation. It is also highly probable that many of these plants were introduced accidentally as contaminants of the crops which were subsequently processed in the structures around the hearth or as inclusions within the building and fuel material.

### 11.5.5 Flooring materials

Analysis of both the bulk and monolith samples revealed multiple compacted layers of waterlogged flooring materials within all excavated roundhouses (Figure 11.8).

The active floor surfaces were constructed using five main plant components: bracken, wood, sedge (white, glaucous, hairy sedge), rush (jointed, hard, soft, compact

rush) and turves. Other flooring materials included toad rush, wood rush, wood-club rush, spike rushes, and grasses (*Poaceae* sp.). These always occurred in much smaller quantities so they may have been collected and incorporated accidentally along with the other flooring materials.

The five main plant components used in floor construction were found in a variety of combinations but at times within specific structures certain plants were clearly favoured. For example, layers of bracken, wood, sedge and rush were typically mixed to form laminated layers within ST1 and ST2 whereas in ST3, ST4 and ST6 bracken, wood and turf were preferred with sedge and rush in a much more reduced role. It is possible that this was because specific types of floor surface were favoured and/ or required for different activities such as sleeping, working and storage (see below).

It was noted within ST2, ST3 and ST4 that the buds of wood species tended to be composed of both immature and mature examples and that these occurred in distinct concentrations depending on their stage of development. The same was true of bracken; tightly curled fronds were sometimes overlain by more mature fronds, demonstrating that some were gathered in early spring and others in summer. This was particularly evident in ST3 where it appeared that the floors were regularly refurbished all year round with newer material overlying the older surfaces. This evidence is a good indicator of seasonality as this demonstrates wood and bracken were cropped all year round and some of the floors could be identified as spring, summer and autumn depending on the maturity of the finds (Robertson & Roy 2019: 12).

Many of the same plants used to refurbish the floors will probably also have been employed as roofing materials. Bracken was clearly a vital component of the flooring at BLoM but was also probably used for thatching as it can last for 20 years before needing to be replaced (Miller 1997: 214). Rush, sedge, heather and straw were all commonly used as roofing materials. Heather, in particular, is described as an excellent thatching material which if constructed correctly may last upwards of 100 years (Milliken & Bridgewater 2004: 85–89). However, it should be noted here that there was no evidence to suggest that roofing material had collapsed and become incorporated within the floor surfaces; there was no structural evidence of collapse nor was there any evidence of disarticulation and disruption in the floor surfaces themselves.

#### 11.5.5.1 Bracken

Bracken was the most abundant flooring material employed, probably because it is more absorbent than many other suitable plants. It was used prolifically to continually refurbish ST1, ST2, ST3, ST4 and ST6. In many instances the bracken was well preserved and formed

distinctive laminated layers, suggesting that there was a continuous and rapid build-up of this material which helped to prevent both decomposition and domestic debris becoming trapped within the layers. The bracken floors at a wetland site would need to be replaced much more regularly as people and animals would cause continual damage because of trampling. It was observed that some bracken in certain deposits, particularly those from ST3, had evidence of sporangia whereas other layers did not. This attests to seasonality in that those fronds with sporangia were collected in the late summer which is supposed to be best time to gather this species as it causes minimal damage (Rymer 1976). As the BLoM populace clearly had continued access to this resource in the quantities needed throughout the year, this demonstrates they were successfully managing this resource throughout Episodes 1 and 2.

Bracken has multiple economic roles and has long been used for thatching, manure, bedding, insulation, packing material, medicine, astringent, fuel and as a dye (Freethy 1987: 86–87; Miller 1997: 222; Bevan-Jones 2009: 38–41, Campbell & Pelling undated,). Its biochemical properties render it inedible for herbivores and the natural insecticides and flavonoids it contains all have antibiotic properties which make it a natural barrier that helps to repel insects and rodents (Dimbleby 1978: 29; Ottoson & Anderson 1983: 306; Feethy 1987: 87; Donnelly et al 2002: 255;). Bracken is also an excellent waterproofing layer which probably explains its dominance at BLoM. It was used to create waterproof foundation surfaces prior to construction, while the internal floors would also have been both waterproofed and insulated, as well as discouraging pest invasions. Unsurprisingly, bracken was a popular building material on other wetland sites, ie Cults Loch (Robertson 2018a: 85).

Due to its biochemical properties, it has been argued that ancient populations did not include bracken within their diets as it was regarded as unsuitable for consumption (Bevan-Jones 2009: 41). There is, however, evidence from the medieval period onwards that the fronds were eaten by both peasants and pigs (Freethy 1987: 86–87). The young shoots are described as edible and nutritious oatcakes were made from the rhizomes (Miller 1997: 215; Dimbleby 1978: 28). There is no surviving evidence that bracken was consumed at BLoM. Given the community's access to other foodstuffs in the form of crops, nuts, fruits, vegetables and animal produce there would probably have been little need for them to include bracken within their diet unless they wanted additional variety.

#### 11.5.5.2 Wood

Woody debris was also used to refurbish the floors. It consisted of a mix of roundwood, fragments and chips, some of which were worked offcuts and was a frequent

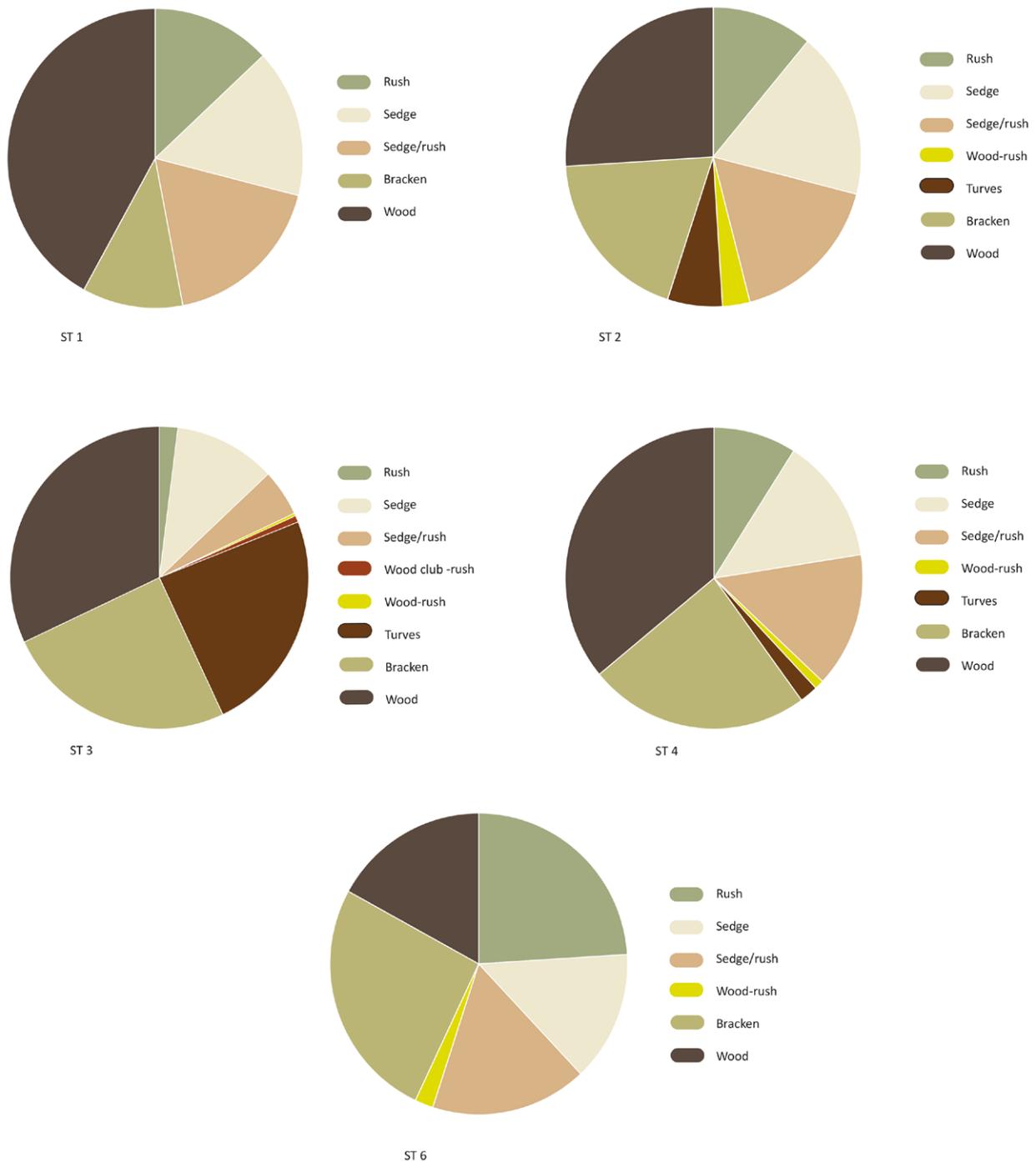


Figure 11.8. Waterlogged flooring materials from all structures (all expressed as proportions).

inclusion in ST1, ST2, ST3, ST4 and ST6. This material came from woodworking debris and woodland waste that was gathered up and deliberately intermixed within the other flooring resources. Buds and leaves were also present, but these were probably added to the floors as a by-product rather than as deliberate inclusions.

### 11.5.5.3 Sedges and rushes

These species have historically been used for flooring and thatching (Smith 1999: 331; Johnston & Reilly 2007) and they were used extensively at BLoM. Their use in this capacity has also been recorded at both Cults Loch (Robertson 2018a) and Oakbank crannog (Miller 2002). As both species favour open water and damp marshy environments, they would

have been readily available around the edges of the island and the loch (Stace 2010).

White sedge, glaucous sedge and hairy sedge were all used to create floor layers within ST1, ST2, ST3, ST4 and ST6. The sedge was used extensively during Episode 1 but less frequently in Episode 2, possibly because it became harder to source if it was overused in the earlier period. Lesser-pond sedge was only found associated with the Episode 1 palisade [1028] while grey sedge and common sedge were only found in the Episode 3 deposit [611] located outside Palisade [609]. None of these three species appears to have been collected for flooring material so their presence in these deposits is likely to be accidental, possibly because they grew in very limited locations, whereas the white sedge, glaucous sedge and hairy sedge were much more plentiful and closer to hand.

The rush species were a mix of jointed rush, toad rush and hard/ soft/ compact rush, all of which would have grown alongside the sedge and these two species were routinely intermixed within the floors. Rush was present in Episode 1 ST1 and ST2 with less frequent inclusions in Episode 2 ST3, ST4 and ST6. This was particularly obvious in ST3 where both sedge and rush had a much-reduced role in the construction of the floors which were mainly built using large quantities of bracken and wood. The discrepancy in the use of rush and sedge between Episodes 1 and 2 could be because of overexploitation during Episode 1 but the preference for bracken, wood and turf during Episode 2 may also reflect differences in how these later structures were used and/ or designed, which necessitated a greater need for the waterproofing and biochemical properties of these plants.

#### 11.5.5.4 Turves

Turf was used in both Episodes 1 and 2 as flooring and insulation. Traces of turf in the form of waterlogged peat and heather were noted in ST2 and ST4, but this material type was mainly concentrated within ST3 and in the ditch midden. There was no evidence that old turf floors were routinely destroyed by burning within the structures as observed at Cults Loch (Robertson 2018a: 86). Instead, during Episode 1 old turf floors appear to have been removed and subsequently disposed of within the ditch midden where they were allowed to decompose. Heather can be used in rope making and dyeing (Miller 1997: 222) but there is no surviving evidence to suggest this occurred at BLoM.

#### 11.5.6 Fuel types

Wood was the main source of fuel (Chapter 14.2.4), but peat and dung were also used, while chaff and hazelnut shells were recycled for kindling. Fragments of charred peat were present in all the excavated roundhouses, in the ditch midden, the palisade [1028], the two trackways

in Episodes 1 and 2 and rampart [767] in Episode 3. There were traces of burnt dung in ST1 hearth 2 deposits [019] and [025]. There are charred fruit remains in ST2, ST3 and ST6 which could be inclusions within dung burnt as a fuel. The evidence suggests dung had a very marginal role as a fuel resource at BLoM. Dung from both livestock and the human occupants would have been regularly available but it may be this material was primarily reserved to fertilise the arable fields especially as wood and peat were so easily sourced.

There were occasional accidental burning events within ST2, ST3, ST4 and ST6 in which the flooring adjacent to the hearths were burnt. The most obvious examples of accidental burning are deposits [249] in ST2/Phase 1; [1162], [1739] and [15020] in ST3/Phase 5; [1018] and [1023] in ST4 and [657] in ST6. There is also evidence of burnt floors in exterior deposits [1137] and [1139] associated with ST3 but again these were caused by accidental burning events, possibly caused by the dumping of hearth debris rather than from the deliberate burning of old floor layers. There is no surviving evidence to suggest that old floor surfaces were routinely burnt within the hearths either as a method of disposal or as a recycled fuel resource. Instead, old floors were more likely disposed of outside as evidenced by the presence of decomposed flooring and turves in the ditch midden during Episode 1.

#### 11.5.7 Economically useful plants

Distinguishing between plants collected for food and those for other purposes is somewhat complicated as many of the same species may have multiple uses (Bishop et al 2013: 34). This was particularly true at BLoM as many of the fruits, vegetables and weeds which were not only edible were also traditionally used to cure a multitude of health ailments. However, there were two species that could be confidently identified as having been deliberately collected for something other than as a food, building and fuel resource.

##### 11.5.7.1 Puffballs

The assemblage consisted of 26 intact puffballs and seven fragments (Table 11.1), the bulk of which (31) came from Episode 2. Episode 1 produced only two examples, one from the ditch midden deposit [800] and one from trackway context [18003]. Apart from two puffballs from deposit [1023] in ST4 all the other Episode 2 examples came from ST3 where they were found in floor deposits in the SW quadrant ([1154], [1162] and [1153]) and the SE quadrant ([1722] and [1728]). Four puffballs in ST3 were identified to species; three were brown puffballs and one was a deceiving bovist (Figure 11.9). The brown puffball has several valuable properties and would have been collected deliberately. The deceiving bovist is much smaller and it has no real important economic uses so its presence at BLoM is probably accidental.

Episode	Phase	Structure	Context	Species	Name	Number	L (mm)	B (mm)
1		Midden	800			1	N/A	N/A
1		Trackway	18003			1	73.2	N/A
2	4	ST3	1154			1	68.1	51.3
2	5	ST3	1162			1	33	27.1
2	5	ST3	1162			1	49.9	N/A
2	5	ST3	1162			1	65.1	42.8
2	5	ST3	1162			1	N/A	N/A
2	2	ST3	1153	<i>Bovista aestivalis</i>	Deceiving bovist	1	31	24.5
2	2	ST3	1153			1	53.1	42.2
2	2	ST3	1153			1	N/A	N/A
2	2	ST3	1153			1	37.8	24.9
2	2	ST3	1153			1	55.9	N/A
2	4/5	ST3	1728	<i>Bovista nigrescens</i>	Brown puffball	1	52.1	N/A
2	4/5	ST3	1728	<i>Bovista nigrescens</i>	Brown puffball	1	37.2	28.4
2	4/5	ST3	1728	<i>Bovista nigrescens</i>	Brown puffball	1	48.7	42.9
2	4/5	ST3	1728			1	N/A	N/A
2	4/5	ST3	1728			1	67.1	40.7
2	4/5	ST3	1728			1	46.2	33.5
2	4/5	ST3	1728			1	49.2	42.1
2	4/5	ST3	1728			1	34.1	32
2	4/5	ST3	1728			1	52.2	42
2	4/5	ST3	1728			1	61.1	52.2
2	4/5	ST3	1728			1	56.3	49.7
2	4/5	ST3	1728			1	62.2	41.9
2	4/5	ST3	1728			1	50.1	49.5
2	4/5	ST3	1728			1	47.2	42
2	4/5	ST3	1728			1	49.2	40.1
2	4/5	ST3	1728			1	43	41.1
2	4/5	ST3	1728			1	46.9	32.9
2	4/5	ST3	1728			1	41.1	30.9
2	6	ST3	1722			1	49.1	42
2		ST4	1023			2	N/A	N/A

Table 11.1. Summary of puffball finds by structure.

Puffballs are a fungi and would have been collected from late summer to autumn. These two species usually grow in more solitary locations or in small groups within woodland and grassy fields (Pegler et al 1995: 130 & 138). Therefore, it is highly unlikely the BLoM finds represent material gathered accidentally alongside wild food resources or building materials. Instead, these finds must have been deliberately sought out and brought back to the settlement for a specific reason. This is confirmed by their presence in both Episodes 1 and 2 and by its

continued recurrence within four phases of occupation in ST3 which clearly demonstrates that this resource was in constant demand. Puffballs have long been used for a variety of reasons including for food, fuel, fire starter, medicine, ink, raw material, smoking bees, rituals and as a hallucinogenic (Burk 1983: 55; Compton et al 1995: 154–157; Hatfield 2007: 276–278; Berihuete-Azorin et al 2018: 1).

The brown puffballs which survive at BLoM were not intended for human consumption. Brown puffballs are



Figure 11.9. Puffballs found in ST3. Left – brown puffball from [1728]. Right – deceiving bovist from [1153].

only edible when immature whereas those from BLoM were all found to be mature; and once mature may cause food poisoning if eaten. Immature and mature puffballs are easy to distinguish because the colour, texture and odour changes as the fungi develops (Watling & Seaward 1976: 170). Given the experience of the community in gathering wild resources it is assumed they would have been aware of this potential health hazard and that they had deliberately allowed the brown puffballs to mature. As these were retained and not disposed of as spoiled food alongside other domestic debris this strongly suggests they had another non-dietary role within the settlement. This is not to argue that puffballs did not form part of the diet, merely that evidence of this has not survived within the archaeobotanical record.

Analysis of the puffballs suggest they were deliberately air dried to preserve them long term. Many were found near the hearths where they may have been stored or hung up to dry, making them easily accessible when needed. Examination of the external surfaces did not reveal any evidence of burning or damage and, as most of them were still whole, this suggests they were never actually used for their intended purpose. The puffballs may have been intended for use as fireboxes as they are suitable mechanisms for transporting smouldering fires from one location to another (Milliken & Bridgewater 2004: 104). However, for the puffballs to be used as an efficient tinder box the fibres of the fungi are normally first prepared and there is no surviving evidence that the samples were in fact prepped for this activity (Berihuete-Azorin et al 2018: 12). This may not mean the puffballs were not intended for use as tinder boxes, merely that either they were still to be prepared, or the evidence has not survived.

They may also have formed part of a medical kit used to treat both the human and animal occupants. For thousands of years puffballs have treated a multitude of

ailments including stopping bleeding, cuts, nose bleeds, burns and scar tissue while also preventing tetanus and infection (Milliken & Bridgewater 2004: 220; Hatfield 2007: 277–278). The successful application of this medicine relied on either the spores being sprinkled into the wound, or the puffball flesh being chopped up into a poultice which was then applied to the affected area (Hatfield 2007: 277). The powder from the mature puffballs could be mixed with animal fat to form a salve which was especially good for treating wounds that did not quickly stop bleeding (Phyllis D Light, pers comm).

It is also possible they were collected for smoking bees, ritual purposes and for their supposed hallucinogenic properties. Practically, it is much more likely the puffballs were used as plasters and tinder boxes. Their use as a plaster would have been of particular value in ST3 which seems to have been used for many craft activities (Chapter 15.10.7.2) which could have easily led to cuts and burns.

Puffballs were found at Cults Loch where they were identified as a food resource (Robertson 2018a). However, the maturity of these samples was not recorded so this interpretation is now open to question. Brown puffballs have been noted at Skara Brae, Orkney, Vindolanda, Northumberland, Stanwick, North Yorkshire, Stole, Norfolk (Watling & Seaward 1976: 165), Lochlee, Ayrshire and the Roman fort at Bar Hill, Dunbartonshire (Dickson & Dickson 2000: 13 & 15) as well as at Oakbank Crannog (Robertson & Watling forthcoming). At Vindolanda mosaic puffballs (*Calvatia utriformis*) were also observed although brown puffballs were more numerous (Watling & Seaward 1976: 165). Both the Vindolanda and Skara Brae assemblages were mature, and it is highly unlikely they were collected accidentally or were blown in by the elements, instead they were gathered intentionally, and it is likely they had a similar role to those used at BLoM (Watling & Seaward 1976: 170–171; Dickson & Dickson 2000: 55 & 57).

#### 11.5.7.2 Willow leaves

A large deposit of willow leaves was recovered from within the wooden bowl SF219 and the sediments around it in the ditch midden (Figure 11.10). This is notable because willow was only ever a minor component of the structural wood and fuel assemblages on the settlement (Figure 14.1 & Chapter 17.2.3.4) and there was no evidence that a willow tree grew in the vicinity of the ditch midden whereby its leaves could have become accidentally trapped within the sediments. Instead, the leaves appear to have been deliberately collected.

The medical properties of willow bark and leaves for treating pains, aches, fevers, bleeding, gout and dysentery have long been recognised (Grieve 1998: 847; Dickson & Dickson 2000: 268; Milliken & Bridgewater 2004: 228;



Figure 11.10. Deposit of willow leaves found within the wood bowl SF219.

Hatfield 2007: 374–375). Drinking the juice of willow leaves or the burnt ashes was believed to be an effective treatment for delaying and treating fevers (Blunt & Raphael 1994: 163; Hatfield 2007: 374). Willow leaves have also been used externally for the treatment of pain in the form of poultices (Henriette Kress, pers comm). The leaves were also added to bedding as it was thought they could cool the body while easing pain such as fevers, damp joints and arthritis (Hatfield 2007: 374). The advantage of using leaves over bark is that they could be collected with little damage to the tree so this resource could be successfully managed long term especially if the willow trees were located some distance from the site. This may go some way to explaining why the leaves were observed in such large numbers, but no bark was noted. The large quantities of willow leaves suggest that the healing benefits of this species was understood at BLoM and this resource may have formed an important part of their Iron Age first aid kit.

#### 11.5.7.3 Other economically useful plants

Many of the weeds within the macroplant assemblage have been exploited throughout history for a variety of economic purposes. These include water-plantain (*Alisma plantago-aquatica* L.), nodding bur-marigold (*Bidens cernua* L.), meadowsweet (*Filipendula ulmaria* (L.) Maxim.), gypsywort (*Lycopus europaeus* L.), and bog bean (*Menyanthes trifoliata* L.), tormentil (*Potentilla erecta* (L.) Raeusch.) and selfheal (*Prunella vulgaris* L.). During the medieval period an orange dye was extracted from nodding bur-marigold and a black dye from gypsywort, and it is possible prehistoric societies were also aware of these properties and exploited them accordingly (Fraser

& Smith 2011: 79). Meadowsweet has long been collected for sweetening floors, as a drink flavouring and as a dye (Miller 1997: 216; Hatfield 2007: 231–232).

Until the advent of modern healthcare, the importance of domestic plant medicine in daily life cannot be overstated (Hatfield 1999: 149). Many of the weeds including water-plantain, meadowsweet, bog bean, knotgrass, selfheal, docks and tormentil have long been used to treat a range of health issues including teeth cleaning, colds, coughs, fevers, headaches, colic, jaundice, tumours, dermatitis and stings (Hatfield 1970, 2007; Miller 1997: 221; Dickson & Dickson 2000: 268). It is very plausible that many of the weeds at BLoM were employed in such a capacity to aid with the care of both the human and animal occupants. However, there is no definitive evidence at BLoM that any of these plants were deliberately collected. These weeds tend to favour the grassland and damp sediments found around the settlement, so it is just as probable they were simply weeds that grew within the confines of the site or were introduced accidentally as an inclusion of the crops and building materials. Unlike the puffballs and willow, all of these plants were scattered throughout the settlement with no clear evidence of selective or deliberate storage or disposal within any of the structures or deposits.

#### 11.5.8 The weeds

Both the waterlogged and carbonised weeds were concentrated within Episodes 1 and 2 with only trace amounts observed in Episode 3. These species were introduced to BLoM by a variety of recognisable taphonomic pathways. Waterlogged weeds were scattered throughout ST1, ST2, ST3, ST4 and ST6 all embedded within the floor

deposits. Some may have been deliberately introduced by the occupants but the majority were probably deposited accidentally, either as components of crops, building materials, tracked in by both humans and animals or blown in by the elements. The waterlogged finds from the ditch midden, trackways, palisades and ramparts are in all probability from plants that grew in these locations and became accidentally trapped as construction took place around them. The carbonised weed assemblage was much smaller in both number and variety but was present in all six structures. These were found primarily within the floor deposits surrounding the hearths and were typically inclusions of the burnt flooring material. The burnt finds in the external deposits were components of domestic debris accidentally trampled and reworked into the surfaces as people moved across the site.

The BLoM weeds grow in a range of habitats such as arable fields used for crops and livestock, waste ground, meadows, moorland, grassland, damp ground, boggy habitats and aquatic landscapes. The waterlogged weed assemblage was diverse, with most of the species continuously present throughout the occupation of the settlement, suggesting there was little change in the immediate landscape during that time. What would have affected the ecological development of BLoM is the direct impact of the human and animal occupants who would have contributed to changes in soil pH through the disposal of ditch midden waste including faecal matter. Certainly, the habitats dominant within the settlement were a mix of arable and waste ground weeds such as fat-hen and common chickweed typically found alongside nettles that favoured more nitrogen rich soils in waste ground. Another noticeable category of plants were species that typically grow in peatier, damp environments. The construction of BLoM created a much larger suite of weed species that would otherwise have existed in this location given the original wetland nature of this site.

#### 11.5.8.1 Arable fields, waste ground, meadows, moorland and grassland

The weed assemblage contained large numbers of plants that typically grow in arable fields alongside crops, waste ground, moorland and grassland. Both wheat and barley crops were harvested low to the ground, thereby increasing the opportunity for agricultural weeds to become intermixed within the cereals. Small quantities of these crops were then processed within the structures around the hearths, and it is probable arable weeds were separated from the grain during this process and became embedded within the floor during this activity. It is also probable livestock were left to graze on nearby grassland and later fed fodder during winter periods. This could lead to plants such as grass and buttercups becoming deposited within the settlement if animals were brought in to be

stabled for periods. Many of the most common agricultural weeds at BLoM included fat-hen, common chickweed and corn spurrey that all tend to favour sandier soils, and this suggests that the fields under cultivation were for periods of time composed of a sandy type of sediment. It is likely the fields were fertilised using dung, making them nitrogen-rich for periods of time which would create the opportunity for a larger variety of weed species to colonise this landscape. This would also allow species such as dockens to invade arable fields as they have long very tough tap roots which are not easily disturbed by ards during ploughing, thereby creating an opportunity for other weed seeds to become accidentally harvested alongside the crops during harvesting (Hatfield 2007: 101; Bond, pers comm).

Other species such as common nettle usually favour more disturbed nitrogen rich soils. These plants would be able to quickly colonise any disturbed sediments in the settlement including those contaminated with faecal matter, which would encourage their growth. Weeds including bromes (*Bromus* L.), heath-grass (*Danthonia decumbens* (L.) DC.) and buttercup probably grew in the damp confines of the site, but these plants are also found in meadowlands and grassland which may have been used for animal grazing. This wide range of weed species suggests a range of landscapes surrounded BLoM and that many of these plants were able to directly colonise the settlement alongside the populace during all episodes of settlement.

#### 11.5.8.2 Peat

The landscape BLoM was built on was naturally peaty and many of the species typically found include heather, crowberry, tormentil and moss. However, there is evidence that additional turves were imported to the settlement, and it is just as likely these plants were inclusions of the peat turves used for building and fuel. The crowberry may also have been deliberately collected for use as food (see above).

#### 11.5.8.3 Damp, boggy and aquatic habitats

Those species which tend to favour damper environments included water-plantain, nodding bur-marigold, meadowsweet, gypsywort, blinks (*Montia fontana* L.), yellow water-lily, water-pepper (*Persicaria hydropiper* (L.) Delarbre), pale persicaria, broad-leaved pondweed (*Potamogeton natans* L.), cinquefoils (*Potentilla* L.), sealfheal, bog bean and violets (*Viola* L.). Unlike many of the arable, waste ground and heathland weeds that were introduced to the site either intentionally or accidentally through the behaviour of the occupants, many of the wetland species were already growing in the immediate landscape. Given the peaty landscape BLoM was built on, it is not surprising these species were all present as many of them would have grown in this location prior to the initial construction and would have continued to inhabit this site alongside the occupants. The presence of both gypsywort

and yellow water-lily indicates that areas of slow moving and standing water were present. This suggests that not only was the settlement built on a damp habitat but that specific areas were more prone to being boggy, stagnant and flooded.

These species tended to be localised within very specific areas within the site and were more frequently encountered within the external deposits such as the ditch midden, palisade [1022] and the trackways in Episode 1 and 2. These plants grew in the damp environments surrounding the ditch midden and the trackways and were naturally incorporated within these features as the site expanded. Trace amounts of these weeds were noted in ST1, ST2, ST3, ST4 and ST6 and in most instances were introduced accidentally by people or animals tracking across the settlement. However, in ST2 bog bean was localised around the outer wall deposit [322] and entrance [304] and it could be these parts of this roundhouse were particularly damp which allowed these species to colonise those areas within the roundhouse. Several deposits exterior to ST3 including [1139], [1145], [1715] and [15014] were also found to contain plants that favour damp, boggy habitats. This demonstrates that ST3 was built on a particularly boggy part of the settlement which may explain why so much bracken was used to continually refurbish the floors within this structure.

### 11.5.9 Moss

Fragments of moss, identified as *Sphagnum*, were noted in varying quantities in most of the waterlogged deposits and a smaller number of carbonised fragments were found in ST1. Some of the moss may have already been present prior to initial construction, with the rest introduced accidentally as a component of the turves used for building and fuel. Some moss species including *Sphagnum* do have some economic uses such as insulating material, toilet paper, nappies, packing, bedding, rope or for treating wounds. However, there is no surviving evidence in the form of concentrated deposits to suggest that any species of moss was collected deliberately for any of these purposes.

### 11.6 Conclusion

Both the waterlogged and carbonised macroplant assemblages from BLoM have provided an excellent opportunity to study the economic role of a large variety of plant resources for the short period during which the settlement was occupied. The research questions focused on identifying the role of both cultivated and wild plants, crop husbandry practices, diet, construction, status and how the relationship between this community and their exploitation of plant resources developed over time. The macroplant evidence demonstrates that BLoM was a small self-sustaining farming community that was able to successfully exploit a wide range of both cultivated and

wild resources to maintain their way of life for as long as they occupied the settlement.

Analyses of the cereal remains revealed that agrarian farming had a major role in both main episodes of occupation. Throughout the occupation of BLoM, the populace practised a small-scale subsistence economy where grain was processed on an *ad hoc* basis as and when needed. Emmer wheat was the dominant crop in both Episodes 1 and 2 with six-row hulled barley, two-row hulled barley, bread/ club wheat and spelt having a much more secondary role. The actual importance of naked barley and oat is unclear but if they did play a part in the diet, it was negligible. By cultivating a wider variety of crops the BLoM community were perhaps practising a deliberate risk management strategy. This would minimise the dangers of hunger or famine in the events of poor weather or crop disease. As the BLoM community seem to have been able to access a range of cereal species this would mean that if one crop failed for any reason they would still have some access to a reserve.

The wheat species were likely reserved for human consumption whereas some of the barley may have been used for animal fodder. The presence of both cereal caryopses and chaff within the structures and their proximity to the hearths indicate that BLoM was both a small-scale producer and consumer site. Analysis of the episodes reveals that the agrarian economy at BLoM remained stable and unchanged throughout its occupation.

Wild food resources were dominated by hazelnuts throughout the occupation of BLoM but there was also evidence that fruits and perhaps vegetables were also incorporated within the daily diet of the populace. Hazelnuts had an important dietary role, particularly in Episode 2 where they were processed in large quantities directly on site. The caches of puffballs and willow leaves demonstrate that the BLoM community knew how to exploit every aspect of the wild resources available to them.

A diverse range of plant species were used as construction materials, but a mix of bracken, wood, sedge, rush and turves were the preferred plants for the active floor surfaces. The evidence indicates that the occupants tailored the construction of their floor surfaces to whatever material was either easily available or preferred for specific activities. There is a demonstrable change in the use of sedge and rush in Episode 2 where it becomes more of a minor component with a greater reliance on bracken and wood. Analysis of the floors showed that these surfaces were kept comparatively clean with little evidence that large accumulations of domestic refuse were allowed to build up (Chapter 9.6.4). Instead, the floors were regularly refurbished as and when required.

The settlement was constructed on a damp peaty island in a landscape surrounded by a mosaic of habitats including arable fields under cultivation, peat bogs,

woodland, meadows and grassland that were probably used for grazing livestock. The weeds from this wide range of landscapes were introduced to the site via a variety of taphonomic pathways. A number of these weeds could have had some economic importance as food sources, building materials or medicines and may have been deliberately collected whilst others were accidentally introduced on to the settlement. The weed assemblage did not vary between Episodes 1 and 2 and this signifies that there was no real environmental change to the surrounding habits during the short period in which the settlement was occupied.

The BLoM macroplant assemblage is representative of a domestic settlement that enjoyed access to a wide range of both cultivated and wild plant resources from varying landscapes. Apart from changes in plants selected for floor construction there appears to have been little alteration in how resources were used. This demonstrates that the relationship between the inhabitants and their plant resources in terms of agricultural husbandry, diet, status and the development of the surrounding habitat was relatively stable and experienced little noticeable change throughout the occupation of BLoM.



# Faunal remains and shellfish

Jackaline Robertson

## 12.1 Faunal remains

### 12.1.1 Introduction

A total of 10,925 animal bone fragments along with a single piece of fish (6.5 kg) were analysed from all phases of occupation on the settlement. The assemblage accumulated through two identifiable activities, from the disposal of butchery waste and domestic cooking debris. The faunal remains were composed largely of very poorly preserved and heavily fragmented small burnt fragments (Table 12.1) with only a few notable exceptions which were concentrated within the ditch midden, but these still provided an opportunity to understand the role of domestic animal species throughout the occupation of the settlement. The main aim of this study was to analyse the animal husbandry strategies practised at BLoM and how this compared to other Iron Age sites in Scotland and Northern England.

### 12.1.2 Methodology

The animal and fish bone were collected both by hand and from the bulk samples. The bone assemblage was washed then air dried prior to analysis. The uncharred fragments recovered from the waterlogged midden were slowly dried in the coldstore to minimise damage to the external surface of the bone. The assemblage was identified to element and species with the aid of skeletal atlases and the reference collection stored at AOC Archaeology Group, Edinburgh (Schmid 1972; Hillson 1986, 1992). Some bone fragments extracted from the processed bulk samples were smaller than 10 mm and these were semi quantified rather than fully counted.

Where an element could not be identified conclusively to species it was described as large mammal (L/M – horse/ cattle/ deer), medium mammal (M/M – sheep/ goat/ pig), small mammal (S/M – dog/ cat/ rodent) or indeterminate (I/M). No attempt was made to identify the ribs and vertebrae to species; instead these were described as L/M, M/M or S/M where appropriate. Separating sheep and goat bones followed Boessneck (1969) and Payne (1985). When analysing the assemblage the following criteria were recorded: phase, context, feature, element, species, side, fusion, age, fragmentation, size and evidence of staining on the bone surface. These results are reported in full in a catalogue stored in the site archive.

Epiphyseal fusion, tooth eruption and wear were assessed to establish the age of the individual. The proximal, distal and shaft areas of each fragment was recorded to determine the level of fragmentation within the assemblage (Dobney et al 1988). Assessing the level of staining used the following method: no staining was rated '0'; some staining

Episode	Structure	Unburnt no.	Burnt no.	Unburnt %	Burnt %
1	ST1	8	1818	1	99
1	ST2	90	1880	5	95
1	ST5		40		100
1	Midden	74		100	
1	Palisade 1		1		100
1	Trackway	2	11	15	85
2	Post-ST2	17	826	2	98
2	ST3	372	4564	8	92
2	ST4	25	175	13	87
2	ST6		221		100
2	Late ST6		25		100
2	Post ST6	3	156	2	98
2	Bank 1	45	168	26	74
2	Palisade 2		1		100
3	Entrance area	2	8	20	80
3	Palisade 3	1		100	
3.1	Deposit [741]	15		100	
3.1	Trackway		2		100
3.2	Rampart 2	11	343	3	97
	Unstratified	3	19	14	86
<b>Total</b>		<b>669</b>	<b>10257</b>	<b>6</b>	<b>94</b>

Table 12.1. Burnt and unburnt bone, by proportion and total number of fragments.

affecting less than 25% of the bone surface was designated as '1'; 25–50% surface staining was '2'; while 50–75% was described as '3' and greater than 75% was rated as '4'. A four-point system was used to assess preservation with excellent, good, adequate and poor recorded where appropriate.

The assemblage was inspected for butchery marks, pathologies, bone working, burning and carnivore gnawing. Only intact bones were measured (Von Den Driesch 1976). Only one artefact of bone was found (Chapter 15.3).

The assemblage was quantified using both number of identifiable specimens (NISP) (Figure 12.1) and minimum number of individuals (MNI) (Figure 12.2). It is appreciated that both methods have recognised drawbacks as there is no standardised methodology for calculating these figures and the results can vary accordingly within the same assemblage (Grayson 1984; Lambacher et al 2016). By using both methods in conjunction it should allow for a more accurate interpretation of the assemblage and how the domestic species were exploited.

The NISP was calculated for all episodes of occupation and includes the counts for the large (L/M), medium (M/M), small (S/M) and indeterminate (I/M) mammals. The NISP was recorded by structure to also help identify any surviving patterns in spatial deposition. Understanding the MNI proved more problematic given the overall preservation of the bone which was mostly poor and tended to favour

the recovery of teeth. The archaeological stratigraphy of the site is relatively secure, but the accumulation of animal remains was a relatively rapid process. When formulating the MNI the assemblage was analysed by episode in an effort not to overestimate the species population. The minimum number of elements (MNE) was recorded for the three main domesticates and it is from these figures that the MNI was calculated.

### 12.1.3 Overview

A total of 10,926 bone fragments (6.5 kg) were analysed from 192 contexts. The bone was collected from all periods of activity within the settlement and was present in all six structures, the midden, the surrounding trackways, palisades and ramparts. The assemblage accumulated through the disposal of domestic cooking waste in the hearths and surrounding floor deposits within the structures alongside some butchery debris that was mostly concentrated within the midden and ST3.

The domestic animals were cattle (*Bos taurus*), sheep/goat (*Ovis aries/Capra*) and pig (*Sus domesticus*). The only other identifiable species were rodent and fish. Understanding the taphonomy of the rodents was somewhat complex. These individuals are potentially intrusive as they tend to burrow into disturbed sediments. However, there was no evidence to suggest this settlement had suffered

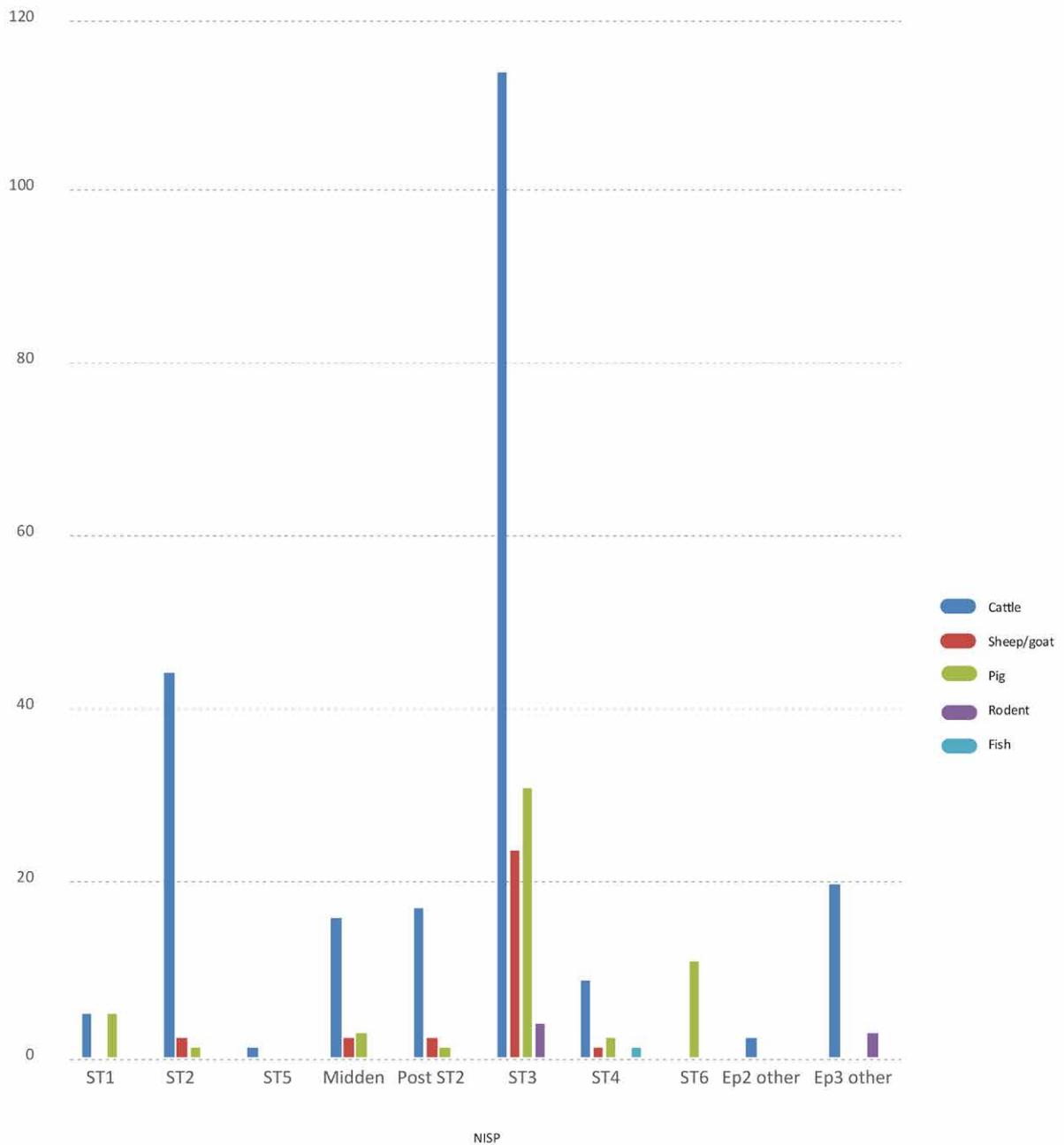


Figure 12.1. Number of identified specimens (NISP) by structure.

later disruption and one rodent bone was burnt, indicating they were contemporary with the occupation of the site. It was not possible to identify any of the rodents to species due to the absence of any skulls and mandibles. There was also a single fish bone which could not be identified.

The faunal assemblage accumulated through a variety of pathways, primarily through the accidental deposition of burnt bone in and around the hearths along with the deliberate disposal of some butchery waste. While the assemblage was composed largely of burnt fragments it

was still possible to identify the presence of all three main domesticates and draw from the available evidence some understanding of the role of animals at BLoM throughout its occupation. It was evident that cattle, sheep/ goat and pig all had a continued dietary role at BLoM from its initial occupation until the site was eventually abandoned.

The results are presented by context in Chapters 3–6; summaries of each structure or feature are presented below. Only those contexts with significant assemblages in terms of size and identifiable fragments are described

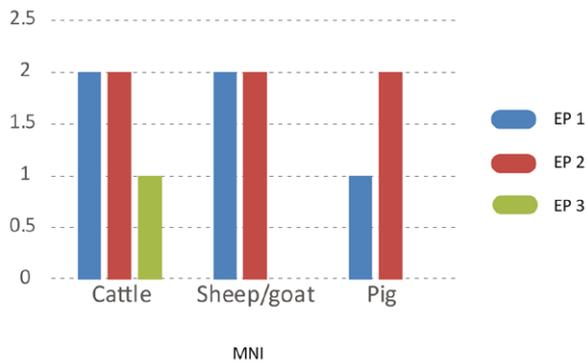


Figure 12.2. Minimum number of individuals (MNI) by episode.

in detail; the full assemblage is available in the site archive. In this section an overview of the assemblage is presented and discussed.

### 12.1.4 The assemblage

#### 12.1.4.1 Episode 1

##### ST1

The 1,826 bone fragments (246.4 g) were recovered from 21 contexts associated with ST1. The only species identified within ST1 was a pig which may be the remnants of a roasted piglet. Five fragments of a cattle molar were extracted from a test pit. Of the bone, 99.0% was charred. This assemblage accumulated through domestic activities such as cooking and subsequent hearth-cleaning.

##### ST2

A total of 1,970 fragments (552.8 g) were recovered from 29 deposits. The species were cattle (44), sheep/ goat (2), pig (1), L/M (45), M/M (111) and I/M (1767). Of these fragments 95% had been burnt. Butchery marks were noted on one L/M long bone which was chopped and one M/M rib which had a cut mark. The bone inside ST2 represented domestic food debris which was either waste associated with the hearths or was overspill from these same features and had been trampled into the surrounding floors.

##### Ditch midden

The 74 fragments (2.3 kg) were dispersed among two deposits. The species were cattle (16), sheep/ goat (2), pig (3), L/M (50) and M/M (3). The skeletal elements were a mix of horn, skulls, maxilla, mandibles, loose teeth, vertebrae, ribs, scapula, long bones, patella and metapodials. The accumulation of the bone in the midden is from the disposal of butchery waste as opposed to cooking refuse. This feature has presented an excellent

opportunity to explore the role of animals at this site in terms of diet, butchery, social activities, status and disposal of waste at BLoM.

This mix of skull fragments, maxillae and mandibles, vertebrae, ribs and metapodials is indicative of primary butchery waste deliberately disposed of within the midden alongside some higher quality cuts of meat from the scapula and long bones (Figure 12.3). Evidence of butchery was observed on two L/M vertebrae and a L/M long bone shaft. There was a shallow cut mark along the spine of a thoracic vertebra and the body of a lumbar vertebra chopped or sawn in two. The long bone shaft appeared to have been deliberately cracked perhaps to extract marrow. The absence of any burnt bone demonstrates that cooking waste was not disposed of within this feature. It is possible that this butchery waste accumulated from a special social event such as a feast and was deliberately deposited within this midden to display status.

#### 12.1.4.2 Episode 2

##### ST3

A total of 4,936 fragments (2.7 kg) were recovered from 61 contexts within ST3 and from two deposits located outside the building. Of these 92% had been burnt. The species were cattle (113), sheep/ goat (24), pig (31), rodent (4), L/M (134), M/M (723), S/M (6) and I/M (3901). Of note was the presence of skull fragments, ribs, vertebra and foot bones intermixed with other food and domestic refuse among the hearth debris, most of which were burnt. These skeletal components contain little meat and are usually disposed of as butchery waste. The mix of both low and high value cuts of meat suggests the bone accumulated through a variety of activities such as butchery and cooking.

There was evidence for the presence of butchery waste as demonstrated by cut marks on L/M vertebra and two M/M vertebrae indicating that cuts of meat were perhaps prepared in this location. Additionally, cooking activities that involved the roasting of at least one pig alongside the build-up of residual burnt food refuse left *in situ* within the hearths may explain why such a wide range of skeletal elements were present within these deposits.

##### ST4

A total of 200 fragments (47 g) were recovered from 14 contexts associated with ST4, of which 87% had been burnt. All the contexts produced only trace amounts of bone, suggesting that the hearths and surrounding floors in this structure were regularly cleaned and domestic debris was not allowed to build up. The species were cattle (9), sheep/ goat (1), pig (2), L/M (3), M/M (6) and I/M



Figure 12.3. Bone from the Episode 1 midden. A) Cow skull (1 of 2). B) Cow skull (2 of 2). C) cow mandible. D) Butchered large mammal vertebrae; the chopmark is visible through the vertebral body.

(178). There was also one poorly preserved fragment of fish bone that could not be identified further. There was no evidence of any butchery or pathology marks. These fragments are all domestic food waste that were either overlooked when the hearth was cleaned or were spilled onto the floor and trampled into the surface.

#### ST6

A total of 221 burnt fragments (38.9 g) were collected from eight deposits in ST6. The species were pig (11), L/M (20), M/M (31) and I/M (159). All the contexts produced only trace amounts of bone, suggesting that the hearths and surrounding floors in this structure were regularly cleaned and domestic debris was not allowed to build up.

## 12.1.5 Discussion

### 12.1.5.1 Preservation and taphonomy

Preservation of the animal bone was variable due to the acidic soil conditions, the effects of anaerobic deposits and exposure to heat. The bone was mostly recorded as poor although a much smaller number were described as adequate to excellent. It was noted that the better-preserved fragments tended to be concentrated within the midden and had not been burnt prior to deposition. Teeth were among the better-preserved fragments for the main species present and were generally dispersed throughout the settlement. The cellular structure of teeth makes them better able to survive the acidic soil conditions present at BLoM.

At Buiston Crannog the waterlogged bone collected from the midden was noticeably better preserved when compared to other burnt fragments collected from elsewhere on the crannog (O'Sullivan 2000a: 155). The explanation for this was that the concentration of bone within the Buiston midden raised the soil pH creating an independent calcareous microenvironment beneficial for the recovery of animal bone that did not exist anywhere else on site (*ibid*). These same environmental conditions existed at BLoM which is why the midden bone was so well preserved compared to the fragments collected from the structures and other features.

Poor preservation affecting animal bone assemblages has been recorded at many prehistoric sites throughout the E and SW of Scotland. These include Cults Loch (Robertson 2018b: 151 & 177), Fishers Road (O'Sullivan 2000b: 52), Rispain Camp (Haggarty et al 1983: 43) and Moredun Hillfort (Robertson 2023a: 183) where the animal bone assemblages were dominated by poorly preserved burnt fragments. Similar difficulties in preservation have also been noted in northern England and most of those sites which have produced larger assemblages tend to be in the SE of the region (Stallibrass 1995: 131; Huntley 2002: 85). The low recovery of faunal remains from prehistoric sites in these regions is mostly attributable to the soil conditions.

A few notable exceptions to this pattern exist, ie Broxmouth hillfort (Barnetson 1982: 101; Cussans 2013: 433), Inveresk Gate Roman fort (O'Sullivan 2004: 58), both in East Lothian and Abernethy fort in Perth and Kinross (Robertson 2023b: 224). This was because of the unusual lowland limestone in the East Lothian region that helped preserve large faunal assemblages whereas the bone from Abernethy fort had benefitted from being preserved within an anaerobic context (Robertson 2023b: 224). The assemblages from all these sites are more like those found in Atlantic Scotland.

This discrepancy in recovery has created a bias in the interpretation of the role of animals in the Iron Age, as

much of the evidence has derived from the Highlands and Islands of Scotland. This is somewhat problematic as the geographical landscape and climate in the N differs from the SW. This difference would have shaped regional and cultural attitudes to animal husbandry practices and diet. While there may have been regional differences in animal husbandry techniques, the BLoM occupants were likely more similar in their dietary habits and treatment of livestock to their close neighbours in central and southern Scotland and northern England than it was with those communities in the Highlands and Islands.

### 12.1.5.2 Species present

The NISP for the domestic species was cattle (229) followed by pig (55) and sheep/ goat (31) (Figure 12.1). Analysis of the MNI identified the remains of five cattle, four sheep/ goat and three pigs (Figure 12.2). Cattle bones were recorded in ST2, ST3, ST4, ST5, the ditch midden and the Episode 3 Rampart 2. Sheep/ goat skeletal elements were noted in ST2, ST3, ST4 and the ditch midden. Pig was recorded in ST1, ST2, ST3, ST4 and the ditch midden. Sheep/ goat and pig were not recovered from Episode 3, but this is probably due partly to issues of preservation but also because none of the surviving Episode 3 deposits were domestic in nature. The identifiable cattle, sheep/ goat and pig skeletal remains were concentrated within the ditch midden and ST3. Rodent remains were present in ST1, ST3 and Rampart 2. A single fish bone was noted in ST4.

The three domesticated species at BLoM are all common finds from throughout Iron Age communities in both Scotland and Northern England. In most Iron Age settlements either cattle or sheep/ goat were usually the more valuable species within the economy with pig tending to have a more minor role. It is recognised that the available NISP and MNI figures for BLoM are very small (Tables are available in the site archive). Consequently, it is not possible to accurately identify which species if any was more important within the diet of the settlement and if this changed over time. The most that can be said is that all three species had a dietary role throughout the occupation of the settlement.

### 12.1.5.3 Body part representation

The cattle assemblage was composed of 229 fragments dominated by large numbers of loose teeth (197) followed by pieces of skull (3), horn (5), horn/ skull (1), mandibles (2), scapula (6), long bones (5), patella (1) and foot bones (9) (Table 12.2). The skeletal elements are clearly dominated by loose teeth, but the relatively low numbers of other identified fragments are probably due to taphonomic factors. There were several fragmented L/M long bone shafts which could not be conclusively identified to species but were probably cattle. Although small this assemblage is still representative of animals that were transported to

Episode	1	1	1	1	2	2	2	2	2	3	3.1	3.2			
Element	ST1	ST2	ST5	Midden	Post-ST2	ST3	ST4	Post-ST6	Bank	Entrance	741	Rampart 2	Unstrat	Total	
Horn						5									5
Horn/skull				1											1
Skull				3											3
Mandible				1		1									2
Loose teeth	5	56	1	2	5	96	9	3	2	2		14	2		197
Scapula				5		1									6
Radius p						1									1
Radius d						1									1
Ulna						1									1
Pelvis											1				1
Tibia d				1											1
Patella				1											1
Calcaneum						2									2
Metacarpal p				1		2									3
Metacarpal p/d				1											1
Phalanx 1						1									1
Phalanx 2						2									2
<b>Total</b>	<b>5</b>	<b>56</b>	<b>1</b>	<b>16</b>	<b>5</b>	<b>113</b>	<b>9</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>14</b>	<b>2</b>	<b>229</b>	

Table 12.2. Cattle: skeletal elements (p = proximal epiphysis, d = distal epiphysis, p/d = proximal and distal epiphysis).

the site on the hoof, slaughtered, butchered, consumed and disposed of within the settlement. The presence of burnt L/M skull fragments, vertebrae, ribs and foot bones all indicate that lower quality cuts of meat probably formed part of the diet during some periods of occupation alongside higher quality cuts that included meat removed from long bones.

The 31 sheep/ goat skeletal elements were mandibles (4), loose teeth (12), scapula (1), long bones (4), pelvises (2) and foot bones (8) (Table 12.3). The sheep/ goat body parts have derived from animals that were brought to BLoM on the hoof and were subsequently slaughtered, butchered and disposed of in this location. The presence of burnt M/M skull fragments, vertebrae, ribs and foot bones demonstrate that all parts of the carcass were consumed with little wasted.

The 55 pig bones consisted of maxilla (2), mandible (1), loose teeth (42), long bones (3) and foot bones (7) (Table 12.4). As with the other two domesticates it appears these animals were brought to the site, slaughtered and then eaten. There is evidence that on occasion pigs were roasted in ST1, ST3 and ST6. As with the other two domesticated species it appears both high and low value cuts of meat were consumed.

There was no surviving evidence within this fragmented assemblage to suggest meat from the three

Episode	1	1	2	2		
Element	ST2	Midden	ST3	ST4	Total	
Mandible		2	2			4
Loose teeth			12			12
Scapula			1			1
Humerus d	1		1			2
Ulna			2			2
Pelvis			1	1		2
Carpal/Tarsal	1					1
Metacarpal p/d			1			1
Phalanx 1	2		2			4
Phalanx 3			2			2
<b>Total</b>	<b>4</b>	<b>2</b>	<b>24</b>	<b>1</b>	<b>31</b>	

Table 12.3. Sheep/ goat: skeletal elements (p = proximal epiphysis, d = distal epiphysis, p/d = proximal and distal epiphysis).

main domesticates was imported from other locations. The range of skeletal elements indicates entire carcasses were butchered, consumed and disposed of within the settlement. If animals were butchered elsewhere, it is unlikely that primary butchery waste such as the skulls

Episode	1	1	1	2	2	2		
Element	ST1	ST2	Midden	ST3	ST4	ST6	Unstrat	Total
Mandible				1				1
Maxilla			1	1				2
Loose teeth	3	2		23	2	11	1	42
Humerus shaft			1					1
Ulna			1					1
Fibula				1				1
Astragalus				1				1
Metatarsal p				1				1
Metapodial	1							1
Phalanx 1				1				1
Phalanx 2	1			2				3
<b>Total</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>31</b>	<b>2</b>	<b>11</b>	<b>1</b>	<b>55</b>

Table 12.4. Pig: skeletal elements (p = proximal epiphysis, d = distal epiphysis, p/d = proximal and distal epiphysis).

and metapodials recovered from the ditch midden would have been transported to the settlement for disposal as it would have been easier to discard it at the butchery site. It is possible that cuts of quality meat that would have included long bones were exported from BLoM to other locations but, given the small size of the assemblage and poor level of preservation, this is more difficult to prove.

The recovery of butchery waste in the ditch midden indicates that in Episode 1 the inhabitants were not routinely choosing to eat some poorer cuts of meat which contained little in the way of flesh, such as the skulls and toes. It is possible that the ditch midden material is representative of a special event such as a feast and these fragments were left in this feature as a display of wealth and status. By Episode 2 those traditionally poorer cuts of meat were being recovered from hearths alongside other domestic food waste, suggesting perhaps that they had become a more regular part of the diet. However, given the small size and poor preservation of the animal bone assemblage, this interpretation of a change in the utilisation of animal carcasses is somewhat speculative. If this is an accurate pattern in how animals were consumed this could represent a change in the economic status of the site in Episode 2, something that is also hinted at in other strands of evidence from the site (Chapter 18.3.2.6).

It is of course also possible that butchery waste was deliberately destroyed in the hearths rather than being discarded in middens and was not actually consumed. Furthermore, it appears that entire pigs were roasted within ST1, ST3 and ST6 with the meat probably carved directly from the carcass. This could have easily resulted in both prime and lower cuts becoming intermixed within

the hearths as residual waste and is not reflective of actual eating patterns but is demonstrative of cooking techniques.

#### 12.1.5.4 Age at death

To determine the age of the main domesticates at time of death the following criteria were analysed: tooth eruption, tooth wear and epiphyseal fusion (Silver 1969; Payne 1973; Grant 1982; Payne 1987). Calculating accurate kill-off patterns was made more difficult given the small number of maxillae, mandibles, long bones and foot bones available for analysis for all three domesticated species. It is therefore recognised that the conclusions presented are somewhat arbitrary. Given the small number of suitable mandibles and epiphyseal fusion it was deemed unnecessary to produce either mandibular wear stage graphs or fusion stage tables.

Analysis of surviving tooth eruption and wear for two cattle maxillae and one mandible from the ditch midden gave an approximate age of death of between 24 to 30 months for two individuals. Study of the loose teeth which included incisors, premolars and molars revealed that most had little wear to the occlusal surface.

Ten cattle bones had evidence of epiphyseal fusion of which nine were fused and one remained unfused at time of death. The fused skeletal elements were composed of three scapula, one radius, one tibia, one metacarpal, one calcaneum and three phalanges. These bones typically fuse between the ages of seven months and 36 months. The unfused element was the distal epiphysis of a radius which normally fuses before the age of 48 months.

The available ageing data demonstrates that neonates, juveniles and older individuals were absent within the surviving cattle assemblage. This pattern suggests the

Episode	ST	Area	Context	Element	Species	Side	No	Measured (mm)
1	Midden	Midden	800	Metacarpal	Cattle	Left	1	GL 188, Bp 45.1, SD 24.9, CD 82, DD 19.1, Bd 47.2
2	ST3	Phase 2/5	15020	Phalanx 2	Cattle	N/A	1	GL 35.8, Bp 25.1, SD 19.8, Bd 22.2
2	ST3	Phase 2/5	15026	Phalanx 2	Pig	N/A	1	GL 17.3, Bp14.9, SD 12, Bd 12.1
2	ST3	Phase 3	1153	Phalanx 2	Cattle	N/A	1	GL 44.1, Bp 26.5, SD 19.8, Bd 20.2
2	ST3	Phase 4	1743	Astragalus	Pig	Left	1	GLI 33.2, GLm 31.4, Bd 20.2
2	ST3	Phase 4	1746	Calcaneum	Cattle	Right	1	GL 112.9, GB 33.1
2	ST3	Phase 5	1740	Phalanx 1	Sheep/goat	N/A	1	GL 23.3, Bp 10.3, SD 8.2, Bp 8.8
2	ST3	Phase 5	1740	Phalanx 1	Sheep/goat	N/A	1	GL 25, Bp 11.1, SD 8.1, Bd 8.9

Table 12.5. Bone measurements for the main domesticates.

BLoM cattle were slaughtered when they reached skeletal maturity and were at their optimum meat-bearing size.

A total of three sheep/ goat mandibles were studied for evidence of tooth eruption and wear. Two mandibles were collected from the ditch midden and the other from a ST3 floor deposit [1728]. The two mandibles from the midden derived from two individuals and the youngest died between the age of three to five months whereas the eldest was older than 21 months. The animal from ST3 died between the age of 28–40 months.

Five sheep/ goat skeletal elements, one humerus, one pelvis and three phalanges, had evidence of epiphyseal fusion. Four of these skeletal elements were scattered among hearth deposits in ST3 except for one phalange located in probable hearth deposit [216]. The humerus and phalanges were all fused and belonged to animals older than 10 and 13 months respectively. The pelvis was unfused meaning this individual was younger than 10 months.

The kill off pattern for the sheep/ goat indicates that both juveniles and adults were present, but that neonates and more mature animals were seemingly absent. This suggests that sheep/ goat were culled as juveniles or once they had reached their prime.

One pig maxilla and one mandible came from ST3 but it is unclear if these belonged to one or two animals. Analysis of tooth eruption and wear revealed that the maxilla belonged to an animal older than eight months and the mandible to an animal which died between the ages of 21–24 months.

The other pig bones were a humerus from the ditch midden, a phalanx from ST1 and three phalanges from ST3. The humerus was unfused indicating this animal was younger than 12 months. The phalanx from ST1 was unfused so this animal had also died before the age of 12 months. Of the three phalanges from ST3 only one was fused which meant the animal was older than 12 months. The proximal end of the second phalange was unfused so again this animal was younger than 12 months. Analysis

of the final phalange indicated the proximal epiphyses was unfused whereas the distal end had just fused which normally occurs before birth meaning this belonged to a neonate that died shortly after birth. The pigs with only one exception all appear to have been culled before the age of 12 months.

#### 12.1.5.5 Sexing

Establishing the sex for cattle and sheep/ goat is normally determined by analysing specific skeletal elements such as horn cores, pelvis and metapodials (Boessneck 1969; West 1990; Greenfield 2006). The small size and poor preservation of the cattle horns and metapodials and the sheep/ goat pelvises means it was not possible to extract any reliable information to establish sex for either of these species. Sex determination in pigs is normally assessed by comparing male and female canines which have sexually dimorphic characteristics. Two of the pig canines recovered from ST3 appeared to be female.

#### 12.1.5.6 Measurement

Given the high degree of fragmentation within the assemblage only eight foot bones were suitable for measurement for the three main domesticates. The foot bones were composed of four cattle, two sheep/ goat and two pig (Table 12.5). From the limited information available it is difficult to draw any useful comparisons with any contemporary Iron Age sites. It was not possible to identify any noticeable changes in the size and stature of the three main domesticates over the period of occupation of the settlement.

#### 12.1.5.7 Animal husbandry and subsistence strategies

Understanding the economic role of the three domestic species is somewhat subjective given the small size of the identifiable animal bone assemblage. It must be recognised that the small sample size and poor preservation of most of the bone has created some bias within the final analysis.

The available evidence for the kill-off pattern from the surviving cattle and sheep/ goat indicates that both these species appear to have been culled as they reached skeletal maturity or just before. Certainly, there was no surviving evidence for neonates and older animals within this assemblage. The pigs, which have no secondary products, were generally slaughtered while still young. One pig was older than 12 months and this animal may have been kept for breeding or was deliberately fattened for a longer period before being slaughtered.

Both cattle and sheep/ goat had an important role at BLoM and this is true within most Iron Age societies throughout Scotland, ie at Clachtoll (Robertson 2022b: 266), Tofts Ness (Nicholson et al 2007: 189), Old Scatness (Cussans et al 2015: 227), Dun Vulcan (Mulville 1999: 236), Howe (Smith et al 1994: 139), Scalloway (O'Sullivan 1998: 109), Pool (Bond 2007b: 212), Broxmouth (Barnetson 1982: 102; Cussans 2013: 467), Rispaing Camp (Haggarty et al 1983: 43), Moredun (Robertson 2023a: 184), Abernethy (Robertson 2023b: 226), and in northern England at Grimthorpe, Stanwick and Thorpe Thewles (Stallibrass 1995: 124–125). The most obvious exception is Cnip where sheep were only marginally important, probably because of inadequate access to the required grazing to sustain a larger flock (McCormick 2006: 168). Analysis of the macroplant assemblage reveals that access to fodder and grazing areas was unlikely to have been a problem at BLoM so the occupants would have had the necessary resources to support both cattle and sheep/ goat (Chapter 11.5).

If grazing and fodder was not an issue at BLoM as the evidence indicates, it raises the interesting question of why neonates and older animals are missing from the surviving assemblage. If the bone assemblage is an accurate reflection of the animal husbandry practised at BLoM and has not been shaped by preservation conditions this perhaps indicates that the economy was more focused on meat production with exploitation of secondary products such as dairying and wool a more minor concern.

Nonetheless, it is also probable that the butchered animals were part of a larger herd and flock that were exploited for other resources including dairying, wool, traction and later their skins. The absence of neonates and older animals could be due to the small size and poor preservation of the assemblage but there are other explanations. It is possible there was a high fatality rate for young animals at this site if they were not needed for secondary products and breeding. Neonate fragments tend to be more fragile so would have decayed rapidly within the sediment types present at BLoM. Older animals no longer needed for dairying or breeding were perhaps sold or traded to other settlements thereby removing all evidence of their economic and dietary role within this society completely from the assemblage.

The small kill-off pattern available for study suggests these cattle and sheep/ goat were slaughtered for meat once they had reached their optimum size. However, it remains possible, given the poor preservation of most of the bone, that evidence of more fragile neonates and juvenile bones was largely destroyed, thereby creating a bias within the conclusions for the cattle and sheep/ goat. It is also possible that those animals transported on the hoof to BLoM were deliberately selected for their meat with the younger and older animals slaughtered and consumed at a separate location.

It has been suggested that early dairy cows could only lactate if their calves were kept alive or the stuffed skins of their young were present (Halstead 1998: 14; Bond 2002: 180; Balasse 2003: 8). A similar issue may have existed with Iron Age sheep in that lambs were required to ensure milk production before they could be culled (Cussans 2013: 466–467). This theory has been used to recognise dairy economies by identifying higher than expected rates of infant mortality within cattle and sheep assemblages. However, larger numbers of neonates and juveniles may not always represent a dairying economy. These individuals could just as easily have died from illness or were culled early if they were not needed for breeding or there was a need to preserve fodder (McCormick 2006: 167; Cussans 2013: 466). Therefore, the absence of young cattle and sheep/ goat at BLoM does not automatically exclude the possibility that dairying did not have a role alongside the production of meat. The cattle and sheep/ goat at BLoM probably had a more mixed role within the economy and provided a range of resources before and after death.

Unlike the other two domesticated species pigs usually have a more minor role within Iron Age societies as they have no secondary products to offer. This pattern of pig exploitation has been recorded at Clachtoll broch (Robertson 2022b: 262), Scatness (Cussans et al 2015: 227), Howe (Smith et al 1994: 139), Scalloway (O'Sullivan 1998: 109), Pool (Bond 2007b: 212) and Dun Vulcan (Mulville 1999: 272). Crosskirk was a notable exception as pigs were preferred to sheep (MaCartney et al 1984: 142). At Broxmouth the evidence suggested the pigs not only arrived on the hoof but that joints of pork were also imported (Cussans 2013: 465–466).

Large numbers of pig within a domesticated assemblage have been interpreted as evidence of possible high status (Bond 2002: 181). The presence of pigs indicates that some high value meat was consumed at BLoM especially as these animals are not as universally useful as the other two main domesticated species. The actual economic significance of pigs at BLoM is unclear as the NISP figures for this species is larger than those recorded for sheep/ goat, but this may be due to preservation rather than an accurate reflection of their importance within the economy and diet.

Normally pig bone tends to decay more rapidly than the other domesticated species as it is more porous. As the remnants of most of the BLoM pig fragments were burnt and left *in situ* within the hearths this may have contributed to their better survival and accidentally overinflated their importance within the assemblage. The remains of pigs were also dispersed among several structures, the ditch midden and ramparts indicating that the population had regular access to pork, fat, manure and bristles throughout the occupation of the settlement. Entire pigs were roasted within ST1, ST3 and ST6 and the presence of a neonate and at least one adult indicates that pigs were likely bred in the near vicinity.

The poor preservation of the animal bone assemblage has made it difficult to identify any changes in animal husbandry practices over time but cattle, sheep/ goat and pig all had a dietary role throughout the occupation of BLoM.

#### 12.1.5.8 Stabling

Given the wet conditions at BLoM it is unlikely that animals would have been housed long term within the settlement. Analysis of the sediment samples indicates that there was some evidence for stable waste, but not the extensive quantities that would occur if livestock were permanently housed within the settlement or structures (Chapter 9.6.6). Housing the domesticates long term in this environment would not only have created difficulties in maintaining the floor surfaces but could also have damaged the health of the animals. Being built on peat the surfaces, both internal and external, required constant refurbishment and this would have been made more difficult with the continual presence of large livestock trampling, defecating and urinating on the floor surfaces. Extensive evidence of trampling was not observed within the sediments nor was there macroplant evidence of animal feed trampled into the surfaces (Chapter 11.5). The wet floors would also have been detrimental to the feet of hooved livestock that are susceptible to foot rot if they are housed long term in damp conditions (Winter 2004: 53).

There is evidence that the landscape surrounding BLoM included arable fields, meadows and woodland. The cattle and sheep/ goat were probably left to graze in the nearby fields and only brought to the settlement on a temporary basis before being either slaughtered or returned to pasture or stables located on the dry land around the loch. The difficulty in stabling the cattle and sheep/ goat outwith the immediate security of the settlement would be ensuring their continued care and safety. These animals would require access to food, water and shelter, especially during winter, and they would need protection from potential threats such as from wild animals and theft from other settlements. To guarantee

the safety of animals left to graze or housed outwith the settlement it would require members of the community to expend time to care for them. The pigs were likely kept in sties on drier ground or left to forage in woodland (Smith 2000: 706).

#### 12.1.5.9 Spatial deposition and discard patterns

Analysis of the spatial distribution of the bone made it possible to identify patterns in how domestic food waste and butchery debris were disposed of at BLoM. The bone found in the houses mostly represents domestic cooking refuse, overspill from the hearths which has been trampled into the surrounding floor surfaces. In ST3 there was a mix of butchery waste and food debris.

The scatter of trace amounts of burnt bone across the entire settlement are like a background noise in the assemblage. The bone recovered from the rampart, palisade and trackways was redeposited domestic food refuse which was either accidentally trampled into these surfaces or was deliberately backfilled into these areas alongside other domestic refuse during construction phases. The bone from the ditch midden had not been burnt and contained primary butchery waste along with some high value cuts of meat. The material from the ditch midden provides the clearest evidence for the deliberate disposal of refuse.

The bone in the ditch midden could be more than butchery waste and is perhaps representative of specific activities typically associated with feasting, banquets, special gatherings and social hierarchy (Garcia & Pons 2012: 225; Cussans et al 2017: 53). The composition of the bone in the ditch midden is notably different from the rest of the BLoM assemblage which is typical of more everyday domestic activities such as food preparation, cooking and disposing of household refuse. This difference in interpretation could be a consequence of the preservation that favoured the recovery of skeletal elements in the ditch midden and this may have created a bias. However, the abundant accumulation of bone within the ditch midden could still be evidence of an extraordinary food product served at a large social gathering such as a feast or banquet (Garcia & Pons 2012: 230). Furthermore, the concentration of specific cattle, sheep/ goat and pig skeletal elements within a single feature is reminiscent of other Iron Age sites in particular Old Scatness (Cussans et al 2017: 53).

At Old Scatness it was noted that the bone deposited in the broch ditch during Phase 4 differed from the Phase 5 midden deposits with regards to species and body part representation (*ibid*: 53-57). This obvious difference in deposition led to the bone in the broch ditch being interpreted as evidence that a short-lived or one-off special event occurred during Phase 4 (*ibid*: 48).

Episode	Structure	Chop	Cut	Marrow	Total
1	ST2	1	1		2
1	Midden	1	1	1	3
2	ST3	3			4
Total		6	2	1	9

Table 12.6. Butchery evidence.

Furthermore, it appears the waste from this feast was deliberately disposed of in such a manner to be visible to visitors to publicly demonstrate the wealth and status of the settlement (*ibid*: 58-59).

The accumulation of skeletal elements in the BLoM ditch midden is similar to the finds reported in the broch ditch at Old Scatness. It is therefore possible that during Episode 1 the population of BLoM celebrated with a feasting event and the resulting refuse was deposited within the ditch midden. The midden would likely be visible to any visitors and this accumulation of bone would demonstrate that the BLoM community were able to access valuable resources to celebrate special events such as feasting. The presence of the skeletal elements would also highlight their status as it would demonstrate that the Episode 1 population did not have to be frugal and could publicly be seen to be wasteful rather than having to exploit every useful resource.

Feasting events were identified at Broxmouth but, unlike those at Old Scatness and BLoM, these appear to have been more regular occurrences with a focus on pig (Cussans et al 2017: 58). It is possible if feasting did occur more frequently at BLoM the evidence has simply not survived given the small size and poor preservation of the assemblage. However, as evidence of possible feasting was noted only in Episode 1 this more likely reflects a change in the economic and social status of BLoM throughout its occupation. It is possible that during the later episodes the population did not have access to the same resources they had in Episode 1 to use on special events nor could they afford to be extravagant.

#### 12.1.5.10 Butchery

Evidence of butchery was noted on six L/M and three M/M fragments (Table 12.6; Figure 12.3).

While the number of butchered bones was miniscule it was still possible to identify a range of primary, secondary and tertiary marks which belong to different stages at which the carcass is processed (Rixson 1989: 49). The butchery marks were attributable to a range of tools including knives, saws and choppers which are evidence of large blade butchery. Given the level of fragmentation within this assemblage it was impossible to identify any of the methods used to cull these animals.

The primary stage of butchery is the slaughter and dressing of the carcass which includes the removal of the head, feet and skin. While there were no surviving butchery marks on the cattle skull from the ditch midden its very presence along with phalanges is typical of the general waste produced at this initial stage of butchery. The head of this animal was probably removed by chopping through the neck area although there is no surviving evidence to definitively prove this.

The secondary stage of butchery normally involves splitting the carcass into manageable joints. Four L/M and two M/M vertebrae had been butchered. There were two distinctive marks; some vertebrae had been cut in two whereas most had the lateral edges sliced off. This method suggests that the carcasses were laid flat on a surface or on the ground while joints were detached rather than being suspended in the air. A rib had a small cut mark indicating it had been detached from the vertebral column.

The tertiary and final stage of butchery involves reducing the carcass into cuts of meat suitable for domestic consumption and this includes marrow cracking. This final stage of butchery was noted on two L/M long bone shafts which had been cracked to extract the marrow. Given the large number of fragmented long bones in this assemblage it is likely that most of these were also deliberately broken to extract marrow.

The practice of marrow cracking may suggest the population were calorie-poor and needed this dietary resource for the additional nutrients it provided or to add variety to the diet. It is also possible that if social stratification was practised within this community, certain societal groups may have been more dependent on this resource or had greater access to it but this is entirely speculative. As the assemblage is so small and poorly preserved it is impossible to state with any certainty how important marrow cracking was to this settlement and if this changed over time. While there is evidence that animals were slaughtered and butchered on site it cannot be ruled out that carcasses were butchered and jointed away from the settlement or that cuts of meat were transported to other locations, thereby removing evidence from the archaeozoological record. The butchery practices employed at BLoM are like those reported at other Iron Age sites at Clachtoll broch (Robertson 2022b), Scalloway (O'Sullivan 1998: 129), Howe (Smith 1994: 150) and Broxmouth (Barnetson 1982: 104; Cussans 2013: 449).

#### 12.1.5.11 Pathology

Only a single cattle skull from the ditch midden had evidence of a possible nutritional disease. The teeth in the cattle skull displayed some signs of dental hypoplasia that could be an indicator of environmental stress such

as malnutrition (Bartosiewicz 2013: 170). The absence of any other injuries or other signs of infection are more likely due to the small size and poor preservation of the assemblage rather than a true representation of the health and nutritional status of the three main domesticated species.

#### 12.1.5.12 The burnt bone

Some 94% of the assemblage was burnt and was present in all the sampled contexts except for the ditch midden deposits. The burnt bone had accumulated from domestic activities such as cooking and cleaning. The burnt fragments were generally smaller than 50 mm with most of them completely calcified, indicating they had been burnt at a high temperature or were repeatedly exposed to heat within the hearths and ovens. A much smaller number had only been partly charred or were exposed to a lower temperature for a shorter period.

This raises the question as to why so much bone was burnt in the hearths. There was evidence that pigs were roasted within ST1, ST3 and ST6 with some of the remains left to accumulate within the hearths. While roasting pigs and larger cuts of meat may account for some of the burnt bone within the hearth deposits there may be other explanations for its presence. It is possible that fragments such as mandibles and long bones were deliberately exposed to heat to make it easier to extract the marrow as this process loosens the marrow before cracking (Bond, pers comm). Bone could have represented an additional fuel source but this is unlikely at BLoM as most mammal bone does not burn well and there is clear evidence this community had easy access to both woodland and peat for fuel throughout its occupation. Therefore, the accumulation of burnt bone within the hearths and structures is likely due to how the occupants prepared and cooked their food.

#### 12.1.5.13 Scavengers

There was no evidence of any marks on the faunal assemblage attributable to scavengers, but rodents were present at BLoM and were active during its occupation. A small number of hazelnut shells had been damaged by rodents and it is likely they also gnawed any accessible bone, although this evidence has not survived within the archaeozoological record. The presence of rodent bones within ST1 and ST3 is an indicator that the inhabitants lived alongside vermin and that on occasion their remains were overlooked during general cleaning of surfaces.

#### 12.1.5.14 Wild species

A single fragment of fish was recovered from ST4. Fish would have been readily accessible from the nearby sea or rivers, so it is possible that poor preservation at the settlement has removed evidence of this resource from the archaeological record. It is also possible fish were

gutted at the catch area with only the prepared fillets being transported back to the site.

Deer were exploited at many Iron Age sites but there was no surviving evidence this animal had a dietary role at BLoM. It must be considered that the small size of the faunal assemblage means evidence for the exploitation of wild animals may not have survived at BLoM. It is also feasible the poor preservation of most of the bone means some of the long bones described as L/M could be deer. A comb of antler was found on the settlement, so it is possible that the occupants were exploiting deer through scavenging shed antler (Chapter 15.3).

It has been argued that access to deer was perhaps based on social status or on the cultural preferences of specific Iron Age settlements (Mulville 1999: 273). The absence of deer and many other wild species within the diet may therefore reflect the status of BLoM. Deer was exploited at a range of other sites throughout Scotland including Clachtoll (Robertson 2022b: 262), Crosskirk (McCartney 1984: 136), Howe (Smith et al 1994: 49), Pool (Bond 2007b: 211), Tofts Ness (Nicholson et al 2007:187–188) Dun Vulcan (Mulville 1999: 261), Sollas (Finlay 1991: 147), A'Cheardach Mhor (Clarke 1960: 170), Baleshare and Hornish Point (Halstead 2003: 143–144), Cnip (McCormick 2006: 169–171) and Old Scatness (Cussans & Bond 2015: 208). At all of these northerly settlements deer were hunted or antler was scavenged alongside other resources.

At Broxmouth (Cussans 2013: 439) and at Inveresk Gate (O'Sullivan 2004: 73) deer was exploited but was not a major contributor to the diet. It is possible that for Iron Age settlements in central and southern Scotland deer was perhaps not as easily accessible. It is also possible these communities chose not to actively hunt wild species to the same extent as their more northerly contemporaries. Deer may also not have been as extensively hunted because there may not have been the same pressures on access to grazing for both domestic and wild species. If this was true this would mean these communities could focus on other activities besides from hunting unless they wanted to add variety to their diet in the form of venison or collect antler for use as artefacts.

### 12.1.6 Conclusion

The animal bone assemblage from BLoM is relatively small especially when compared to other Iron Age sites in Scotland. The small size of the assemblage is due to preservation and possibly also a reflection of the relatively short occupation of the settlement. Nonetheless, the assemblage has contributed to our understanding of the economy of the settlement and the animal husbandry practised by the occupants.

The three main domesticates, cattle, sheep/ goat and pig all had a dietary role. All three species were brought on the hoof to be slaughtered, butchered, cooked, eaten

and disposed of on the settlement. There was insufficient evidence to determine whether the economy was based on dairying or meat production or was a combination of the two. While the small kill-off pattern available for study is more suggestive of a meat economy, it is probable these animals came from a larger herd that were exploited for a range of products before and after death.

Small quantities of food waste were overlooked in the hearths and later trampled into the surrounding floors with butchery debris discarded in the ditch midden and around some of the hearths in ST3. Given the relatively small concentrations of domestic waste recovered, it appears that these structures were kept relatively clean of general debris. The recovery of both high- and low-value meat joints within the structures suggests that most of the carcass was utilised for food. However, the presence of butchery waste in the ditch midden indicates that in Episode 1 waste cuts were not always consumed. The refuse in the ditch midden may represent feasting with the bone deliberately disposed of in this feature to advertise the community's social status to visitors to the settlement. The presence of cattle, sheep/ goat and pig demonstrates that the animal husbandry practised at BLoM remained relatively steady throughout the occupation of the settlement and, while the assemblage is small, it is still consistent with most other Iron Age sites throughout Scotland and northern England.

## 12.2 Shellfish

### 12.2.1 Introduction

A small assemblage of shellfish was retrieved from the Episode 1 midden deposit [800] and deposits in the Episode 2 structures, ST3 and ST6 (Figure 12.4). The main objective of this analysis was to study the economic role of marine shell within the settlement.

### 12.2.2 Methodology

The shell fragments were collected both by hand and during bulk sample processing. During excavation common limpet shells were noted in midden [800] and deposit [1165] in ST3 but, due to poor preservation, could not be extracted for analysis in laboratory conditions. Their presence is therefore recorded within the catalogue but no further useful information could be extrapolated such as fragment count or weight.

The shells were identified to species using reference material and guides stored at AOC Archaeology Group (Hayward et al 1996; Sterry et al 2012). Given the fragmented condition of the assemblage no attempt was made to calculate the minimum number of individuals (MNI) which is normally done by counting the shell apices for gastropods and valve umbos for bivalve species. Instead, all the fragments were counted and weighed. The fragments were scanned for evidence of artefactual working, but none was observed.

### 12.2.3 Results

The species present were the common periwinkle (*Littorina littorea*) and the common limpet (*Patella vulgata*). The assemblage was composed of 109 fragments (22.5 g) dominated by the common limpet (76%) followed by the common periwinkle (24%). Common limpet was found in the midden, ST3 and ST6 whereas common periwinkle was only present in two deposits within ST3. Some 94% of the assemblage was found in hearth deposits in ST3, with 59% of the total assemblage in Hearth 8 and 25% in Hearth 3. The trace amounts of shellfish in ST6 also came from hearth deposits.

Preservation of the shell was universally poor, and this was due to a combination of taphonomic factors. The fragments were all burnt and had then suffered additional post-depositional damage which had resulted in the surfaces becoming noticeably worn and abraded. It must be noted that these preservation issues may have permanently removed material from the archaeological record, thereby creating a potential bias within the conclusions.

### 12.2.4 Discussion

Both common limpet and periwinkle are edible and given their presence among other domestic food debris in the midden and the hearths in ST3 and ST6, it is logical to assume the shell is also residual food refuse. The recovery of shell from multiple structures and deposits indicates this resource was exploited throughout both Episodes 1 and 2. BLoM is located close to the W coast of the Machars and for a healthy individual the journey between the settlement and seashore would have taken approximately 20 minutes, making this resource readily available.

The small size and poor preservation of the assemblage makes it difficult to assess the actual importance of shellfish to the BLoM community. Poor preservation aside, the lack of species diversity is probably because of the rocky formation of the nearby seashore. Many Scottish beaches are rocky and, while this provides a favourable habitat for colonies of limpet and periwinkle, this environment is not always suitable for other marine species (Hayward et al 1996). This would have influenced what shellfish were locally available, rather than reflecting the cultural preferences of the community. At other sites such as at Broxmouth (Armit et al 2013: 476), Tofts Ness (Nicholson 2007: 228), Cnip (Ceron-Carrasco 2006:180) and Clachtoll (Robertson 2022c: 279) limpet and periwinkle were also among the dominant species.

Even though shellfish was locally available there may have been difficulties in easily accessing this resource in large enough quantities, hence the small size of the assemblage. Collecting shells may have been regarded as too labour-intensive for the dietary rewards it ultimately provided (Renfrew 1993: 18; Armit et al 2013: 477). The common limpet has traditionally been viewed as more

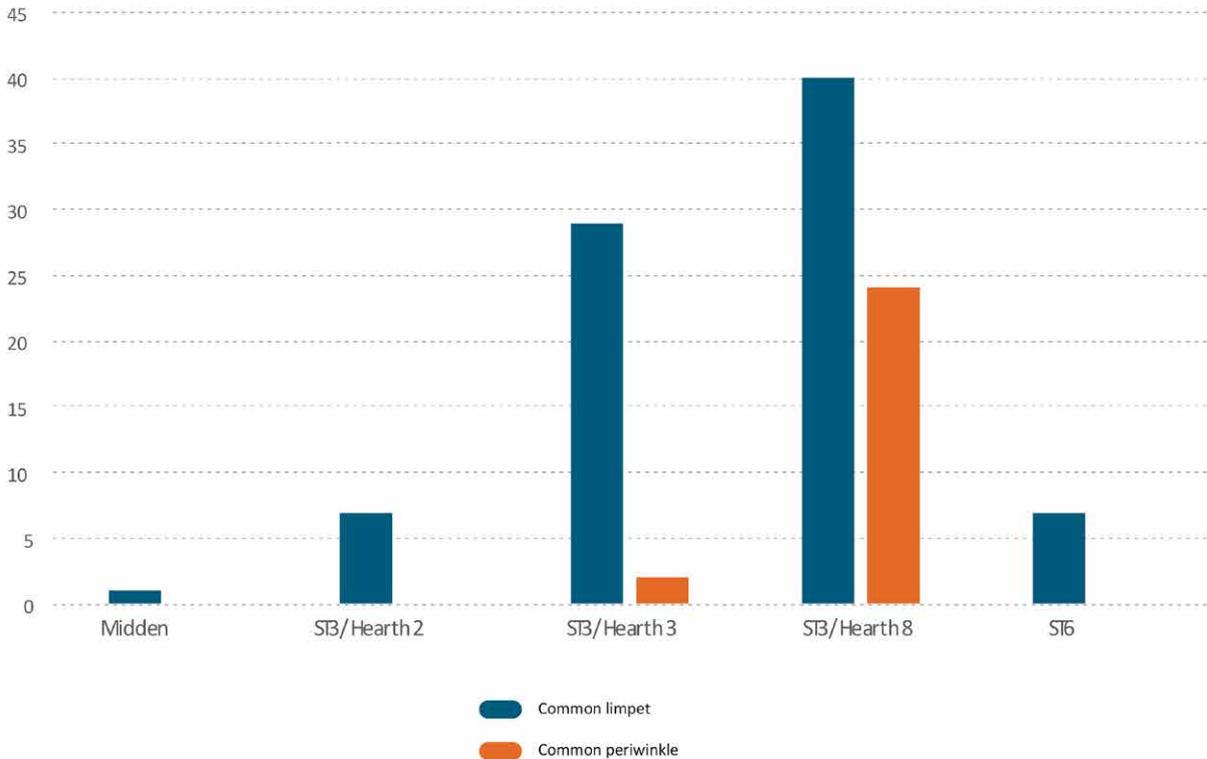


Figure 12.4. Shellfish by fragment number.

of a famine food and was usually only gathered if they were easily accessible in large quantities or that access to other food items was restricted (Ceron-Carrasco 2006:180; Nicholson 2007: 228). Analysis of the faunal and macroplant assemblages demonstrates that meat, dairy, grain, wild nuts and fruit were available throughout the occupation of BLoM. It is therefore unlikely that the inhabitants needed to gather shellfish in large quantities for extra nutrients to survive, but instead they may have been collected to add some variety to the overall diet.

Shellfish have been used for purposes other than for providing food. Common limpet was used as fish bait at other Iron Age sites in Scotland (Ceron-Carrasco 2000: 57; Nicholson 2007: 228; Cussans 2010: 177; Cussans 2015: 250). Shellfish used as bait is normally cooked by boiling or roasting as this makes it easier to extract the flesh thereby making this activity less labour intensive and more time efficient as opposed to breaking the shells (Cussans 2010: 177). Processing shellfish for bait normally creates assemblages of burnt shells which are largely unbroken. As the material from BLoM was composed entirely of small broken burnt fragments this is more reminiscent of food debris rather than bait processing waste. If fishing did occur, it is possible that shellfish bait was transported to BLoM to be processed by boiling or roasting. However, as evidence of fish within the BLoM diet is negligible, with

only a single fish bone being recovered (see above), this is very speculative.

Shellfish have also been used to produce lime-wash (Armit et al 2013: 478) and fertiliser (Ceron-Carrasco 2006: 180). However, there is no evidence that shells were routinely collected or stored in the quantities required for either purpose at BLoM. Lime-washing of buildings appears to have been regularly undertaken at Broxmouth to act as a waterproofing and insecticidal agent (Armit et al 2013: 478) but there is no evidence that any of the structures at BLoM were whitewashed. Given the more southerly location of the settlement, it is likely the soil under cultivation was more fertile and animal manure was sufficiently available to maintain crops without the additional labour of collecting and processing shells for fertiliser.

### 12.2.5 Conclusion

The shell fragments in the midden, ST3 and ST6 are representative of small accumulations of food waste. The small size and poor preservation of the surviving assemblage makes it difficult to draw any firm conclusions about the actual importance of this resource to the economy of the settlement. The most that can be stated with any certainty is that during Episodes 1 and 2, shellfish was cooked and eaten in ST3 and ST6 with waste disposed of within the midden along with other food refuse.



# Insect remains

Enid Allison, Kimberley Davies,  
and Nicki J. Whitehouse

## 13.1 Introduction

Insect remains were examined from 45 samples. Most of the material came from floors within ST1, ST2, ST3, ST4 and ST6, but samples from external areas, midden deposits and natural peats were also investigated. The assemblages have provided valuable insights into human living conditions, the nature and formation of deposits, importation of natural materials onto the site for use within the buildings and waste disposal. To a more limited extent the work has produced information on the local environment, both from naturally arrived insect background fauna and from species that arrived in the buildings with imported materials.

## 13.2 Methods

### 13.2.1 Insect extraction and recording

The samples generally had volumes of 2–5 litres with only a few smaller exceptions. Individual volumes are provided in the sample descriptions and in Appendices 1–4 held in the site archive. Analysis was carried out following the various seasons of excavation. Most of the samples from ST2 were examined by KD and NJW, the rest by EA. Details of individual working methods are described in the archive reports for each phase of work.

Insect remains were extracted by paraffin flotation with recovery to 0.3 mm (Kenward et al 1980; Coope 1986). Analysis focused on beetles (Coleoptera) and to a lesser extent on true bugs (Hemiptera), fly (Diptera) puparia and insect ectoparasites. All but five samples were fully analysed. Puparia were recorded in detail only from ST2. Insect remains were removed from the paraffin flots onto moist filter paper for identification using low-power stereoscopic zoom microscopes (x10–x45/x60). Beetles and bugs were identified by comparison with Key's reference collection at Plymouth Museum, EA's own reference collection and with reference to standard published works. In a few cases where distinguishing sclerites of individual species within certain genera is problematic in the absence of genitalia, the following groups were used: *Latridius minutus* group (*L. minutus* and/or *L. assimilis*), *Carpelimus bilineatus* group (*C. bilineatus* and/or *C. erichsoni*). Fly and ectoparasite remains were identified using keys of Séguéy (1944), Arthur (1963), Whitaker (2007), standard keys for fly larvae and other reference media. Nigel Wyatt (Natural History Museum) kindly provided advice on fly puparia for ST2. Minimum numbers of adult beetles and bugs (MNI) were estimated from the major sclerites, with other insect groups recorded semi-quantitatively on a four-point scale: + 1–3 individuals; ++ 4–10; +++ 11–50; ++++ >50. Other invertebrates were noted simply as present, common or abundant. The remaining five samples from ST1 and

ST6 were scanned in industrial methylated spirits (IMS) in petri dishes. Nomenclature for beetles and bugs follows Duff (2018) and lists compiled by Bantock & Botting (2018) respectively. Extracted insect material is currently stored in IMS in glass vials.

### 13.2.2 Interpretive methods

Interpretive methods used are largely based on those developed at the Environmental Archaeology Unit, University of York, and employed on a variety of occupation sites (eg Hall & Kenward 1990; Allison et al 1991a, b; Kenward & Hall 1995; Kenward et al 2000; Barrett et al 2007; Kenward et al 2011; Allison 2018; Allison & Kenward 2022). Beetles and bugs were assigned to broad ecological groups to aid interpretation, based on categories used by Kenward et al (1986), Kenward (1997), Kenward et al (2011) and Smith et al (2020). Some taxa are included in more than one group while others are uncoded, either because they occur in a wide variety of habitats and situations, or because it was not possible to identify the available sclerites closely enough. The main sources of ecological information referred to throughout the text are: Southwood & Leston (1959), LeQuesne (1960), Hodkinson & White (1979), White & Hodkinson (1982), Atty (1983), Hansen (1987), Koch (1989), Luff (1998, 2007), Morris (2002, 2008, 2012), Cox (2007), Lott (2009), Lott & Anderson (2011), Duff (2012, 2016, 2020), Foster et al (2014) and sources compiled for BugsCEP (Buckland & Buckland 2006). Other sources are mentioned below where relevant.

The relative abundance of selected ecological groups in each sample has been calculated as a percentage of the number of individuals in the whole assemblage, rounded to the nearest whole number. The figures represent a minimum proportion since generalist or uncoded taxa may have exploited similar habitats. The significance of the proportions may vary according to ecological group and the type of deposit studied. On occupation sites, such as BLoM, proportions of decomposer beetles are typically high relative to other taxa. It is emphasised that figures produced for the various ecological groups are of use for summarising the data but they do not necessarily accurately represent the proportions of available habitats on a site.

The diversity of beetle assemblages with >50 individuals, and of the decomposer component within each assemblage, was measured for samples examined by EA using the index of diversity (alpha) of Fisher et al (1943). Alpha measures the species richness and diversity of ecological niches in natural communities, and it has been shown to be effective in determining the degree of mixing within archaeological assemblages (Kenward 1978: 60–26; 2009: 47). In occupation deposits a low value of alpha provides a useful indication of

autochthonous fauna (ie insects breeding in a particular deposit), while higher values of alpha generally suggest ecological succession through time or mixed origins (eg dry litter in a floor becoming damp and mouldy then compact and wet, or because insects from natural habitats have been incorporated into the deposit, some of which may have arrived with materials brought onto site). Alpha and the associated standard error were calculated using a program created by Harry Kenward at the University of York in 1992 and subsequently adapted for a personal computer by John Carrott (Palaeoecology Research Services).

### 13.2.3 Ecological groups

A 'house fauna' predominantly consists of a group of taxa associated with relatively dry mouldering organic litter within ancient buildings where various types of cut vegetation were used either structurally (such as floor litter, bedding or roofing material) or stored (for example, hay or straw; Hall & Kenward 1990; Kenward & Hall 1995; Carrott & Kenward 2001). This fauna is not confined to human dwellings but would have developed in various types of buildings fulfilling the same criteria, including barns, stables and workshops. The main taxa consistently representing the house fauna at BLoM are *Latridius minutus* group, *Cryptophagus* spp. and *Atomaria* spp.. It is stressed, however, that other groups of insects would also have colonised ancient buildings depending on the circumstances of individual structures (eg the moistness and foulness of the substrate, the range of activities and materials within the buildings and the construction of individual buildings), and very few insects can be described as being strictly confined to buildings.

'Outdoor' taxa (defined by Kenward 1978: 14) would not usually live and breed either within buildings or in accumulations of decaying organic material. On an occupation site they are often species that have either been brought onto a site or into buildings by human agency (eg in cut vegetation used in flooring or bedding, in materials used in construction, or as fuel such as turf or peat), or species that are naturally occurring within the environs of a site (eg in nearby overhanging trees and other vegetation). The 'outdoor' group is a very broad one, encompassing sub-groups such as aquatic, damp ground/ waterside, plant-feeding and moor/ heathland insects, but it can be particularly useful when considering deposits within buildings and other deposits associated with settlement.

The subjectively-defined 'oxyteline association' includes species of *Carpelimus*, *Platystethus*, and *Anotylus*, together with *Neobisnius ?villosulus* (Carrott & Kenward 2001). The association is regularly recorded from occupation sites where they generally appear to have exploited wet, somewhat foul, muddy habitats (eg

Kenward & Hall 1995). At the current site, the group was dominated by *Carpelimus bilineatus* group.

Synanthropic insects favour artificial habitats associated with human occupation and activity. These include pests of stored products (eg grain beetles), beetles that colonise man-made accumulations of decomposing organic matter, certain flies (eg the house fly, *Musca domestica*), pests of structural timber (eg woodworm beetle (*Anobium punctatum*) and human ectoparasites. Only beetles are considered in the statistics for synanthropes here. Three broad categories are used in interpretation: ‘strong’ synanthropes are essentially dependent on human activity for survival and rarely found in natural habitats; ‘typical’ synanthropes are especially favoured by artificial habitats but can survive long-term in natural situations; ‘facultative’ synanthropes are common in natural situations but are clearly favoured by man-made habitats (Kenward 1997; Smith et al 2020).

### 13.3 The insect assemblages

The concentration of insect remains was highly variable between samples, ranging from <1–170 individuals per litre of sediment. Preservation was generally good with low levels of fragmentation. In a few samples, notably in ST1, taphonomic processes had resulted in various degrees of colour loss and thinning of cuticle, which limited taxonomic resolution. True bugs (Hemiptera) and ectoparasites (lice, fleas and ticks) were low in abundance in comparison to beetles and fly puparia.

The assemblages are described in Chaps 3–6 in context number order. A full list of insects and other invertebrates recorded from the site is provided in Table 13.1, hosts of plant-associated beetles and bugs in Table 13.2, and records of fly puparia from ST2 in Table 13.3. Lists of taxa from individual samples, the main statistics for assemblages with >50 individuals, and data used in the compilation of Figures 13.1–13.3, are provided in Appendices 1–4 held in the site archive

Taxon	No. of samples where taxon present	Taxon	No. of samples where taxon present
<b>ANNELIDA</b>		<i>Oxytelus</i> sp. uncertain [u]	1
Oligochaeta sp. (earthworm) egg capsules	9	<i>Eutheia</i> sp. [u]	13
<b>CRUSTACEA</b>		<i>Stenichnus</i> sp. [oa-d]	2
Cladocera spp. ephippia	2	<i>Euconnus</i> sp. [oa-d]	2
Ostracoda spp. carapaces	6	Scydmaeninae sp(p). [u]	3
<b>INSECTA</b>		<i>Stenus ossium</i> Stephens [oa]	1
<b>DERMAPTERA</b> (earwigs)		<i>Stenus flavipes</i> Stephens [oa-d]	1
Dermaptera sp. [u]	8	<i>Stenus clavicornis</i> (Scopoli) [oa-d]	1
<b>HEMIPTERA: HETEROPTERA</b> (true bugs)		<i>Stenus juno</i> (Paykull) [oa-d]	1
Pentatomoidea sp(p). [oa-p] (shield bugs)	6	<i>Stenus</i> spp. [u]	29
Anthocoridae (minute pirate bugs)		<i>Euaesthetus bipunctatus</i> (Ljungh) [oa]	1
<i>Lyctocoris campestris</i> (Fabricius) [rd-sf]	1	<i>Euaesthetus ruficapillus</i> Lacordaire [oa-d]	1
<i>Temnostethus gracilis</i> Horvath [oa]	1	<i>Lathrobium</i> spp. [u]	14
Lygaeidae (ground bugs)		? <i>Lathrobium</i> sp. [u]	1
<i>Drymus brunneus</i> (Sahlberg) [oa-p]	1	<i>Lithocharis ochracea</i> (Gravenhorst) [rt-st]	2
<i>Drymus</i> sp. [oa-p]	1	<i>Rugilus erichsoni</i> or <i>orbiculatus</i> [rt]	2
<i>Stygnocoris sabulosus</i> (Schilling) [oa-p]	1	<i>Rugilus orbiculatus</i> (Paykull) [rt-sf]	7
Lygaeidae spp. [oa-p]	2	<i>Rugilus</i> sp. indet. [rt]	6
Corixidae (water boatmen)		<i>Astenus</i> sp. [rt]	2
Corixidae spp. [oa-w]	5	<i>Ochthephilum</i> sp. [oa-d]	1
?Corixidae sp(p). nymphs [oa-w]	2	<i>Paederus</i> sp. [u]	1
Saldidae (shore bugs)		Paederinae sp. (small) [u]	4
Saldidae sp. [oa-d]	8	<i>Othius ?subuliformis</i> Stephens [rt]	1
Heteroptera sp. (water bug) [oa-w]	1	<i>Othius</i> sp. [rt]	1

Taxon	No. of samples where taxon present	Taxon	No. of samples where taxon present
Heteroptera sp. (water bug) nymphs [oa-w]	1	<i>Leptacinus batychrus</i> (Gyllenhal) [rt-sf]	4
Heteroptera sp. and sp. Indet. [u]	4	<i>Leptacinus pusillus</i> (Stephens) [rt-st]	9
HEMIPTERA: HOMOPTERA		<i>Leptacinus cf pusillus</i> (Stephens) [rt-st]	4
Aphrophoridae (spittle bugs)		<i>Leptacinus</i> sp. indet. [rt-sf]	1
<i>Aphrophora alni</i> (Fallén) [oa-p]	1	? <i>Leptacinus</i> sp. [rt-sf]	1
<i>Aphrophora</i> sp. indet. [oa-p]	6	<i>Gyrophypnus angustatus</i> Stephens [rt-st]	2
Cicadellidae (planthoppers)		<i>Gyrophypnus fracticornis</i> (Müller) [rt-st]	22
<i>Ulopa reticulata</i> (Fabricius) [oa-p-m]	2	<i>Gyrophypnus</i> sp. and sp. indet. [rt]	12
<i>Megophthalmus</i> sp. [oa-p]	3	<i>Xantholinus gallicus</i> or <i>linearis</i> [rt-sf]	3
Delphacidae (leafhoppers)		<i>Xantholinus gallicus/linearis/longiventris</i> [rt-sf]	2
<i>Conomelus anceps</i> Germar [oa-p]	19	<i>Xantholinus</i> sp. indet. [rt]	4
Delphacidae spp. [oa-p]	19	Xantholinini sp. [u]	2
Auchenorrhyncha spp. [oa-p]	22	<i>Quedius cinctus</i> (Paykull) [rt-sf]	1
Psylloidea (jumping plant lice)		<i>Quedius</i> sp(p). [u]	2
<i>Livia junci</i> (Schrank) [oa-p]	6	<i>Staphylinus</i> sp. [u]	2
<i>Livia junci</i> (Schrank) nymphal skin [oa-p]	1	<i>Neobisnius ?villosulus</i> (Stephens) [rt-sf]	18
<i>Craspedolepta nervosa</i> (Förster) nymphal skin [oa-p]	1	<i>Erichsonius cinerascens</i> (Gravenhorst) [oa-d]	2
<i>Baeapelma foersteri</i> (Flor) nymphal skins [oa-p-t]	3	<i>Erichsonius</i> sp. indet. [oa]	2
Psyllidae sp. nymphal skins (oa-p-t)	1	<i>Bisnius cephalotes</i> (Gravenhorst) [rt]	3
<i>Trioza cf urticae</i> (Linnaeus) [oa-p]	2	<i>Bisnius</i> or <i>Philonthus</i> sp. [u]	3
<i>Trioza urticae</i> (Linnaeus) nymphal skins [oa-p]	6	<i>Philonthus albipes</i> (Gravenhorst) [rt]	1
<i>Trioza</i> sp. and sp. indet. nymphal skin [oa-p]	3	<i>Philonthus politus</i> (Linnaeus) [rt]	3
Aphidoidea spp. (aphids)	4	<i>Philonthus umbratilis</i> (Gravenhorst) [oa-d]	1
Coccoidea: Diaspididae sp(p). (scale insects)	16	<i>Philonthus</i> spp. [u]	4
PHTHIRAPTERA (lice)		<i>Philonthus</i> or <i>Quedius</i> spp. [u]	3
Anoplura sp. indet.	1	<i>Gabrieus</i> sp(p). [rt]	8
<i>Bovicola bovis</i> Linnaeus	2	Staphylininae spp. [u]	25
<i>Bovicola ovis</i> (Schrank)	1	Staphylinidae sp. [u]	6
<i>Bovicola</i> sp. indet.	5	Geotrupidae (dor beetles)	
COLEOPTERA (beetles)		<i>Geotrupes</i> sp. <i>sensu lato</i>	19
Gyrinidae (whirligig beetles)		Scarabaeidae (dung beetles and chafers)	
<i>Gyrinus</i> sp. [oa-w]	2	<i>Acrossus depressus</i> (Kugelann) [oa-rf]	2
Haliplidae (crawling water beetles)		<i>Acrossus rufipes</i> (Linnaeus) [oa-rf]	7
<i>Haliplus</i> sp. [oa-w]	6	<i>Agrilinus ater</i> (De Geer) [oa-rf]	8
Dytiscidae (diving beetles)		<i>Aphodius fimetarius</i> (Linnaeus) [ob-rf]	2
<i>Agabus sturmii</i> (Gyllenhal in Schönherr) [oa-w]	1	<i>Aphodius ?fimetarius</i> (Linnaeus) [ob-rf]	2
<i>Agabus bipustulatus</i> (Linnaeus) [oa-w]	1	<i>Chilothorax distinctus</i> (Müller) [ob-rf]	2
<i>Agabus</i> or <i>Ilybius</i> sp. [oa-w]	3	<i>Melinopterus prodromus</i> or <i>sphacelatus</i> [ob-rf]	15
<i>Colymbetes fuscus</i> (Linnaeus) [oa-w]	1	<i>Nimbus contaminatus</i> (Herbst) [oa-rf]	18
<i>Hydroporus palustris</i> (Linnaeus) [oa-w]	1	? <i>Teuchestes fossor</i> (Linnaeus) [oa-rf]	1
<i>Hydroporus</i> spp. [oa-w]	4	Aphodiinae spp. and sp. indet. [ob-rf]	20
Hydrophorinae spp. [oa-w]	7	<i>Phyllopertha horticola</i> (Linnaeus) [oa-p]	11

Taxon	No. of samples where taxon present	Taxon	No. of samples where taxon present
Dytiscidae sp. [oa-w]	1	? <i>Phyllopertha horticola</i> (Linnaeus) [oa-p]	3
Carabidae (ground beetles)		Clambidae (fringe-winged beetles)	
<i>Leistus</i> sp. [oa]	1	<i>Clambus pubescens</i> Redtenbacher [rt-sf]	1
<i>Carabus violaceus</i> Linnaeus [oa]	1	<i>Clambus</i> sp. [rt-sf]	13
<i>Carabus</i> sp. indet. [oa]	4	? <i>Clambus</i> sp. [rt-sf]	1
<i>Elaphrus cupreus</i> Duftschmid [oa-d]	4	Scirtidae (marsh beetles)	
<i>Clivina</i> sp. [oa]	1	<i>Contacyphon</i> spp. [oa-d]	20
<i>Dyschirius globosus</i> (Herbst) [oa]	7	Scirtidae sp. indet. [oa-d]	1
<i>Blemus discus</i> (Fabricius) [oa]	1	Dascillidae (orchid beetles)	
<i>Trechoblemus micros</i> (Herbst) [u]	1	<i>Dascillus cervinus</i> (Linnaeus) [oa-p]	6
<i>Trechus obtusus</i> or <i>quadristriatus</i> [oa]	5	Byrrhidae (pill beetles)	
<i>Trechus</i> sp. indet. [oa]	2	<i>Simplocaria</i> sp. [oa-p]	1
<i>Bembidion (Metallina) lampros</i> or <i>properans</i> [oa]	1	Byrrhidae sp. [u]	2
<i>Bembidion (Philochthus) guttula</i> or <i>mannerheimi</i> [oa]	3	Elmidae (riffle beetles)	
<i>Bembidion (Trepanedoris) doris</i> (Panzer) [oa-d]	1	<i>Elmis aenea</i> (Müller) [oa-w]	2
<i>Bembidion</i> spp. [oa]	10	<i>Oulimnius troglodytes</i> (Gyllenhal) [oa-w]	2
<i>Ocys harpaloides</i> (Audinet-Serville) [oa]	3	<i>Oulimnius tuberculatus</i> (Müller) [oa-w]	2
<i>Poecilus versicolor</i> (Sturm) [oa]	1	<i>Oulimnius ?tuberculatus</i> (Müller) [oa-w]	1
<i>Poecilus</i> sp. [oa]	1	<i>Oulimnius</i> sp. indet. [oa-w]	7
<i>Pterostichus vernalis</i> (Panzer) [oa-d]	1	Dryopidae (long-toed water beetles)	
<i>Pterostichus diligens</i> (Sturm) [oa-d]	3	<i>Dryops</i> spp. [oa-d]	6
<i>Pterostichus ?diligens</i> (Sturm) [oa-d]	1	Throscidae	
<i>Pterostichus diligens</i> or <i>strenuus</i> [oa]	2	<i>Trixagus</i> sp. [oa]	1
<i>Pterostichus strenuus</i> (Panzer) [oa]	3	Elateridae (click beetles)	
<i>Pterostichus niger</i> (Schaller) [oa]	2	<i>Agriotes obscurus</i> (Linnaeus) [oa-p]	2
<i>Pterostichus anthracinus</i> (Illiger) [oa-d]	1	<i>Agriotes</i> sp. [oa-p]	2
<i>Pterostichus minor</i> (Gyllenhal) [oa-d]	3	<i>Adrastus pallens</i> (Fabricius) [oa]	1
<i>Pterostichus nigrita</i> or <i>rhaeticus</i> [oa-d]	2	<i>Denticollis linearis</i> (Linnaeus) [u]	4
<i>Pterostichus (Pseudomaseus)</i> sp. [oa-d]	2	Elateridae spp. and sp. indet. [ob]	19
<i>Pterostichus</i> spp. and sp. indet. [oa]	9	?Elateridae sp. [ob]	2
<i>Stomis pumicatus</i> (Panzer) [oa]	1	Elateridae spp. larval apices	2
<i>Amara plebeja</i> (Gyllenhal) [oa]	1	Cantharidae (soldier beetles)	
<i>Amara</i> sp. [oa]	2	Cantharidae spp. [ob]	6
<i>Ophonus</i> sp. [oa]	1	Ptinidae (spider and woodworm beetles)	
<i>Calathus melanocephalus</i> (Linnaeus) [oa]	2	<i>Ptinus fur</i> (Linnaeus) [rd-sf-h]	1
<i>Agonum fuliginosum</i> (Panzer) [oa-d]	5	<i>Grynobius planus</i> (Fabricius) [l]	2
<i>Agonum gracile</i> Sturm [oa-d]	1	<i>Anobium punctatum</i> (De Geer) [l-sf]	5
<i>Agonum thoreyi</i> Dejean [oa-d]	2	Cryptophagidae (silken fungus beetles)	
<i>Agonum (Europhilus)</i> sp. [oa-d]	2	<i>Cryptophagus</i> spp. [rd-sf-h]	22
<i>Agonum</i> sp(p). and sp. indet. [oa]	4	<i>Atomaria</i> spp. [rd-sf-h]	36
<i>Limodromus assimilis</i> (Paykull) [oa]	1	Silvanidae	
<i>Oxypselaphus obscurus</i> (Herbst) [oa-d]	3	<i>Oryzaephilus surinamensis</i> (Linnaeus) [g-ss]	1

Taxon	No. of samples where taxon present	Taxon	No. of samples where taxon present
<i>Dromius quadrimaculatus</i> (Linnaeus) [oa-p-t]	1	Phalacridae	
<i>Philorhizus sigma</i> (Rossi)	1	Phalacridae sp. [oa-p]	1
Lebiini sp. [oa]	1	Kateretidae (short-winged flower beetles)	
Carabidae spp. and sp. indet. [ob]	24	<i>Brachypterus</i> sp. [oa-p]	4
Helophoridae (grooved water scavengers)		Nitidulidae (sap and pollen beetles)	
<i>Helophorus aequalis</i> or <i>grandis</i> [oa-w]	1	<i>Eपुरaea melanocephala</i> Marsham [oa]	1
<i>Helophorus</i> spp. [oa-w]	27	<i>Meligethes</i> sp. [oa-p]	6
Hydrochidae		Nitidulidae sp. indet. [u]	1
<i>Hydrochus</i> sp. [oa-w]	1	Cerylonidae	
Hydrophilidae		<i>Cerylon</i> sp. [l]	2
<i>Laccobius bipunctatus</i> (Fabricius) [oa-w]	1	Corylophidae	
<i>Laccobius</i> sp. indet. [oa-w]	4	<i>Orthoperus</i> sp. [rt-sf]	6
<i>Hydrobius fuscipes</i> (Linnaeus) [oa-w]	1	Corylophidae sp(p). [rt]	2
<i>Chaetarthria</i> sp. [oa-d]	1	Latriidiidae (minute brown scavenger beetles)	
<i>Anacaena globulus</i> (Paykull) [oa-w]	1	<i>Stephostethus lardarius</i> (De Geer) [rt-sf]	1
<i>Anacaena</i> sp. or sp.indet. [oa-w]	4	<i>Latriidius minutus</i> group [rd-st-h]	36
<i>Enochrus</i> sp. [oa-w]	1	<i>Enicmus</i> sp. [rd-sf]	6
Hydrophilinae spp. [oa-w]	5	? <i>Enicmus</i> sp. [rd-sf]	2
<i>Coelostoma orbiculare</i> (Fabricius) [oa-w]	2	<i>Corticaria punctulata</i> Marsham [rt-sf]	4
? <i>Coelostoma orbiculare</i> (Fabricius) [oa-w]	1	<i>Corticaria ?punctulata</i> Marsham [rt-sf]	1
<i>Sphaeridium</i> sp. [rf]	2	<i>Corticaria serrata</i> (Paykull) [rt]	1
<i>Cercyon haemorrhoidalis</i> (Fabricius) [rf-sf]	14	<i>Corticaria</i> spp. [rt-sf]	12
<i>Cercyon ?haemorrhoidalis</i> (Fabricius) [rf-sf]	1	? <i>Corticaria</i> sp. [rt-sf]	1
<i>Cercyon impressus</i> (Sturm) [rf-sf]	1	Corticarina sp. [rt]	1
<i>Cercyon melanocephalus</i> (Linnaeus) [rf]	2	Corticariinae spp. [rt]	14
<i>Cercyon nigriceps</i> (Marsham) [rf-st]	3	Salpingidae	
<i>Cercyon pygmaeus</i> (Illiger) [rf-st]	2	<i>Salpingus planirostris</i> (Fabricius) [l]	1
<i>Cercyon quisquilius</i> (Linnaeus) [rf]	1	<i>Salpingus</i> sp. [l]	1
<i>Cercyon ?quisquilius</i> (Linnaeus) [rf]	1	<i>Vincenzellus</i> or <i>Salpingus</i> sp. [l]	1
<i>Cercyon terminatus</i> (Marsham) [rf-st]	6	Scraptiidae	
<i>Cercyon ?terminatus</i> (Marsham) [rf-st]	1	Scraptiidae sp. [u]	1
<i>Cercyon unipunctatus</i> (Linnaeus) [rf-st]	5	Cerambycidae (longhorn beetles)	
<i>Cercyon ustulatus</i> (Preysslser) [oa-d]	1	?Cerambycidae sp. [u]	1
<i>Cercyon analis</i> (Paykull) [rt-st]	31	Chrysomelidae (seed and leaf beetles)	
<i>Cercyon ?analis</i> (Paykull) [rt-st]	3	<i>Donacia obscura</i> Gyllenhal [oa-p-d]	1
<i>Cercyon</i> spp. indet. (decomposer group) [rt]	18	<i>Donacia simplex</i> Fabricius [oa-p-d]	1
<i>Cercyon</i> spp. indet. [u]	6	<i>Donacia</i> or <i>Plateumaris</i> sp. [oa-p-d]	4
<i>Cryptopleurum minutum</i> (Fabricius) [rf-st]	10	<i>Plateumaris sericea</i> (Linnaeus) [oa-p-d]	1
<i>Megasternum concinnum</i> (Marsham) [rt-sf]	24	<i>Plateumaris</i> sp(p). [oa-p-d]	4
Histeridae (clown beetles)		<i>Oulema</i> sp. [oa-p]	1
<i>Acritus nigricornis</i> (Hoffman) [rt-st]	6	<i>Lema</i> or <i>Oulema</i> sp. [oa-p]	1
<i>Onthophilus striatus</i> (Forster) [rt-sf]	1	<i>Gastrophysa viridula</i> (De Geer) [oa-p]	4

Taxon	No. of samples where taxon present	Taxon	No. of samples where taxon present
<i>Margarinotus brunneus</i> (Fabricius) [rt-sf]	1	<i>Prasocuris</i> ( <i>Hydrothassa</i> ) sp. [oa-p-d]	1
Histerinae sp. [rt]	1	<i>Prasocuris phellandrii</i> (Linnaeus) [oa-p-d]	1
Histeridae spp. and sp. indet. [u]	4	<i>Chrysolina</i> sp. [oa-p]	1
Hydraenidae		? <i>Chrysolina</i> sp. [oa-p]	1
<i>Hydraena britteni</i> Joy [oa-w]	6	<i>Crepidodera plutus</i> (Latreille) [oa-p-t]	2
<i>Hydraena britteni</i> or <i>riparia</i> [oa-w]	7	<i>Crepidodera</i> sp(p). (Fabricius) [oa-p-t]	4
<i>Hydraena nigrita</i> Germar [oa-p]	3	<i>Chaetocnema arida</i> group [oa-p]	2
<i>Hydraena testacea</i> Curtis [oa-w]	3	<i>Chaetocnema concinna</i> or <i>picipes</i> [oa-p]	4
<i>Hydraena</i> spp. and sp. indet. [oa-w]	13	<i>Altica</i> sp. [oa-p]	2
<i>Limnebius truncatellus</i> (Thunberg) [oa-w]	3	<i>Aphthona</i> sp. [oa-p]	4
<i>Ochthebius bicolon</i> Germar [oa-w]	2	<i>Neocrepidodera ferruginea</i> (Scopoli) [oa-p]	2
<i>Ochthebius minimus</i> (Fabricius) [oa-w]	7	<i>Longitarsus</i> spp. [oa-p]	15
<i>Ochthebius</i> c.f. <i>minimus</i> [(Fabricius) oa-w]	9	<i>Phyllotreta nemorum</i> group [oa-p]	2
<i>Ochthebius</i> sp. indet. [oa-w]	8	Alticini spp. [oa-p]	8
Ptiliidae (featherwing beetles)		?Alticini sp. [oa-p]	1
<i>Ptenidium</i> spp. [rt]	25	Chrysomelidae spp. and sp. indet. [oa-p]	15
<i>Acrotichis</i> spp. [rt]	31	Apionidae	
Ptiliidae sp. [rt]	1	<i>Perapion curtirostre</i> (Germar) [oa-p]	4
Silphidae (sexton beetles)		<i>Protapion ?apricans</i> (Herbst) [oa-p]	2
<i>Phosphuga atrata</i> (Linnaeus) [u]	2	Apionidae spp. and sp. indet. [oa-p]	8
<i>Silpha</i> sp. [u]	3	Eirrhinidae (wetland weevils)	
Silphidae sp(p). indet. [u]	7	<i>Notaris acridulus</i> (Linnaeus) [oa-p-d]	4
Staphylinidae (rove beetles)		<i>Notaris</i> sp. indet. [oa-p-d]	1
<i>Phyllodrepa floralis</i> (Paykull) [rt-sf]	1	Curculionidae (weevils)	
<i>Phyllodrepa</i> sp. [u]	1	<i>Limnobaris</i> sp. [oa-p-d]	1
<i>Dropephylla vilis</i> (Erichson) [l]	1	<i>Mecinus pyrastrer</i> (Herbst) [oa-p]	1
<i>Omalium</i> sp(p). [rt]	9	<i>Isochnus foliorum</i> (Müller) [oa-p-t]	4
<i>Olophrum fuscum</i> or <i>piceum</i> [oa]	2	<i>Orchestes testaceus</i> (Müller) [oa-p-t]	1
<i>Olophrum</i> sp. [oa]	9	<i>Orchestes quercus</i> (Linnaeus) [oa-p-t]	1
<i>Acidota cruentata</i> Mannerheim [oa]	1	<i>Rhamphus</i> sp. [oa-p-t]	1
<i>Lesteva punctata</i> Erichson [oa-d]	2	<i>Nedyus quadrimaculatus</i> (Linnaeus) [oa-p]	1
<i>Lesteva sicula</i> ssp. <i>heeri</i> Fauvel [oa-d]	13	<i>Siracalodes mixtus</i> (Mulsant & Rey) [oa-p]	1
<i>Lesteva</i> cf <i>sicula</i> ssp. <i>heeri</i> Fauvel [oa-d]	4	<i>Trichosirocalus horridus</i> (Panzer) [oa-p]	2
<i>Lesteva</i> sp. indet. [oa-d]	4	<i>Rhinoncus pericarpus</i> (Linnaeus) [oa-p]	1
Omalinae sp. [u]	5	<i>Rhinoncus</i> sp. [oa-p]	1
<i>Metopsia clypeata</i> (Müller) [rt]	2	Ceutorhynchinae spp. [oa-p]	7
<i>Megarthus</i> sp(p). [rt]	10	<i>Strophosoma</i> sp. [oa-p]	1
<i>Micropeplus fulvus</i> Erichson [rt-sf]	2	<i>Otiorhynchus ligneus</i> (Olivier) [oa-p]	1
<i>Micropeplus staphylinoides</i> (Marshall) [rt-sf]	16	<i>Phyllobius</i> sp. [oa-p]	2
<i>Micropeplus tesseraula</i> (Curtis) [rt]	3	<i>Phyllobius</i> or <i>Polydrusus</i> sp. [oa-p]	3
<i>Micropeplus</i> sp. indet. [rt]	1	<i>Sciaphilus asperatus</i> (Bonsdorff) [oa-p]	1
<i>Euplectus</i> sp. [u]	2	<i>Sitona obsoletus</i> (Gmelin) [oa-p]	3

Taxon	No. of samples where taxon present	Taxon	No. of samples where taxon present
<i>Bryaxis bulbifer</i> (Reichenbach) [oa-d]	1	<i>Sitona</i> sp. [oa-p]	1
<i>Bryaxis</i> sp. [oa]	2	<i>Hypera</i> sp. [oa-p]	1
<i>Pselaphus heisei</i> Herbst [oa-d]	2	Scolytinae sp. [l]	1
Pselaphinae spp. [u]	17	Curculionidae spp. and sp. indet. [oa-p]	27
<i>Sepedophilus ?littoreus</i> (Linnaeus) [u]	1	Coleoptera spp. and sp. indet. [u]	13
<i>Sepedophilus pedicularis</i> (Gravenhorst)	1	DIPTERA (flies)	
<i>Sepedophilus</i> sp. [u]	2	Syrphidae sp. larval spiracular processes	1
<i>Tachyporus</i> spp. [u]	7	Chironomidae sp. larval head capsules	3
<i>Tachinus laticollis</i> or <i>marginellus</i> [u]	6	Diptera spp. adults	9
<i>Tachinus rufipes</i> (Linnaeus) [sf]	1	Diptera spp. puparia	38
<i>Tachinus</i> sp. indet. [u]	9	HYMENOPTERA (bees, wasps and ants)	
Mycetoporini sp. [u]	1	Formicidae spp.	7
Tachyporinae sp. [u]	2	Hymenoptera Aculeata sp.	5
<i>Aleochara</i> sp. [rt]	6	Hymenoptera Parasitica spp.	16
<i>Oxyptoda</i> spp. [u]	13	LEPIDOPTERA (butterflies and moths)	
<i>Cypha</i> sp. [u]	2	Lepidoptera sp. cocoon	1
<i>Cordalia obscura</i> (Gravenhorst) [rt-sf]	16	SIPHONAPTERA (fleas)	
<i>Cordalia</i> or <i>Falagria</i> sp. [rt-sf]	4	<i>Pulex irritans</i> Linnaeus [ss]	4
<i>Falagria caesa</i> or <i>sulcatula</i> [rt-sf]	2	Siphonaptera sp. indet. body segments	3
Aleochariinae spp. [u]	38	TRICHOPTERA (caddis flies)	
<i>Syntomium aeneum</i> (Müller) [oa]	1	Trichoptera sp. wing fragments	4
<i>Carpelimus bilineatus</i> group [rt-sf]	28	Trichoptera sp. larval head fragments	9
<i>Carpelimus elongatulus</i> (Erichson) [oa-d]	2	<b>ARACHNIDA</b>	
<i>Carpelimus</i> spp. and sp. indet. [u]	30	Acarina spp. (mites)	27
<i>Platystethus nodifrons</i> Mannerheim [oa-d]	9	Araneae sp. (spiders)	9
<i>Platystethus ?nodifrons</i> Mannerheim [oa-d]	1	<i>Ixodes ricinus</i> (Linnaeus)	1
<i>Platystethus arenarius</i> (Geoffroy in Fourcroy) [rf]	4	<i>Ixodes ricinus</i> (Linnaeus) nymphs	4
<i>Anotylus nitidulus</i> (Gravenhorst) [rt-d]	4	Pseudoscorpiones sp.	3
<i>Anotylus rugosus</i> (Fabricius) [rt-sf]	21	<b>BRYOZOA</b>	
<i>Anotylus sculpturatus</i> group [rt]	2	<i>Cristatella mucedo</i> Cuvier statoblasts	5
<i>Anotylus tetracarinatus</i> (Block) [rt-sf]	13	Bryozoa sp. statoblasts	2
<i>Oxytelus sculptus</i> Gravenhorst [rt-st]	33		

Table 13.1. BLoM insects and other invertebrates recorded from fully analysed samples (N = 41). Ecological codes for Coleoptera and Hemiptera are shown in square brackets: d – damp ground/ waterside, h – house fauna, l – wood/ timber, m – moor/ heathland, oa – outdoor taxa not usually found within buildings or in accumulations of decomposing matter, ob – probable outdoor taxa, p – plant-associated, rd – dry decomposers, rf – foul decomposers, rt – eurytopic decomposers. sf – facultative synanthropes, ss – strong synanthropes, st – typical synanthropes, t – tree, u – uncoded, w – aquatic. sp./spp. = species additional to listed taxa; sp./spp. indet. may be or may include previously listed taxa.

Table 13.2. Habitat and food preferences of strongly plant-associated beetles and bugs. Main sources: Cox 2007; Morris 1990, 1997, 2002, 2008, 2012; Southwood & Leston 1959; White & Hodkinson 1982 (the following page).

<i>Temnostethus gracilis</i>	Trunks and twigs of lichen encrusted deciduous trees, rocks or walls
<i>Stygnocoris sabulosus</i>	Dry, light soils, generally with good vegetation cover, often under heather in the western parts of Britain
<i>Ulopa reticulata</i>	Associated with heathers ( <i>Calluna</i> and <i>Erica</i> )
<i>Megophthalmus</i> sp.	On low species of rushes ( <i>Juncus</i> )
<i>Conomelus anceps</i>	On rushes ( <i>Juncus</i> )
<i>Livia junci</i> adults and nymphs	Wet meadows on rushes ( <i>Juncus</i> )
<i>Craspedolepta nervosa</i> nymph	On yarrows ( <i>Achillea</i> )
<i>Boaeopelma foersteri</i> nymphs	On alder ( <i>Alnus</i> )
<i>Trioxa urticae</i> adults and nymphs	On nettles ( <i>Urtica</i> )
<i>Phyllopertha horticola</i>	Poor quality permanent grassland on light soils with a diversity of flowering plants. The larvae feed on turf roots
<i>Dascillus cervinus</i>	Rough grassland, usually on flowers, sometimes in bushes. The larvae mainly feed at the roots of grasses
<i>Simplocaria</i> sp.	In moss
<i>Denticollis linearis</i>	Typically associated with woodland or scrub
<i>Brachypterus</i> spp.	On nettles ( <i>Urtica</i> )
<i>Meligethes</i> sp.	Larvae feed on Brassicaceae, adults on pollen of various flowers
<i>Donacia obscura</i>	Usually associated with Cyperaceae, especially bottle sedge ( <i>Carex rostrata</i> )
<i>Donacia simplex</i>	Usually on bur-reeds ( <i>Sparganium</i> )
<i>Plateumaris sericea</i>	Typically on bur-reeds ( <i>Sparganium</i> ), but also on sedges ( <i>Carex</i> ) and other waterside plants
<i>Lema</i> and/or <i>Oulema</i> sp.	Feed on the leaves of grasses and cereals
<i>Gastrophysa viridula</i>	Usually associated with docks ( <i>Rumex</i> )
<i>Prasocuris (Hydrothassa)</i> sp.	On Ranunculaceae
<i>Prasocuris phellandrii</i>	Feeds on marsh marigold ( <i>Caltha palustris</i> ) and other wetland Ranunculaceae. Adults also occur on leaves of other marginal plants
<i>Phyllotreta nemorum</i> group	On wild and cultivated Brassicaceae
<i>Crepidodera plutus</i>	Usually on willows ( <i>Salix</i> ), especially crack-willow ( <i>S. fragilis</i> )
<i>Crepidodera</i> sp(p).	On willows ( <i>Salix</i> ) and poplars ( <i>Populus</i> )
<i>Chaetocnema arida</i> group	On various grasses, sedges and rushes
<i>Chaetocnema concinna</i> or <i>picipes</i>	Usually on (Polygonaceae) including knotweed ( <i>Polygonum</i> ) and docks ( <i>Rumex</i> )
<i>Longitarsus</i> spp.	Various herbaceous plants, especially Boraginaceae, Scrophulariaceae and Labiatae
<i>Phyllotreta nemorum</i> group	Wild and cultivated Brassicaceae
<i>Perapion curtirostre</i>	On docks and sorrels ( <i>Rumex</i> )
<i>Protapion ?apricans</i>	Associated with clovers ( <i>Trifolium</i> )
<i>Notaris acridulus</i>	On semi-aquatic grasses. Reed sweet-grass ( <i>Glyceria maxima</i> ) is a common host in Continental Europe
<i>Limnobaris</i> sp.	On sedges ( <i>Carex</i> )
<i>Mecinus pyraeaster</i>	On ribwort plantain ( <i>Plantago lanceolata</i> )
<i>Isochnus foliorum</i>	On willows and sallows ( <i>Salix</i> )
<i>Orchestes quercus</i>	On oak ( <i>Quercus</i> )
<i>Orchestes testaceus</i>	On alder ( <i>Alnus</i> )
<i>Rhamphus</i> sp.	On limited range of trees and shrubs
<i>Nedyus quadrimaculatus</i>	On nettles ( <i>Urtica</i> )
<i>Sirocalodes mixtus</i>	On climbing corydalis ( <i>Ceratocarpus claviculata</i> ), and also on common fumitory ( <i>Fumaria officinalis</i> )
<i>Trichosirocalus horridus</i>	On Asteraceae, typically thistles ( <i>Cirsium</i> and <i>Carduus</i> )
<i>Rhinoncus pericarpus</i>	In grasslands, waste places, and open areas, generally on docks ( <i>Rumex</i> )
<i>Sciaphilus asperatus</i>	Grasslands, shrubs and woods, mostly amongst ground vegetation, herbage and low shrubs
<i>Sitona obsoletus</i>	In grasslands, waste places and agricultural land, on clovers especially red and white clover ( <i>Trifolium pretense</i> and <i>T. repens</i> )
<i>Sitona</i> spp.	On various Fabaceae

CONTEXT	221	221A	221B	244	248	249	250	251	261	264	267	268
<i>Musca domestica</i>	10	37	46	5	4	-	13	3	1	-	-	13
<i>Stomoxys calcitrans</i>	1	10	14	1	4	-	4	3	6	-	-	23
Muscidae spp. & sp. indet.	9	7	8	1	5	-	2	-	-	10	50	-
Sphaeroceridae sp. A	-	-	-	-	17	-	-	-	-	-	-	-
Sphaeroceridae sp. B	-	-	-	-	1	-	-	-	-	-	-	-
Sphaeroceridae sp. C	-	-	-	-	-	-	4	-	-	-	-	-
Sphaeroceridae sp(p) & sp. indet.	4	12	1	4	8	5	6	6	10	10	151	3
Drosophilidae sp.	-	-	-	-	-	-	-	-	-	-	2	-
Agromyzidae sp.	-	-	-	-	-	-	-	-	-	-	13	1
Unidentified pupa	-	-	-	-	-	1	11	3	26	6	16	-

Table 13.3. Fly puparia from ST2.

Abbreviations used in the sample descriptions are:

- $\alpha$  – index of diversity (alpha) for the whole assemblage
- RT – total decomposers
- $\alpha$ RT – diversity (alpha) of the decomposer component
- SE – standard error of alpha

## 13.4 Overview of results

### 13.4.1 General observations on living conditions within the structures

Excluding foundation and preconstruction layers, 31 of the samples were from within buildings, mostly from floor layers. The surviving insect remains associated with ST1 provided little information on occupation and living conditions, but good evidence was obtained from ST2, ST3 and ST4, and to a lesser extent from a scanned sample from ST6. Where there was sufficient insect material for interpretation, a range of moisture contents and degrees of foulness was indicated within the floor litter, the various groups of insects likely co-existing in a range of habitats provided by the structures. This may indicate ecological succession over a period of time, eg originally dry floor litter becoming damp and mouldy, then progressively more compact and wet. Damper and fouler conditions would tend to develop within the deeper parts of floor layers due to the general wetness of the natural substrate. There are also likely to have been variations in moisture and foulness relating to spatial and temporal differences in the use of the structure: bedding, walls, and roofs are likely to have been drier than floors, for example, while certain areas within some structures may have been used for carrying out ‘dirty’ activities that produced foul debris, such as cleaning and working skins or wool.

Decomposer beetles predominantly associated with relatively dry, mouldering organic litter, collectively known as house fauna, were present in all the floor samples,

although the proportions varied considerably both within and between structures (1–31%). The highest proportions of house fauna were seen in ST2 floors. Eurytopic decomposers were always in the majority, however, and the most abundant taxa within this group are generally associated with damper and somewhat fouler conditions. *Carpelimus bilineatus* group, notably well represented in many samples, would almost certainly have been living and breeding within the damper parts of most floors where it would have fed on semi-decomposed plant and animal matter (Lott 2009: 61). *C. bilineatus* group appears to have regularly exploited artificial habitats on ancient occupation sites and is often recorded in large numbers in house floors (eg Kenward & Allison 1994b; Kenward & Hall 1995; Allison 2018). Other species that were common and probably breeding in damp to somewhat foul plant litter included *Cercyon analis*, *Oxytelus sculptus*, and *Neobisnius villosulus*. Beetles specifically associated with foul matter, including dung, were present in most floor deposits (3–5% of the fauna) and in many cases the litter had become foul enough to attract breeding flies.

The question of whether livestock were kept in any of the structures is of particular interest but unequivocal insect evidence for this is largely lacking. The key groups of insects identified by Kenward & Hall (1997) as providing a ‘signature’ for stable waste in Roman and later deposits are a combination of a house fauna, pests of grain and other stored products, decomposers associated with stored hay, insects found in moist, open-textured, nutrient-rich decomposing material, obligate foul decomposers (but not necessarily scarabaeid dung beetles), as well as ectoparasites associated with animals. Relatively few comparable prehistoric deposits associated with stabling have been studied and it is possible that the diversity of habitats may be more limited, however. Grain pests have up to now not been firmly identified recorded from prehistoric deposits in Britain and there is some doubt

about a single grain pest recorded from ST1 (see below). There was no clear insect evidence for stored hay, although there is much overlap between this group and the house fauna, but there were hints of the presence of dryland vegetation in ST3, which could potentially have included hay. Hay crops at BLoM may well have included sedges and rushes so there would be potential confusion with wetland vegetation used as floor litter. Most beetle assemblages associated with floors in ST2, ST3, ST4 and ST6 indicated a degree of foulness within the substrates, but in almost all cases the proportions represented are probably not high enough to suggest the presence of significant quantities of dung. The beetle data from ST4 are of interest in this regard, however (see below). The occurrence of fly puparia in many floor layers (predominantly Muscidae species) suggests they provided a suitable environment for breeding and oviposition in substrates consisting of foul decaying vegetation that might have included dung. Stable flies (*Stomoxys calcitrans*) are obligate blood feeders and known pests of livestock; they primarily bite cattle and horses but will also attack humans and dogs in their absence. They are not obligate dung breeders, however: the immature stages prefer actively fermenting or decaying vegetative material either with or without accompanying nitrogenous waste such as manure and urine (Hogsette & Farkas 2000). Breeding takes place in moist, decaying organic matter such as rotting straw and other plant material, and manure, also the preferred substrates for house fly (*Musca domestica*). The presence of puparia suggests a suitable environment for reproduction.

A limited range of ectoparasites was recorded but the evidence they provide is equivocal. Human fleas (*Pulex irritans*) were most common in ST3, with definite records from floors and a preconstruction deposit. Indeterminate body segments, almost certainly of human flea, were present in an external deposit that included discarded floor litter. Other confirmed and probable records were from a foundation deposit for ST1 that contained discarded floor litter, a floor layer in ST2, and a midden layer. The presence of human fleas does not necessarily indicate human occupation, however, since they also occur in buildings where domestic animals are kept, especially in pig sties (Smit 1957: 22). Recent records from Britain and Ireland are predominantly from humans and their dwellings, but a good number (20%) are from domestic animals including cats, dogs and pigs (George 2008: 14). Human lice (*Pediculus humanus*) are more closely tied to the presence of people, but none were identified. Biting lice (Trichodectidae) associated with domestic animals were recorded in several samples, most numerously in ST2 where *Bovicola bovis*, found on cattle, and *B. ovis*, found on sheep, were specifically identified. A poorly preserved indeterminate *Bovicola* specimen and *Bovicola bovis* were recovered from floors in ST3 and ST4 respectively. These

lice do not require a blood meal but feed on the hair and skin of the animal. The records are discussed further in the accounts for individual structures.

Tick nymphs (*Ixodes ricinus*) and an adult male specimen were recorded from several samples from outdoor areas associated with ST3, probably having arrived in the deposits with litter dumped from within buildings. A nymph was also recorded from a single sample from ST4. The ticks could be associated with the presence of livestock, but the nature of their life cycle means that they could also have been imported with vegetation on which all life-stages (larvae, nymphs and adults) loiter in the hope of encountering a suitable host animal. Each stage also spends their inactive phases on the ground at the base of rough vegetation and could therefore potentially be imported with turf. Bracken and wood made up the bulk of the floors in ST3 and ST4, with sedges and rushes being of lesser importance (Chapter 11.5.5). Bracken in particular may well have harboured ticks. Nymphs tend to prey on small mammals, whereas mature individuals are more likely to feed on domestic animals or humans (Arthur 1963). They will also feed opportunistically on a wide range of other mammals and birds. *Ixodes ricinus* was recorded from the Early Christian period raised rath at Deer Park Farms in Co. Antrim, in association with various other insect ectoparasites of domestic animals (Kenward & Allison 1994a; Kenward et al 2011), and from Anglo-Scandinavian tenements at 16-22 Coppergate in York where there was good evidence for the processing or cleaning of sheep wool (Kenward & Hall 1995). *Ixodes ricinus* is a vector of disease in domestic livestock, with cattle and sheep being the most susceptible to infection. Even if the ticks did arrive on the settlement with vegetation of some sort, their occurrence suggests a common presence in the hinterland of the site and the potential hazard presented to domestic animals. Louping-ill, which mainly affects sheep but can also affect man and red grouse, is endemic in the northern and western parts of Great Britain and Ireland, including south-western Scotland (Jeffries et al 2014), having a similar effect to polio in humans (Arthur 1963).

#### 13.4.2 ST1

Foundation deposit [51] appears to have included both naturally lain wetland sediments and discarded litter from an existing building. Assemblages from other layers within the structure produced little information on occupation or living conditions, other than that wetland sediments appear to have been used to build up floor [11]. There were no clear signs amongst the insect remains from floors in other structures that this had occurred elsewhere. Insects from natural outdoor habitats were predominant in other deposits within the structure, which may indicate the proximity of marshy ground, and possibly encroachment by marshland, periods of inundation, or disuse/ abandonment

after an initial period of occupation. Small numbers of very poorly preserved decomposers in the assemblages from [036] and [032] provided the only suggestions of an occupation fauna. The paucity of insects associated with occupation may be due to poor preservation; it would be detrimental for the preservation of insect remains if the floor deposits were dry and aerated when occupation was occurring, for example.

### 13.4.3 ST2

Foundation deposits [264] and [267] directly overlay the natural peat and this was reflected in the insect assemblages; context [264] in particular contained a high proportion of aquatic and wetland taxa. A substantial house fauna in context [267] (23% of the assemblage) suggests the incorporation of relatively dry discarded litter from a building into the foundation. A house fauna was also a significant component (20%) in brushwood foundation layer [268], and primary brushwood flooring deposits [248] and [261] (both 15%). Remains of lice associated with large mammals (Trichodectidae) in brushwood flooring layer [248] in the outer parts of the building, included a specimen of *Bovicola ovis*, found on sheep. The same layer contained beetles suggestive of both somewhat foul and relatively dry litter. Fly puparia recorded in small numbers were mostly of stable fly (*Stomoxys calcitrans*), house fly (*Musca domestica*) and Sphaeroceridae, together with a few obligate foul matter beetles also suggesting a degree of foulness and suitable breeding habitat.

Insects in floor [251], associated with Hearth 4, included a range of taxa that may relate to the use of peat as fuel. Later floors associated with Hearth 3 ([221], [221A], [221B], [249], [250]), most of which were from outside the inner post-ring, produced assemblages characteristic of occupation, indicating both relatively dry mouldering material and damper fouler litter. Fly puparia were more common than in the earlier floor layers: those identified closely were mainly house fly (*Musca domestica*) and stable fly (*Stomoxys calcitrans*). Lice associated with domestic animals were relatively common in flooring [250] within the inner post-ring, with several heads identified as *Bovicola bovis*, found on cattle. A single human flea (*Pulex irritans*) was recorded from the same deposit.

Although some *Cercyon* species, potentially including some important obligate foul matter species, were not closely identified, numbers of obligate foul matter beetles and flies generally increase in the later floor levels. *Cercyon terminatus* and *C. unipunctatus* are especially typical of very foul matter. Foul decomposers were particularly well represented (10% of the fauna) in floor layer [296] close to the entrance, suggesting dirty conditions and potentially the presence of dung, perhaps because the floor here would have been subject to trample from outside that may have included wet mud and dung. The composition of this

assemblage suggests that somewhat stable-like conditions had developed in the substrate, probably tying in with the relative abundance of fly puparia in the later floor layers in the outer areas of ST2. House fly (*Musca domestica*) and stable fly (*Stomoxys calcitrans*) puparia were present throughout the sequence of floor layers. Both would breed in foul floor litter as well as various forms of human and animal waste (Hogsette & Farkas 2000). Although numbers of puparia varied between samples, of the 291 Muscidae puparia identified, only two individuals had not hatched, indicating a 99.3% success rate suggesting that litter inside the structure, especially in Phases 1 and 3 where Muscidae numbers were highest, would have not only been moist and foul but may also have been relatively warm. Survival of house fly larvae is greatest at 17–32°C (University of Florida Entomology Department website).

In summary, the insect faunas from ST2 were dominated by decomposers associated with occupation litter, with various taxa indicating a range of moisture contents and degrees of foulness within the floor layers. The floor surfaces, at least superficially, and bedding and roofing materials, were probably relatively dry, with significantly wetter and fouler conditions typically developing in the deeper parts of the floors due to the generally damp ground conditions and gradual decomposition of the floor litter. In comparison to the other structures studied in detail, these floors contained the highest proportions of house fauna (Figure 13.1) and typical synanthropes make up a higher proportion of total synanthropes. The higher proportions of house fauna may suggest relatively long-standing accumulations and maintenance of reasonably dry conditions that may accord with the largely domestic function of ST2 indicated by other lines of evidence. *Carpelimus bilineatus* group and other members of the ‘oxyteline association’ associated with damp substrates, although often common, were generally less well represented than in ST3 and ST4 (Figure 13.1).

Biting lice found on large mammals (Trichodectidae) were more commonly recorded than in other structures, with most specimens, including firmly identified *Bovicola bovis*, associated with the inner parts of the building. Lipid biomarkers for dung detected a dominant ruminant signal close to the hearth which might perhaps tie in with these records (Chapter 10.3.1). However, the lack of micromorphological or plant macrofossil evidence for the presence of livestock or dung in the building suggests that animals and/ or their dung may only have been present on a limited or temporary basis, such as when caring for young or sick animals by the hearth, or during brief periods of inclement weather; alternatively dried dung may have been used as fuel (Mackay & Henderson 2018; Mackay et al 2020). Flies in these deposits are unlikely to have been ovipositing on dried dung but were most likely attracted to fresh dung or decomposing plant material that had achieved a dung-like quality. The presence of lice does

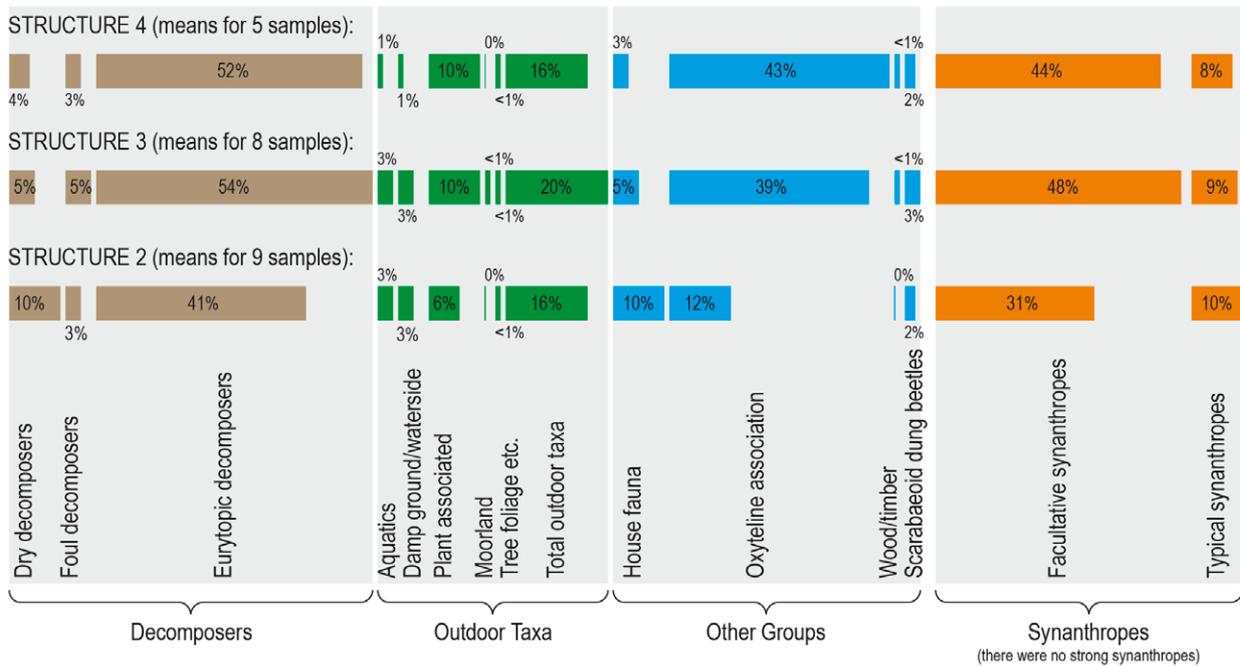


Figure 13.1. Comparison of insect assemblages from floors in ST2, ST3 & ST4 based on amalgamated assemblages (MNI >50) from each structure.

not necessarily indicate that living animals were present but might relate to the processing of skins or wool. *B. ovis*, definitely recorded only from the outer area of ST2, is often specifically associated with the floors of buildings where wool cleaning appears to have been occurring (eg it was numerous in house floors and re-deposited floor litter at Anglo-Scandinavian period Coppergate, York; Kenward & Hall 1995).

#### 13.4.4 ST3

There was a clear contrast between the insect faunas recorded from natural peat [15033] and the preconstruction layer of ST3 [15037], with good evidence from the latter deposit that discarded floor litter from a pre-existing building had been deposited and was mixed with natural sediment.

The general character of ST3, and the range of artefacts, suggests that it may have been as much a workshop as a domestic habitation (Chapter 4.2.13.2). The overwhelming impression from the insect assemblages is that floors were generally damp, tending to foul, although there was probably superficial, or perhaps temporary, dryness that enabled moulds to develop amongst plant litter. In some deposits there were good indications that stable-like conditions had developed, perhaps in the deeper, wetter parts of layers, but there were no indications of stabling as such from either micromorphology or plant macrofossils (Chapters 9.6.6 & 11.5.2.5). Fly puparia were abundant in some layers. Faecal signals of humans or horses in ST3 are

thought most likely to have arrived in the building as trample and, generally, lipid biomarkers suggest that there was less of a connection with livestock than in ST2 (Chapter 10.3.4). A single biting louse (*Bovicola* sp.) was recorded from floor [1144], and ticks (*Ixodes ricinus*) from [1714] and external layer [1715] where the dumping of floor litter was indicated. The presence of ectoparasites associated with domestic animals may tie in with evidence for moderate foulness in many of the deposits in this structure but the records do not necessarily imply the presence of live animals. The use of the structure as a workshop may have entailed the processing of skins and wool, butchery, and other similarly 'dirty' activities producing foul debris, which in some cases might have included faecal matter. There were slight hints of the importation of dryland vegetation and turf in several samples, and stake-lined hollow [15038] may have contained peat or turf.

#### 13.4.5 ST4

There was micromorphological evidence for stabling from this structure (Chapter 9.6.6). A record of the biting louse *Bovicola bovis* in layer [1021] suggests that the animal inhabitants may have included cattle. A poorly preserved unidentified sucking louse (Anoplura) came from the same layer, and a tick (*Ixodes ricinus*) nymph was identified from [1024]. The floors appear to have been generally damp since the 'oxyteline association' accounted for 43% of the fauna from the structure as a whole, and the house fauna associated with relatively dry litter was poorly represented

(3%). Considering the micromorphological evidence for stabling associated with at least some of the floors, it is interesting to note that obligate foul decomposer beetles were not particularly well represented by the standards of other buildings (proportions ranged from 2–5% with a mean value of 3%; Figure 13.1). Conditions foul enough to attract numerous breeding flies, mainly Muscidae, were indicated by vast numbers of puparia in two deposits where beetle preservation was poor, however. *Oxytelus sculptus*, which is often a convincing indicator for stable-like conditions (Kenward & Hall 1997), accounted for 2–6% of the assemblages, similar proportions to those seen in most floors elsewhere.

Both the relatively low numbers of foul matter beetles and the lower overall decomposer diversity in comparison to assemblages from ST2 and ST3 may be a result of the periodic removal of foul build-up and more frequent replenishment of floor litter that, based on micromorphological evidence, appears to have taken place in at least some layers. Flies appear to have readily taken the opportunity to breed amongst the litter as it became foul enough, their rapid rate of development from egg to adult fly meaning that they would probably be less affected by removal of litter. Floor replenishment in structures that were used for domestic occupation, workshops or storehouses was probably much less frequent. The season during which animals were in occupation is also important since lower temperatures negatively affect the activity of many beetles (Speight et al 1999). A study of beetles on modern Icelandic farmsteads found that pitfall traps used to catch beetles in the floors of buildings where sheep and cattle were housed caught many more beetles in July than those placed in the floors in September (Forbes et al 2016).

#### 13.4.6 Waste disposal

Insect evidence indicates that foundation and preconstruction layers for the palisade and ST1, ST2 and ST3, midden layers, deposits associated with the trackway and external layers outside ST3, had all included a proportion of discarded floor litter. A house fauna was particularly well represented in the foundation of ST2 ([267] and [268], 20–23% of the insect fauna), suggesting that the incorporated litter had come from relatively dry long-lived floors, or bedding or roofing materials. Insects in deposit [1146] outside ST3 appear to have almost entirely come from ejected litter, with only a very small component representing the natural background fauna. The composition of this assemblage was very similar to those from within ST3. As well as providing material for levelling or building up the substrate before construction, deposition of litter in external areas may have helped, at least temporarily, to reduce mud and wetness as well as generally raising the ground level.

#### 13.4.7 Importation of natural materials

The clearest and most consistent groups of insects indicating the importation of natural materials into buildings were plant feeders associated with wetland vegetation, particularly sedges and rushes. In ST2 and ST3 there were also suggestions of the importation of dryland vegetation that could have included turf and perhaps hay, although this was less clear. *Ulopa reticulata*, a planthopper that lives exclusively on heathers (*Calluna* and *Erica*) was recorded from two deposits (midden [18026] and a layer outside ST3); the records may indicate the bringing in of moorland turf for burning or building material, or heather that might have been used for bedding or for other purposes within the structures. Heather would also have been a useful source of fibre. Insects from moorland habitats are generally likely to be under-represented because various eurytopic species recorded would include moorland amongst their habitats but would not be counted as part of this group.

Scale insects found on the branches of trees and shrubs (Coccoidea: Diaspididae) were present in at least 16 samples, most commonly from deposits associated with ST3 and ST4 (most samples from ST2 were not examined for these). Most of the scale insects from internal deposits were probably brought in attached to roundwood or brushwood used structurally, and in the case of external deposits they may have come from a combination of discarded floor material, wooden structures and from twigs incorporated into the deposits from overhanging trees.

The buildings were constructed directly onto natural peat and foundation deposits appear to have incorporated some of this to varying extents, but there were also indications in some samples that peat and wetland sediments were used elsewhere in the buildings as construction materials; to build up the mound and floor [011] in ST1, and probably as part of the packing material within outer wall cavity [234] in ST2, for example. The most convincing insect evidence for the use of peat for fuel was from flooring [251] associated with Hearth 4 in ST2. Elsewhere, based on records of limited numbers of peat and fenland beetles in various floors, peat and other wetland sediments might perhaps have been used for bedding materials or in levelling, but this seems likely to have only been a minor component since the predominant elements in most floors were plant materials of various kinds and brushwood (Chapter 11.5.5; Robertson & Roy 2019).

Some aquatic beetles might perhaps have been imported with water used on the settlement, but this is unclear since wetland habitats with a corresponding aquatic background fauna were present relatively close to the buildings and localised flooding may well have occurred from time to time.

### 13.4.8 Wood

Woodworm beetles (*Anobium punctatum*), with larvae that can be serious pests of structural timber, were only sparsely recorded on the site (single individuals from five samples). They are generally thought to prefer older timber (Hickin 1975) and would be less likely to attack wood in buildings that were short-lived or constructed from fresher wood. Beetles found under bark were present in small numbers (Scolytinae sp. (1 sample), *Cerylon* (2), Salpingidae (3)). While these could have been brought on to the site with structural timber that retained its bark, or with firewood, it is equally likely that the small numbers represented had dispersed from mature trees or shrubs growing close to the settlement.

### 13.4.9 Evidence for the local environment and vegetation

On sites where natural materials were used as building materials and floor litter, it can be difficult to distinguish which insects from outdoor habitats reflect the local environment and vegetation rather than imported material, although much of the imported wetland vegetation in this case was almost certainly cut reasonably locally. At BLoM proportions of outdoor insects were almost always consistently higher in external deposits, even though most of these included varying proportions of ejected floor litter, and a good proportion of these are therefore likely to represent local habitats and vegetation. In combination with the evidence from a small number of layers that appeared to be largely of natural origin it is possible to build up a broad picture of a permanently wet, marshy environment locally throughout Episodes 1 and 2. Aquatic beetles identified closely were predominantly taxa found in still- to slowly-flowing waters. *Hydraena britteni*, found in peaty and fen habitats and typically associated with shaded seepage, was the most frequently recorded aquatic beetle from the site as a whole. *Hydraena testacea*, recorded in several samples, is usually associated with marginal vegetation just above the water line (Foster *et al* 2020: 20, 46). Riffle beetles (Elmidae) were represented by *Oulimnius troglodytes*, *O. tuberculatus* and *Elmis aenea*. *O. tuberculatus* and *E. aenea* are associated with well-oxygenated running water, but *O. tuberculatus* less commonly also occurs on the stony lake shores (Holland 1972). Around half of the sites where *O. troglodytes* is currently found are lakes, and both *Oulimnius* species occur together in a number of lowland lochs in south-western Scotland (Foster & Merritt 2021), including archaeological records from Iron Age Cults Loch that were undifferentiated during the original analysis (Allison 2018) but have subsequently been re-examined by Garth Foster. The occasional records of *Elmis aenea*, *Hydraena nigrita* and *Ochthebius bicolon* may reflect the presence of a running water channel in the vicinity. Water from active channels may have been brought onto the

site for human consumption or other purposes requiring reasonably clean fresh water.

Wooded wetland and perhaps somewhat swampy conditions were particularly indicated in construction horizon [1028] associated with the Episode 1 palisade. A range of taxa were associated with damp litter, woody vegetation and loose bark, and plant-feeding beetles included *Donacia obscura*, usually found on sedges (Cyperaceae), and *Notaris acridulus* which is associated primarily with reed sweet-grass (*Glyceria maxima*) and perhaps with other semi-aquatic grasses. Similar habitats with constantly wet ground, waterside mud, emergent and waterside vegetation and shaded ground were indicated in deposits associated with the trackway. There were consistent indications for willows and/ or poplars and alder, probably associated mainly with marshy ground. A record of *Rhynchaenus quercus*, a weevil with larvae that mine the leaves of oak, from within ST2 may suggest trees on relatively dry ground, but the adults overwinter under bark and could have been imported with timber or firewood. There were also suggestions in some samples of areas of disturbed ground with ruderal vegetation, and for nettles (*Urtica*) and docks (*Rumex*) growing on nutrient-rich ground. Grassland, perhaps on drier land further afield, was suggested by consistent records of *Phyllopertha horticola*, a small chafer with turf-feeding larvae. This species was also common at Cults Loch 3 in deposits contemporaneous with Episode 1 (Allison 2018). It is characteristic of poor-quality permanent grassland on light soils where there is a diversity of flowering plants and a high proportion of weeds (Raw 1951). Its larvae feed on turf roots and in archaeological contexts it is sometimes suspected of having been imported onto sites in turves or cut vegetation such as hay (Kenward 2009: 292), but in the deposit where it was most common (context [011] in ST1) there were no signs of such materials amongst plant macrofossils (Chapter 11.4.1.1). Given their relatively large size, 'June bugs' as they are now known colloquially, may have been a readily visible part of the local background fauna during the emergence of the adult beetles from turf on warm, sunny days in early summer. Mass emergences sometimes occur in huge numbers, although not as frequently nowadays as they formerly did (Jessop 1986: 29).

### 13.4.10 Livestock

Scarabaeoid dung beetles, here represented chiefly by Aphodiinae spp., are primarily associated with dung of large herbivores deposited in the open. They were recorded in small numbers in almost all the samples, being more common in layer [011] in ST1 (9% of the insect fauna) and in an assessed sample from [611], a sediment which accumulated just outside the palisades (Chapter 17.2.4.1), where in both cases the main indications were for naturally lain sediment. Their low-level occurrence combined with

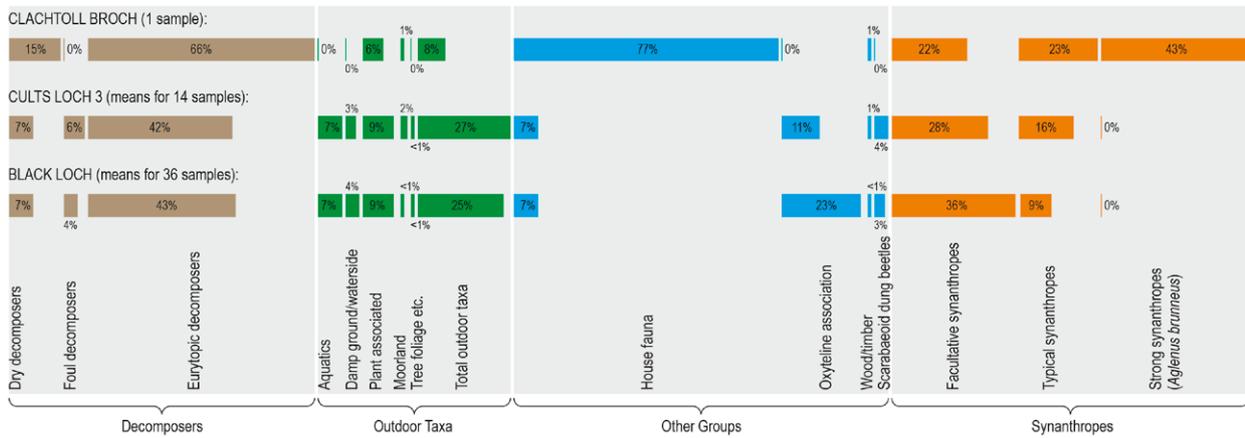


Figure 13.2. Comparison of whole site statistics from Black Loch, Cults Loch 3 & Clachtoll Broch. Proportions of each ecological group were calculated by amalgamating figures for individual assemblages (MNI >50).

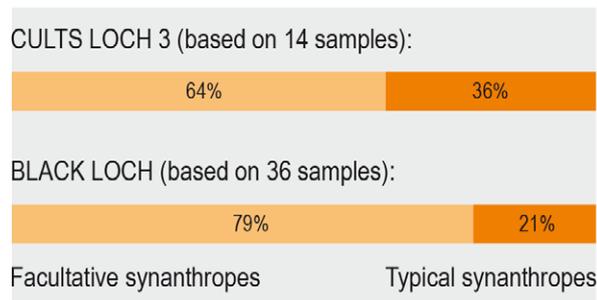


Figure 13.3. Proportions of typical and facultative synanthropes at Black Loch and Cults Loch expressed as percentages of total synanthropes in assemblages with MNI >50.

the range of species represented throughout most of the sequences probably mainly reflects the presence of domestic animals on and around the settlement. Some of the species recorded will exploit various forms of foul decomposing plant litter in addition to dung, or shelter in flood refuse, while others are attracted to light (Jessop 1986: 19–25). The consistent records from internal deposits suggest that some did live amongst the fouler parts of floor layers rather than simply arriving as background fauna but their presence does not necessarily indicate that livestock were stabled there. An aphodiine beetle charred with other insects in wall cavity [315] of ST2 appears to have been living in the deposit when it was burnt, for example. Apart from simply exploiting floor litter that had developed many of the characteristics of dung, some species may also have taken advantage of the sheltered conditions provided by the buildings for overwintering since the floor litter, from a beetle’s point of view, would have had many features in common with flood refuse or similar natural accumulations. Small quantities of dung trampled into internal deposits may also have increased the attractiveness of the floor

litter, and some individuals may have been imported with cut vegetation or turf.

Adult stable flies (*Stomoxys calcitrans*) require a blood meal to complete their life cycle so their presence within ST2 (and probably also in ST3 and ST4 where fly puparia were not examined in detail), certainly suggests that mammals were living locally, but the larvae will feed on both animal and human waste and also foul plant matter, so they do not necessarily indicate the presence of animals and their dung within buildings. On the present site, even the finds of biting lice (*Trichodectidae*) and ticks (*Ixodes ricinus*) do not provide unequivocal evidence for the presence of living animals within the buildings.

### 13.4.11 Comparisons with other sites

The occurrence and relative abundance of various groups of insects on ancient settlements will reflect the nature of occupation and activity, types and uses of buildings, local geography and the date of the site. The types of deposits sampled are also important if comparisons are to be made between multiple sites. The insect data from BLoM generally fits the pattern for other sites of a similar nature, such as Cults Loch 3 crannog, where activity in the late 5th century BCE was contemporaneous with Episode 1 at BLoM, and Buiston crannog, dated to the Early Historic period (Allison 2018; Kenward et al 2000).

Whole-site statistics produced by amalgamating counts for various broad ecological groups in the whole assemblage, were used to compare findings from BLoM with Cults Loch 3 (Figure 13.2).

The assemblages are similar in many respects, both in the abundances of different ecological groups and the range of taxa represented. Oxyteline rove beetles, dominated by *Carpelimus bilineatus* group, are better represented at BLoM in terms of both minimum numbers of individuals and taxa, however, perhaps suggesting generally damper,

	<b>Black Loch of Myrton</b>	<b>Cults Loch 3</b>	<b>Clachtoll Broch</b>	<b>Buiston Crannog</b>	<b>Deer Park Farms</b>
Date of site	Late 5th c. BCE	Late 5th c. BCE	Late Iron Age	Early Historic period	Early Christian period
Site % total synanthropes	45%	44%	80%	36%	54%
Site % total facultative synanthropes [sf]	36%	28%	14%	26%	9%
Site % total typical synanthropes [st]	9%	16%	23%	10%	12%
Site % total strong synanthropes [ss]	<1%*	0%	43%	0%	33%
sf as % total synanthropes	79%	64%	17%	71%	18%
st as % total synanthropes	21%	36%	29%	29%	21%
ss as % total synanthropes	<1%*	0%	54%	1%	61%

Table 13.4a. Synanthrope structure. Comparisons of means for proportions of different groups of synanthropes in whole-site assemblages. Data compiled by amalgamating assemblages from each site. Data for Buiston and Deer Park Farms from Barrett et al 2007, Tables 14.6 & 14.8. \*grain pest possibly laboratory contaminant.

	<b>Black Loch of Myrton</b>	<b>Cults Loch 3</b>	<b>Clachtoll Broch</b>	<b>Buiston Crannog</b>	<b>Deer Park Farms</b>
Date of site	Late 5th c. BCE	Late 5th c. BCE	Late Iron Age	Early Historic period	Early Christian period
sf as % total synanthropes	79%	64%	38%	71%	44%
st as % total synanthropes	21%	36%	63%	29%	52%
ss as % total synanthropes	<1%*	0%	0%	1%	3%

Table 13.4b. Synanthrope structure minus *Aglenus brunneus*. Comparisons of means for proportions of different groups of synanthropes in whole-site assemblages. Data compiled by amalgamating assemblages from each site. Data for Buiston and Deer Park Farms from Barrett et al 2007, Tables 14.6 & 14.8. \*grain pest possibly laboratory contaminant.

dirtier conditions in and around the structures at BLoM, while insects associated with heather moorland are more visible in some deposits at Cults Loch, likely reflecting the use of peat and/or moorland turf as fuel. A more significant difference between the two sites may be that the proportions of typical synanthropes (both individuals and taxa), is higher at Cults Loch which may reflect more intensive, or perhaps more domestic occupation (Figure 13.3).

Typical synanthropes at Cults Loch included *Xylodromus concinnus*, *Cryptophagus scutellatus* and *Cratarea suturalis*, all characteristic of artificial habitats. None of these were recorded at BLoM despite the larger number of samples but they might simply be chance absentees rather than indicating a lack of particular microhabitats. All these observations are made with caution, however, since there have only been limited modern taphonomic studies of beetle communities within buildings, and in any case comparable modern parallels to these types of buildings are lacking.

An assemblage from a Late Iron Age deposit inside Clachtoll Broch has been included in Figure 13.2 by way of contrast. The broch is the remnant of a substantial stone-built structure on the NW coast of Scotland where

occupation of the excavated levels is thought to have taken place circa 50 BCE to 10 CE. Insect remains were recovered from a sample from the floor of Cell 1, thought to have been a storage area that eventually became a midden dump (Allison 2022). Although there have been few taphonomic studies exploring the various factors involved in the development of communities of insects within buildings, the assemblage from Clachtoll is very different in composition to BLoM and Cults Loch in that it is dominated by a very large house fauna (77% of the assemblage) with the strongly synanthropic *Aglenus brunneus* the most numerous species (43% of the fauna), and *Xylodromus concinnus* and white-marked spider beetle (*Ptinus fur*) both proportionally well represented. The low diversities of the whole assemblage and the decomposer component indicate a very pure community exploiting a narrow range of relatively dry, sheltered conditions ( $\alpha = 10$ ,  $SE = 2$ ;  $\alpha RT = 2$ ,  $SE = 1$ ), likely reflecting both the different construction and more restricted use of Cell 1 that provided better niches and conditions for certain species to thrive. Longevity of the building may well also have been a factor in the high proportion of house fauna since some species continue to live and breed even after buildings go out of use

if conditions remain suitable (Smith 1996). The assemblage is clearly distinct from the faunas from BLoM and Cults Loch even if *Aglenus brunneus*, sometimes suspected of being a post-depositional invader (eg Kenward et al 2011), is removed from the calculations (see Table 13.4b), and much damper conditions were indicated.

The house fauna at BLoM is impoverished in comparison to Clachtoll and more generally by the standards of historic period sites, consisting predominantly of a combination of three taxa (*Latridius minutus* group, *Cryptophagus* and *Atomaria*), with the addition of a white-marked spider beetle (*Ptinus fur*) in a single sample. Spider beetles were not recorded at either Cults Loch or Buiston. There were no records of *Aglenus brunneus* from BLoM or Cults Loch, and Iron Age records elsewhere are rare. It is emphasised, however, that to date relatively few insect assemblages have been investigated from prehistoric settlement sites compared to the Roman and later periods. Being blind and flightless, *A. brunneus* has only limited mobility, so its occurrence on ancient occupation sites very likely depends on contact and transport of materials between settlements.

Synanthropes are categorised as ‘strong’, ‘typical’ or ‘facultative’ based on their dependence on human occupation and activity (methods section; Kenward 1997; Smith et al 2020). The divisions between the three categories are somewhat arbitrary and the degree of synanthropy of individual species may vary geographically or with the circumstances of individual sites. All beetle species currently regarded as synanthropes would have originated in natural situations and this has been explored by Kenward & Allison (1994b). Suggested mechanisms by which synanthropy originated include gradual accretion of species from natural environments onto settlements that provided suitable conditions for them to successfully live and breed, the movement of species between locations in transported materials, increasing trade, and the development of urbanisation. Generally speaking, the range of synanthropes recorded on archaeological sites increases with time, as does the degree of synanthropy. The study of Smith et al (2020) found that very few strong synanthropes are present on prehistoric sites and the range of typical synanthropes is also limited by comparison with Roman and later periods, with the caveat that relatively few prehistoric settlement sites have been investigated and data from the Mesolithic and Neolithic periods is particularly scarce. Some ‘synanthropic’ taxa, especially on these very early sites may represent a natural fauna exploiting suitable conditions, eg a small group of dry decomposers recorded from Neolithic deposits at Medmerry on the Sussex coast appeared to be associated with ancient, hollow trees rather than settlement (Allison 2019). *Latridius minutus* group, *Cryptophagus*, and *Atomaria*, all associated with relatively dry mouldering plant litter and making up the ‘typical’

house fauna seen at BLoM, can be found in natural habitats such as dry grass tussocks and leaf litter (Palm 1951), as well as in the artificial conditions amongst dry plant material in buildings. The same taxa have been recorded from Mesolithic wood peats on ‘Urwaldrelikt’ sites where there was little or no evidence of human activity, and notably on a possible occupation site of the same period at Lough Kinale in Ireland (Hill 2015). Some synanthropes become apparent in the British archaeological record only after the onset of the Roman occupation, so their absence on prehistoric sites such as BLoM and Cults Loch is unsurprising.

The relative abundance of the three categories of synanthrope can be used to track the development of archaeological insect faunas and may in some cases provide information on the nature of occupation and have implications regarding the size and age of settlements. The presence of a wider range and greater number of species generally indicates that suitable ecological niches were more abundant. To date, evidence for the development of the synanthropic fauna is chiefly from archaeological assemblages and there has only been limited taphonomic work on assemblages from extant buildings (eg Smith et al 2005; Kenward & Tipper 2008; Kenward et al 2012; Forbes et al 2016), none of which are exactly comparable to ancient situations, either in terms of building construction and occupation, or the beetle communities present.

In Table 13.4a the structure of the synanthropic faunas at BLoM and Cults Loch have been compared with data from comparable isolated rural sites of differing dates where the categorisation of synanthropes and methods of compiling the data were broadly the same. Facultative synanthropes that are also common in natural situations were in the majority at BLoM and Cults Loch 3, as would be predicted for prehistoric sites although, as noted above, typical synanthropes were proportionally more common at Cults Loch. The strongly synanthropic grain pest *Oryzaephilus surinamensis* was represented by a single individual in ST1 at BLoM, but its presence could potentially be a result of laboratory contamination (see below).

The synanthropic structure and low mean decomposer diversities at Buiston crannog, where occupation appears to have lasted 80–90 years but may have been intermittent (Kenward et al 2000), is somewhat intermediate between BLoM and Cults Loch. Synanthropes at Buiston were impoverished by the standards of much less isolated Roman sites of a similar date in Carlisle and York (Allison et al 1991a, 1991b; Hall & Kenward 1990).

The structure of the synanthropic fauna is notably different at both Clachtoll Broch and Deer Park Farms, largely brought about by the abundance of *A. brunneus* (43% and 32% of the assemblages respectively, Table 13.4a), and *Epaulaecus unicolor*, a spider beetle that appears to be indicative of long-term, stable habitats, at Deer Park Farms (Kenward et al 2011). When species are super-

abundant statistics are distorted to some extent, and since it was possible that *A. brunneus* may have bred post-depositionally at Deer Park Farms and Clachtoll, it has been subtracted from the assemblages in Table 13.4b. Even so, the composition of the assemblages remains clearly different. The raised rath at Deer Park Farms appears to have been intensively occupied over a considerable period of time which is thought to at least partially account for the well-developed synanthropic fauna, despite its apparently isolated location. Alternatively, the strong synanthropy at Deer Park Farms may be due to the incidental importation of insects with materials transported from other settlements that already supported a rich synanthropic fauna. Trade in stored products and materials between settlements increases the opportunities for strong synanthropes to arrive, even in isolated locations. Grain pests, for example, appear to have spread rapidly throughout Britain with the transport of commodities during the earliest years of Roman occupation in Britain (Smith & Kenward 2012; Smith et al 2020). The use of discarded floor litter or other organic structural materials that have already developed a substantial synanthropic insect fauna as foundation deposits for new buildings, as appears to have been the case at BLoM, may well have been a factor in the development of synanthropic faunas, since it provides ‘founder populations’ that will readily colonise suitable habitats within new buildings.

The inhabitants of BLoM are unlikely to have been living in complete isolation and there may have been various degrees of contact with a wider community of connected groups. Goods or materials transported to and from the site could therefore potentially have contained insect stowaways. A record of *Corticaria serrata* from ST2 is worthy of note since this appears to be earliest confirmed occurrence of this species in Britain, having previously been seen as a Roman introduction (Kenward et al 1986). Its habitats include haystack refuse and similar litter, and it also lives under bark. It is possible, however, that it has been overlooked on prehistoric sites since separation of *Corticaria* species is often not pursued. Unfortunately, there is a significant element of doubt regarding the record of a saw-toothed grain beetle (*Oryzaephilus surinamensis*) from a primary floor deposit in ST1. The rest of the assemblage largely indicated the incorporation of naturally lain sediments, probably peat, into the floor deposit, with only a slight hint of insects associated with occupation of the structure at that time. Samples from a Roman site where grain pests were common were processed immediately prior to those from ST1, raising the possibility of cross-sample contamination. The species has not previously been recorded from deposits pre-dating the Roman occupation in Britain (eg Buckland 1978; Smith & Kenward 2011) but far fewer prehistoric occupation sites have been investigated compared to the Roman period.

### 13.5 Conclusions

Insect remains have contributed significantly to the picture of domestic life at BLoM. Occupation appears to have occurred amongst various degrees of dampness, both within buildings and outside them, and the predominantly excellent preservation of insect remains in most internal and external deposits attests to the permanence of wetness of the substrate. Floors consisting of cut vegetation and woody material developed a range of ecological conditions that attracted characteristic groups of beetles. Some floors, notably in ST2, may have been reasonably dry superficially or at least temporarily, but litter layers in almost all internal deposits would have become progressively damper and mouldy, then wetter and fouler as time progressed. There would have been variations in moisture and foulness relating to spatial and temporal differences in the use of the structure, with bedding, walls, and roofs likely to have been drier than floors. Activities that produced foul debris, such as cleaning and working skins or wool, may have been focused on certain areas within some buildings.

Lipid biomarkers provided signals for various forms of dung in ST2 and ST3, with the strongest indications from ST2, but there was no micromorphological and plant macrofossil evidence indicating the presence of livestock or substantial amounts of dung in the same deposits. Decomposer beetles specifically associated with foul organic matter, that might encompass both dung and damp rotting vegetable matter, were recorded in most floor layers but they were not present in the proportions that would usually be expected if livestock were kept long-term in some of the buildings. Most of the existing insect evidence for stabling comes from Roman or medieval sites and occasionally from sites where there was historic evidence for stabling, however (eg Hall & Kenward 1990; Kenward & Hall 1997; Allison 2021) and there is currently less of an understanding of what the associated insect fauna might be like in prehistoric deposits. In some floors the substrate had certainly become foul enough to attract breeding flies. Fly puparia were examined in detail from ST2 and stable fly (*Stomoxys calcitrans*) and house fly (*Musca domestica*) were common, but these species will breed successfully on both dung and foul rotting plant material. Records of small numbers of biting lice found on sheep and cattle from some floors were also equivocal as to whether animals or their products such as skins and wool were present. Tick nymphs recorded from ST3 and ST4 are perhaps more likely to have been imported with cut vegetation such as bracken rather than indicating the presence of livestock. The Wigtownshire area has generally mild, albeit wet, winters due to the effects of the Gulf Stream, which may mean that most animals were kept outdoors except in particularly poor weather or if sick, giving birth or when very young. Lipid biomarkers for dung detected a dominant ruminant signal close to the hearth in ST2 which may indicate that

animals and/ or their dung were present there on a limited or temporary basis, perhaps for some of these reasons (Chapter 10.3.1). The relatively large samples required to recover sufficient insects for analysis may not pick up on subtle differences within a deposit in the same way that faecal sterol and micromorphological samples do.

There was micromorphological evidence that livestock were kept in ST4 for at least some of the time. Relatively low numbers of obligate foul matter beetles and lower overall decomposer diversity compared to other buildings might possibly be a result of the more frequent (or thorough) removal of foul build-up and replenishment of floor litter. Seasonality of stabling activity may also have been a factor in the development of the beetle fauna. Fly puparia, mainly Muscidae, were very abundant in ST4 generally, indicating foul substrates, and they were especially well represented in some layers where beetles were scarce. The rapid reproductive rate of flies would make them much less vulnerable than beetles to periodic floor clearance. There was evidence of litter removal and floor refurbishment from a combination of plant macrofossils and micromorphological work in ST2 (Robertson & Roy 2019) but this seems to have had less effect on the size and diversity of the insect assemblages. The reasons for this are not clear but various factors such as a greater intensity of occupation in ST2 providing a wider range of microhabitats, and less frequent episodes of litter removal might have played a part in allowing insect populations to build up.

Insects associated with natural peat and wetland sediments were well represented in foundation deposits, and lesser numbers in some samples suggest that peat may also have been used in construction, for example to build up the mound and floor [11] in ST1 and probably forming part of the packing material within outer wall cavity [234] of ST2. Small numbers of peat and fenland beetles in floor samples may have been imported with cut wetland vegetation that was the predominant element in most floors, but in some cases peaty sediments may have been a minor component, perhaps used for bedding materials down or in levelling. Peat, once dried out, would also have been an effective material for neutralising any very wet or foul areas of flooring. There was convincing insect evidence for the use of peat for fuel was from flooring [251] associated with Hearth 4 in ST2.

Wetland vegetation, particularly sedges and rushes, bracken, and roundwood and brushwood was brought into the structures as flooring and structural materials, and some of these materials were reflected in the insect assemblages. Some insects in ST2 and ST3 were suggestive of the importation of dryland vegetation that could have included turf and perhaps hay, but this was less clear. The use of heather or moorland turf was suggested by records of *Ulopa reticulata*, a planthopper that lives exclusively on heathers, in midden [18026] and a layer outside ST3.

Evidence in the form of a fauna clearly associated with flooring layers indicates that discarded litter from within buildings was dumped into the Episode 1 midden. Insects in deposit [1146] outside ST3 appear to have almost entirely come from ejected litter, with only a very small component representing the natural background fauna, the composition of this assemblage being very similar to those from within ST3 itself. As well as being convenient, deposition of litter in external areas may have helped, probably temporarily, to reduce mud and wetness as well as generally raising the ground level. Discarded litter was also used in foundation and levelling deposits for new structures, and any living insects within this material may well have formed founder populations that could exploit suitable niches within the subsequent layers of cut vegetation.

A significant challenge in the interpretation of local environmental conditions from insect remains on an occupation site lies in separating taxa representing natural and anthropogenic environments. Much of the insect evidence at BLoM relates to conditions and ecological niches within the structures where substantial amounts of wetland vegetation, bracken, and brushwood were used in flooring and construction, with the incidental importation of a range of associated insects. It seems clear, however, that much of the imported wetland vegetation, at least, was almost certainly cut reasonably locally (Chapter 17). The clearest evidence of the local environment in the vicinity of the settlement comes particularly from insects from external areas, notably deposits associated with the palisade and trackway, and from natural peats underlying the buildings. A permanently wet, marshy environment appears to have been present locally throughout Episodes 1 and 2. Some marginal areas would have been rather bare or sparsely vegetated and muddy, but there also appears to have been long waterside or emergent vegetation including sedges (*Carex*), reed sweet-grass (*Glyceria maxima*) or other semi-aquatic grasses, and probably bur-reeds (*Sparganium*). There were consistent indications for wooded wetland where trees or shrubs included willows (*Salix*) and/ or poplars (*Populus*) and alder (*Alnus*). The presence of a weevil with leaf-mining larvae from a deposit within ST2 might perhaps suggest oak (*Quercus*) trees existed on relatively dry ground but the evidence is equivocal since the species hibernates under bark and could conceivably have been imported with timber or firewood. In some places there would have been areas of disturbed ground with 'weedy' vegetation, and nettles (*Urtica*) and docks (*Rumex*) on nutrient-rich ground. Disturbed or rough grassland, perhaps on drier land further afield, was suggested by consistent records of *Phyllopertha horticola* and *Dascillus cervinus*, both of which have turf-feeding larvae. Consistent records of a range of scarabaeid dung beetles (chiefly Aphodiinae spp.) probably mainly indicate the presence of domestic animals on and around the settlement, and the availability of dung, although some

species would have been attracted to other forms of foul decomposing plant litter on the settlement including floors that had become foul. Stable flies (*Stomoxys calcitrans*) require a blood meal to complete their life cycle also suggesting that domestic mammals were present nearby.

The settlement at BLoM probably had some degree of contact with the wider population of the area and goods or materials transported to and from the site might potentially have contained insect stowaways. Two species are of interest in this regard: saw-toothed grain beetle (*Oryzaephilus surinamensis*) from a primary floor deposit in ST1, and *Corticaria serrata*, found in habitats such as haystack refuse and similar litter, from ST2. The former has to date not been recorded from pre-Roman deposits, and the latter has previously also been thought to be a Roman

introduction (Kenward et al 1986), although, as has been noted elsewhere, prehistoric occupation deposits have been much less well studied than those representing Roman and later periods. There is a significant element of doubt regarding the grain beetle, however (see overview above), but its occurrence here cannot be dismissed entirely since small numbers of these beetles could conceivably have been present in Britain much earlier than currently thought, but not in sufficient numbers to show up in the archaeological record. It is particularly found in association with damp and spoiled grain, and if both stored grain and the beetle were present at BLoM, the generally damp conditions within the structures would be ideal for it to have built up substantial populations and there was no evidence of this in any of the deposits studied.



# Wood Use and Woodworking

## 14.1 Introduction

In this chapter the evidence for the use of wood in the construction and occupation of the settlement is presented. In Chapter 14.2 the wood species used by the occupants for fuel and for different structural components is summarised and variations in size, age and species composition explored. In Chapter 14.3 the evidence for woodworking, from conversion of the tree to dressing and joinery is presented, from the tow-holes found on so many of the worked timbers to the ways in which the bases of posts, planks and stakes have been shaped. The primary entrance structure into ST2 was the most complex example of multi-component carpentry in the settlement so Chapter 14.4 is dedicated to its description and analysis. No woodworking tools were recovered from BLoM but in the toolmark evidence surviving on the wood there is plentiful proxy evidence for the types and sizes of tools available to the builders. In Chapter 14.5 the recording methodology is described and the evidence for axes, adzes, chisels and gouges presented. A practical experiment to replicate the tangentially cleft planks and their tow-holes was undertaken by Hamish Darrah for an MSc in experimental archaeology (Darrah 2022) and a *précis* of his experiment and observations is presented in Chapter 14.6. Finally, in Chapter 14.7 an attempt is made to quantify the amount of wood required to build some of the roundhouses and palisades, so that comparative construction costs can be assessed.

## 14.2 Wood use

*Anne Crone*

Throughout the entire occupation of the settlement only six main species, with trace amounts of three others, have been used, in construction and as fuel (Figure 14.1).

The wood species used in the manufacture of artefacts is discussed in Chapter 15.4.7.1. In this section the uses to which each species has been employed will be examined. Total amounts of each species are presented in Figure 14.1 by category of use. The latter has been divided into *Structural/ Vertical*, *Structural/ Horizontal*, *Wickerwork*, *Offcuts* and *Charcoal*.

The term *Wickerwork* is here used to include all components of the horizontal hurdles used as floor coverings, ie both sails and withies. However, for many of the vertical wickerwork walls only the stakes survive; these are included under *Structural/ Vertical* while the remains of any withy courses are recorded under *Wickerwork*. *Wickerwork* also covers brushwood. The logic behind this category is that it covers all small diameter roundwood and should therefore reflect a particular woodland type (Chapter 17.2.3).

Wood use is discussed below by episode and structure.

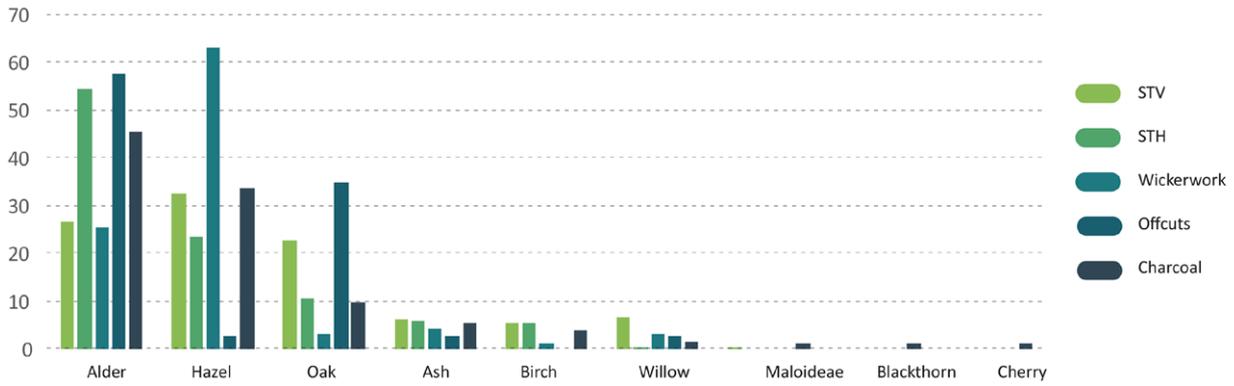


Figure 14.1. Species composition, graphed by category of use (STH = structural/ horizontal. STV = structural/ vertical).

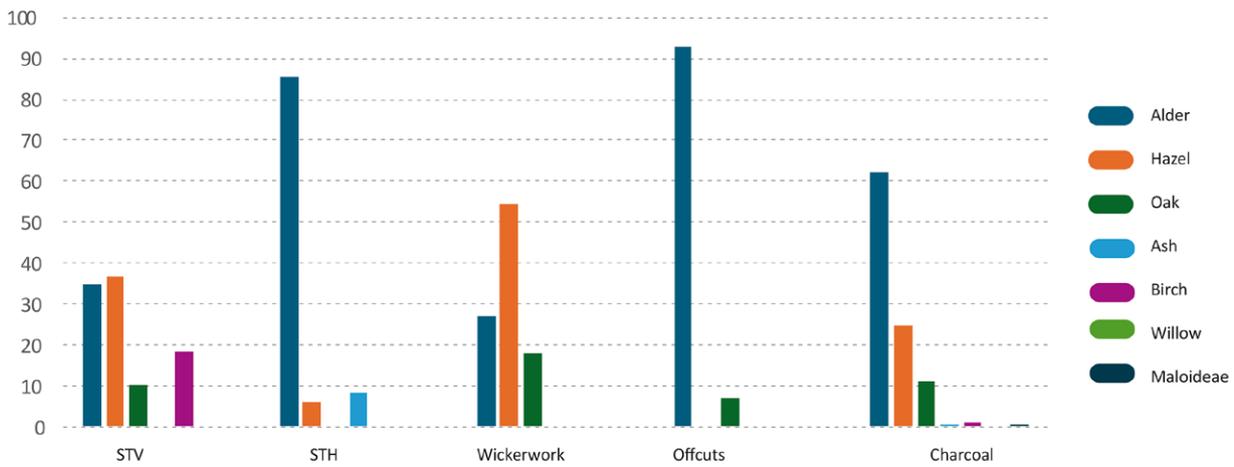


Figure 14.2. ST1: species composition (STH = structural/ horizontal. STV = structural/ vertical).

## 14.2.1 Episode 1

### 14.2.1.1 ST1 (Figure 14.2)

The assemblage is dominated by alder which accounts for 54% of the structural timbers. Hazel (20%), oak (9%), birch (6%) and ash (3%) account for the remainder.

#### Structural timbers

Alder has been used almost exclusively when horizontal timbers are needed, for the primary foundation layers [046] and [047], for the radial and tangential sub-floor framework ([009], [010] and [022], and for the framework around the hearth [041]. The only ash in the assemblage was found in some of these features, in [046] and [022]. Alder has also been used for three of the posts in the post-ring.

Only a small amount of oak was found in ST1. It had been used almost exclusively for vertical components, for posts [021/C] and [021/D] and for the cluster of large

splinters, SF18–20 (also see below), which had been driven into the ground at the end of stakeline [040], possibly to form a foundation for a gatepost (Chapter 14.3.8). The two oak posts vary considerably, in diameter from 0.16 m to 0.26 m and in age from 45 years to 144 years respectively. Dendro analysis has demonstrated that SF18–20 were cleft from the same trunk (Chapter 7.2.2.1) and, using the curvature of the ring-pattern, it is possible to suggest that the parent tree was probably at least 0.64 m in diameter and with as many as 500 rings.

The stakes in stakelines [015], [016], [028], [040] and [048] were a mixture of alder, hazel and birch in varying proportions. Hazel and birch were found in ST1 only in the stakelines.

#### Wickerwork

The stakes were the only components of the wickerwork walls which had survived *in situ* but the charcoal spread [029], which was concentrated around stakelines

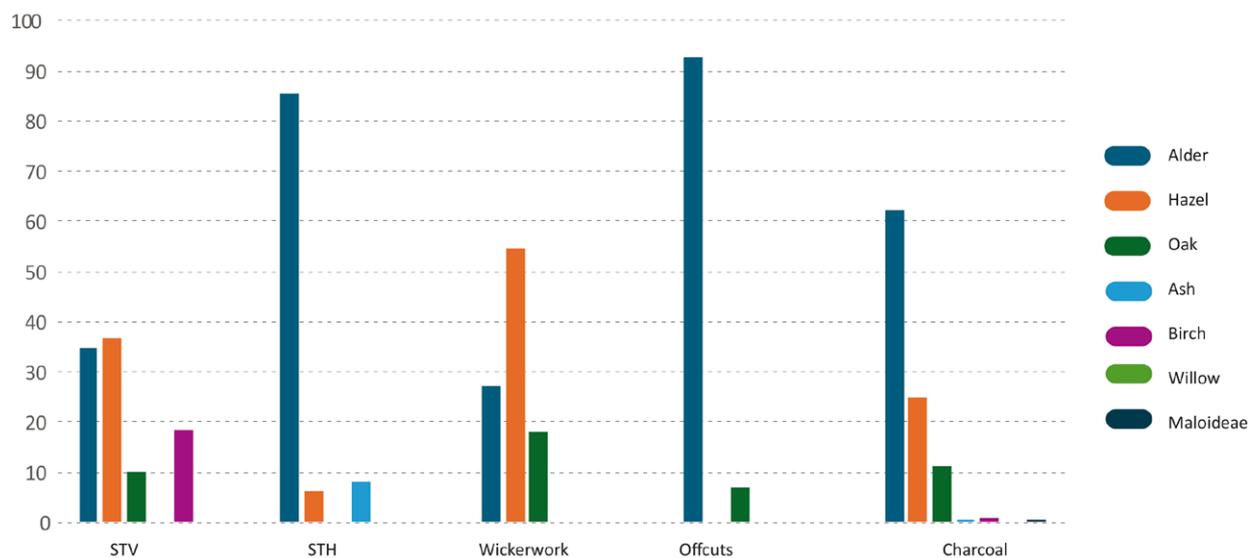


Figure 14.3. ST2: species composition (STH = structural/ horizontal. STV = structural/ vertical).

[016] and [040], may be the remains of the wickerwork walling. Charcoal spread [029] was predominantly hazel (60%) with some alder (20%) and oak (20%) and there was a large proportion of small roundwood 4–8 mm in diameter present.

#### 14.2.1.2 ST2 (Figure 14.3)

In ST2 alder (*Alnus glutinosa*) is the dominant species, comprising 43% of the total number of pieces identified. Hazel (*Corylus avellana*) (29%) and oak (*Quercus* sp.) (19%) together comprise half of the assemblage, with lesser amounts of ash (*Fraxinus excelsior*) (5%) and birch (*Betula* sp.) (4%) present.

#### Structural timbers

The main structural timbers throughout ST2 are either alder or oak and each species appears to have been selectively used for specific functions. Alder has invariably been used for all the larger horizontal components of the construction. Alder logs were used in the foundation framework, [277] and [321] and within the interior all the radial floor components, [222], [238] and [262] were alder, as were the sillbeams [223]. The primary entrance structure was constructed entirely of alder, while the rectangular framework [295] and the radials [310] that form part of refurbished surface of the entrance were also alder.

With the exception of the radial floor components which were generally smaller (but could not be accurately measured because they were too decayed), the alder logs used in ST2 were from large, mature trees. They varied in diameter from 170 mm to 325 mm (av 233 mm) and were between 89 and 139 years of age (av 100 yrs).

Almost all the main vertical components of the structure are oak. This includes the posts of the outer post-ring [225], the vertical planks of the outer wall, [243], [305] and [323], as well as all the posts that form part of the entrance structure, [307]. The inner post-ring [263] contains a mixture of oak and alder posts. Two distinct sources of oak are reflected in the assemblage. The posts in the two post-rings are fashioned from relatively young, small trunks between 83 and 116 years of age (av 104 yrs) and between 145 mm and 220 mm in diameter (av 186 mm); the posts in the entrance structure [307] were similar in age and dimensions although they had been roughly squared (see Section 14.5). The oaks converted to make the vertical planks for the outer wall were significantly larger and older (Table 14.1). The most complete examples flanking the entrance were between 0.45 m and 0.65 m wide and were remarkably consistent in thickness, most of them between 0.08–0.09 m thick. Although the planks consisted of only partial cross-sections of the original trunk because of the way in which they had been converted (see below) some of them had as many as 374 growth rings surviving. Allowing for the missing rings that had been trimmed off, mainly from the centre, some of the trees would have been over 500 years of age, with estimated diameters of up to 1.63 m.

There is greater variety in the stakes of the outer wall. Here hazel dominates, comprising 64% of the assemblage, with small amounts of birch (14%), ash (14%) and alder (7%), and a single stake of oak. Indeed, apart from a single withy the only place that birch is used in ST2 is as stakes along the inner stakeline, [232]. The stakes of the inner stakeline are generally larger and older than those of the outer stakeline. Those in [232]

Context	Sample no.	Conv	L	W	Th (max)	Diam (est)	No. rings
<b>Episode 1</b>							
<b>ST2</b>							
243	T2/2	1/2 CT	0.39	0.16	6.5	0.32+	263
243	T2/3	OT	0.47	0.20	0.055	?	136
243	T2/5	OT	0.4	0.28	0.05	?	114
243	T2/14	OT	0.47	0.33	0.06	?	135
243	T2/15	OT	0.56	0.48	0.12	?	218
243	6	OT	0.61	0.25	0.08	?	155
306E		OT	1.18	0.45	0.15	?	233+
306W		CT	1.16	0.59	0.08	0.8	291+
323	1	CT	0.99	0.54 +	0.055	0.54+	374
323	2	CT	1.08	0.60	0.08	0.60	361+
323	3	OT	1.23	0.45	0.08	0.65	276+
323	4	OT	1.06	0.45	0.09	0.51	189
323	5	CT	1.18	0.55	0.08	0.57	260
<b>Episode 3.2</b>							
<b>Palisade 4</b>							
701	1	OT	0.6	0.54	0.12	?	<i>unm</i>
701	2a	OT	0.71	0.28	0.08	?	136
701	2b	OT	0.64	0.28	0.08	?	148
701	3	1/2 CT	0.63	0.35	0.11	0.70+	337
701	4	1/2 CT	0.57	0.31	0.11	0.62+	384
701	6	1/2 CT	0.49	0.22	0.06	0.44+	292
701	8	OT	0.36	0.17	0.09	?	132 +1
701	9	OT	0.55	0.41	0.11	?	132 +1
701	11	OT	0.84	0.50	0.10	1.63	253
701	12	OT	0.87	0.49	0.10	1.31	<i>unm</i>
701	13	1/2 CT	0.77	0.23	0.10	0.46+	288
701	14	OT	0.68	0.31	0.16	?	238
701	15	OT	0.65	0.58	0.13	?	<i>unm</i>

Table 14.1. The oak planks (some of the OT planks were too fragmentary to confidently estimate diameter).

range in diameter from 38 to 135 mm (av 76 mm) and are between 15 and 56 years of age (av 34 years), while those in [233] are between 43 mm and 83 mm in diameter (av 55 mm) and between 13 and 44 years of age (av 22 years). The small amount of alder used in the construction of the wall contrasts with its extensive use elsewhere in the house.

### Wickerwork

The wickerwork used throughout the house consists almost exclusively of alder and hazel, which comprise 57% and 40% respectively of the total pieces identified, together with single pieces of birch and ash. They were used

interchangeably as both withies and sails in the sub-floor surfaces, [224] and [254], while the withies woven around the inner and outer stakelines of the outer wall, [302] and [314], are entirely hazel and the bundles of withies [303] laid down in the refurbishment of the entrance structure were entirely alder.

Sub-floor surface [224] may be composed of multiple wickerwork screens which were laid down around the outer annulus of the house. They were coarsely made, possibly *in situ*, bundles of withies being woven roughly in and over the radially-aligned and widely spaced sails (Table 14.2). Along the NW quadrant there appears to

Structure	Context	Element	Alder	Hazel	Ash	Birch	Height	Width	Sails	Spacing	Weave	
ST2	223	sillbeam	1				1.9			0.27, 0.31, 0.33, 0.36		
	224						multiple?	1.9 max				
		withies	24	15	1	1					bundled	
		sails	2	1						0.6 - 0.8		
	254						1.4	1.4				
		withies	11	1							basketry	
ST3	755						0.8	0.55				
		withies		18							2-3bundled	
		sails		8					paired	0.2 - 0.25		
	756						1.2	0.7				
		withies	<i>not sampled</i>								single alternating	
		sails	<i>not sampled</i>						paired	0.2 - 0.25		
	1750						2	2				
		withies	1	19					paired	0.15 - 0.2	bundled	
		sails		8								
	1754 (1172)						1.2	2.28			?	
		withies		20								
		sails		7					paired	0.15 - 0.2		
		sillbeam	1								0.29, 0.50, 0.34	
	1753						2.5	1.3				bundled
		withies		20								
	sails		10					paired	0.15 - 0.2			
ST6	634/H1						1.9	1.3			?	
		withies	1	20								
		sails	2	3					single	0.25 - 0.3		
	634/H2				1		2.9	1			?	
		withies		24								
	sails	1	2	4				single	0.3			
Episode 2 entrance	777						2.7	2			single alternating	
		withies	16	11								
		sails	8	1					paired	0.20 - 0.25		

Table 14.2. The hurdle screens (measurements in m).

have been no attempt at weaving, the radials simply lying over the withies. A discrete but poorly preserved piece of woven wickerwork [254] was laid over [224] on the W side of the house. The weave of [254] was more like basketry, with relatively evenly spaced sails and withies and covered an area approximately 1.4 m<sup>2</sup> (Table 14.2). The only proxy evidence for an upright screen comes from sillbeam [223] in which the holes for the sails were spaced between 0.27 m

and 0.36 m apart (Table 14.2). This is wider spacing than that displayed in the wickerwork screens (Table 14.2) suggesting that alternating sails may not have been secured into the sillbeam.

#### 14.2.1.3 ST5

The wood assemblage from ST5 is very small because only a chord of the outer wall of ST5 was uncovered. However,

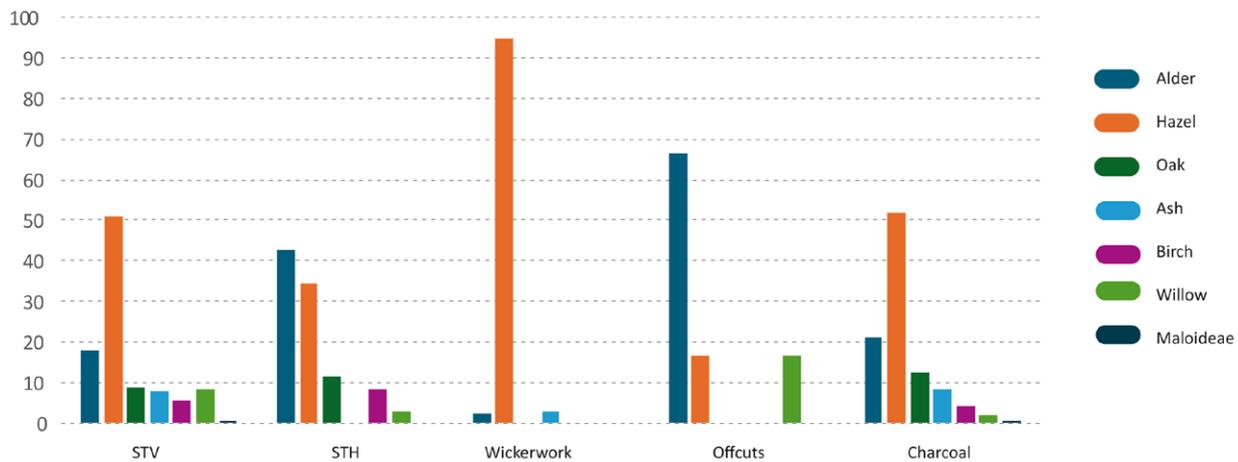


Figure 14.4. ST3: species composition (STH = structural/horizontal. STV = structural/ vertical).

this revealed that the wall structure was identical to that of neighbouring ST2, with the use of vertical oak planks combined with alder and hazel stakes, woven around with hazel withies.

#### 14.2.1.4 The trackway, Palisade 1 and associated structures

All the transverse logs in the Episode 1 trackway were alder ([281], [15002], [18025], [18034]). Alder logs were also used to form the surface [309] between the trackway and ST2. These were mostly large undressed roundwood logs, 0.21 m average diameter (range 0.09–0.32 m) and 102 years of age on average (range 24–212 years). Oak was used for very specific functions in the trackway, seemingly restricted to positions where a hard-wearing wood was needed; the three threshold timbers, [775], [18034/11] and [15002/0], were all fashioned from large oaks and the posts pinning them in place, [793], [18033] and [15010], were all roundwood oaks. The threshold timbers were massive, ranging from 0.47 m to 0.56 m in width, and very old oaks were used; [18034/11] was one of the oldest oaks found on the site, with over 360 growth rings (Chapter 7.2.2.4). Oak logs were also used occasionally as longitudinal runners alongside the track, ie [15004], [18025/4] and [794], and long oak splinters [15046] had been used as packing within a mortise cut into one of the runners (Chapter 14.3.8).

Fences [15042] and [18023] lined the sides of the trackway. The stakes were predominantly alder (51%) with a mixture of hazel (19%), willow (16%) and ash (14%). The withies [18022] woven around fenceline [18023] were 90% willow. Small alder branches [15003] were laid down over the trackway to form a coarse lattice-like surface.

Palisade 1 was exposed for only a length of *circa* 4 m where it consisted entirely of bark-covered alder logs.

There was considerable variation in both diameter and age, the posts varying from 0.11 and 0.30 m in diameter and 32 to 114 years in age.

### 14.2.2 Episode 2

#### 14.2.2.1 ST3 (Figure 14.4)

Hazel is the dominant species used in construction in ST3, accounting for 68% of the total. A broader range of species than seen in other structures was used here, with alder (14%), oak (5%), ash (5%), willow (4%), birch (3%) and a single piece of Maloideae present.

#### Structural timbers

The striking feature of wood use in ST3 is that there are no large timbers employed in its construction and very little oak was used. Apart from the ring of small cleft oak stakes [1758] used in the construction of Hearth 8 (Chapter 14.3.8), the only oak present were three very fragmentary pieces of planking ([1160] & [1727]) used in the foundation under Hearth 5, and a similarly poorly preserved plank, [18035], found just inside the W wall line. One of the oak plank fragments [1160/2] had a decayed notch cut into the underside and so was probably re-used in the foundation. The largest timbers present were the two alder logs [15009] which form the threshold into the structure; they were quite decayed but one measured at least 0.30 m across.

The wood was also relatively young. The average age of the hazel and alder was 23 (n = 87) and 24 years (n = 29) respectively. The oldest timbers were found in the superstructure, in the two ash posts in the post-ring which were 114 and 137 years of age.

The various floor surfaces within the structure were built using a combination of small roundwood logs, generally 100–200 mm in diameter, withies, branches and brushwood. The wood was predominantly alder and hazel

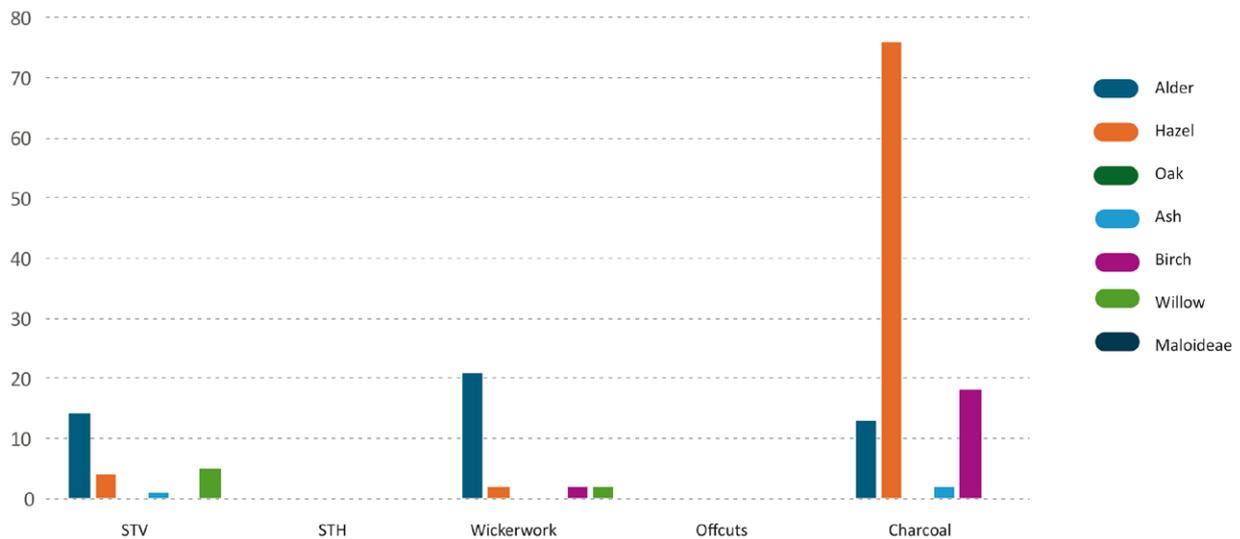


Figure 14.5. ST4: species composition (STH = structural/horizontal. STV = structural/vertical).

with trace amounts of birch and ash, and there was little evidence of trimming or shaping. The only timbers which had been converted were the four alder radials [1755] which were half-logs.

The vertical components of the structure were also all relatively small roundwood; the average diameter of all the analysed stakes in the structure was 56 mm (n = 194) and there was no difference between those used in the outer walls and the inner divisions. The largest components were the only surviving posts of the post-ring, two alder [15036], [1760/26 ] and one ash [15051]; these were 160–170 mm in diameter. Alder post [15036] was later replaced by an ash post [15035] 140 mm in diameter.

The outer walls of the structure were all stake-built, presumably woven together with wickerwork although it only survives along one short section (see below). There are also multiple arcs and lines of stakes which would have formed screens and divisions within the interior. Hazel accounts for 51% of the stakes, alder for 18% and the remainder is a mixture of oak (9%), ash (8%), willow (8%) and birch (6%). A single stake of Maloideae was found, the only example of its use for structural purposes on the settlement. There was no apparent change in composition throughout the use of the structure.

### Wickerwork

The wickerwork around the stakes of the outer walls had survived for short lengths on the W side of the building. The withies around [18005], the Phase 6 wall, had survived to a height of three courses and were a mixture of hazel and ash.

Within ST3 three wickerwork hurdles had been used as surfacing in Phase 2 and another two hurdles were found lying on surfaces outside the structure and associated with

its use (Table 14.2). They were all damaged and incomplete, and in the cases of the external hurdles they were never fully exposed so all dimensions in Table 14.2 are minima. The widest surviving hurdle is [1754], whose sillbeam was still *in situ* but as the ends had not survived the width is still incomplete.

With the exception of a single alder withy and the [1754] sillbeam which is also alder, the other components of the hurdles consisted entirely of hazel. There was some variation in the weave; most had bundled withies but one of the external hurdles [756] had a neater weave of single alternating withies. Hurdle [1750] appears to have a more open, irregular weave than the other hurdles but this could be a post-depositional effect.

All of the hurdles in and around ST3 had paired sails set between 0.15–0.2 m apart (Figures 4.20, 4.21 & 4.40). However, the drilled holes in the [754] sillbeam suggest that not all sails were secured into the sillbeam (the hurdle was too decayed and fragmented to determine this with certainty); one pair of drilled double holes were set 0.5 m apart while beyond them further holes lay 0.29 m and 0.34 m on either side. The sillbeam itself had been fashioned from a half-log of alder and was 95 mm tall and 50 mm wide. With such a narrow base the hurdle screen would probably have been unstable on its own and may have had to be secured in place, possibly with pegs.

#### 14.2.2.2 ST4 (Figure 14.5)

Only a small proportion of the interior of ST4 was investigated. The small structural wood assemblage was dominated by alder (70%), with smaller amounts of hazel (11%), willow (11%), birch (5%) and ash (2%). The only vertical elements were a line of small stakes [1019] which might represent an internal partition and consisted of

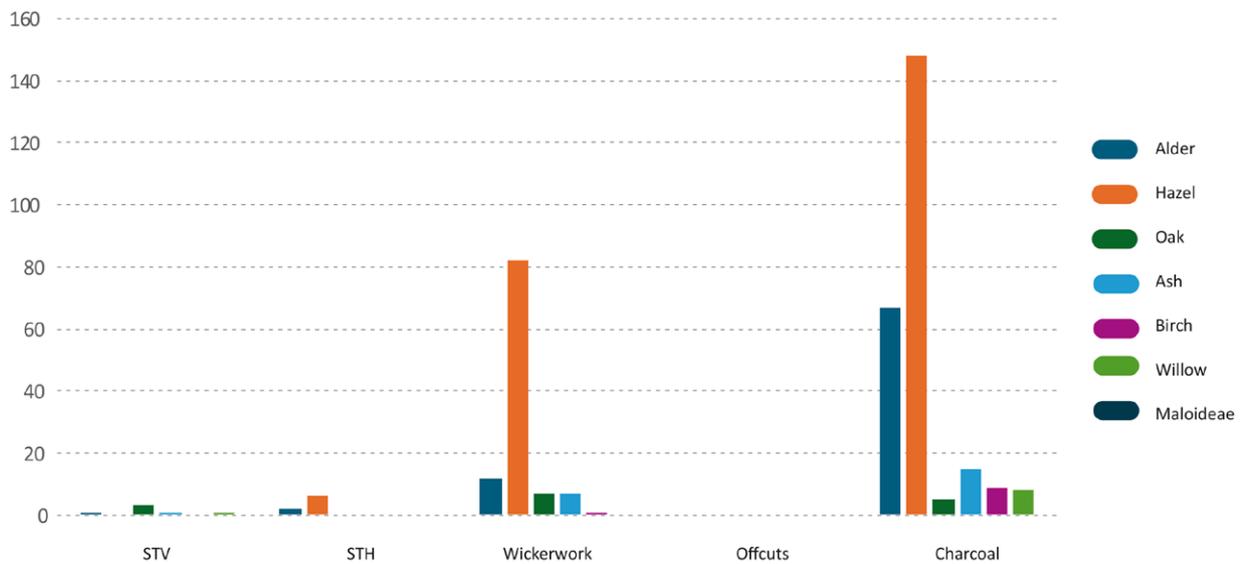


Figure 14.6. ST6: species composition (STH = structural/horizontal. STV = structural/vertical).

predominantly alder stakes with some hazel and ash, and a section of the outer wall represented by stakelines [19008] and [1030] which consisted of a mixture of alder, willow and hazel. The floor surfaces [1016] and [1024] consisted of predominantly alder with some willow and hazel brushwood. The charcoal content of [1003], the uppermost of the floor layers was almost exclusively hazel (90%) so this deposit may represent a hurdle screen used for flooring and subsequently burnt.

The complete absence of oak in ST4, either for construction or as fuel (see below) is notable. This may be because only a small area of the structure was exposed and consequently the superstructure has not been examined, but it could also be because it represents a similar type of construction to that seen in ST3 (see above).

#### 14.2.2.3 ST6 (Figure 14.6)

Like ST4 only a small proportion of the interior of ST6 was investigated and consequently there is little evidence for the superstructure. Aside from clusters of slender vertical stakes which made no clear pattern, the only vertical component was a small flat-based oak post [636] which had been inserted into the decayed remains of a mortise hole in an alder plank [637], a probable post-shoe (see Figure 14.9, bottom). Stake cluster [626], immediately inside Palisade 2, contained one more substantial post, an alder 170 mm in diameter. The four-poster structure [651] consisted of four slender pencil-tipped stakes, two of oak, one ash and one willow, which varied considerably in diameter from 80 mm to 155 mm.

Two discrete wickerwork hurdles, [634/1] and [634/2] formed a floor surface within ST6 (Table 14.2). Like those in ST3 they were incomplete and not fully exposed so the

sizes given in Table 14.2 are minima. In both hurdles the withies were almost exclusively hazel but the sails were more varied, a mixture of hazel and alder in both, with ash in [634/2].

The four-poster structure sat within [656], a circle of stout sails, between 30–40 mm in diameter around which three to four surviving courses of withies had been woven. This structure was constructed entirely of hazel except for a single withy of ash.

A spread of small roundwood, [649], some of which was charred, lay over the natural peat. This consisted entirely of hazel, again suggesting that it might be the remains of a wickerwork panel.

#### 14.2.2.4 The trackway, entrance and defensive perimeter

There were no substantial timbers used in the construction of the Episode 2 entrance and associated walls and fencelines. Apart from two oak planks [727] and [729], which have been dendro-dated to this episode (Chapter 7.2.3.3), the only other large timber in the entrance was the oak threshold [775] which may have been a re-used Episode 1 threshold (see Chapter 4.1). A mixture of species was used as posts and stakes; ash, birch, alder, hazel, oak and willow are all represented. The only oak post, [793/1], was a relatively small roundwood post only 32 years old (Table 7.2). Palisade 2 consisted almost entirely of roundwood alder posts (there were also two ash posts), *circa* 0.20 m in diameter.

Most of the structures were stake and withy fencelines, such as [750] and [751] which were also constructed with a very mixed variety of species, primarily hazel (44%) but with a relatively large proportion of ash (24%), as well as

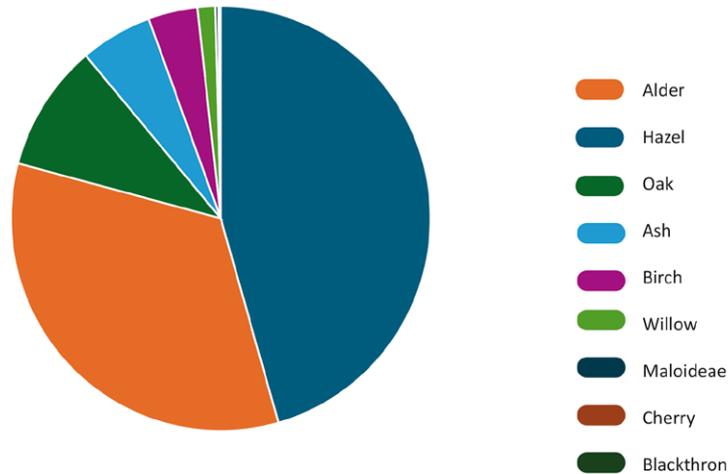


Figure 14.7. Fuel use; species composition.

willow (16%), alder and birch. A stout wickerwork hurdle [777] formed one of the primary surfaces of the track in the entrance area. Constructed with paired sails set 0.2 m to 0.25 m apart it was at least 2 m by 2.7 m and was composed of alder (66.6%) and hazel (33.3%) (Table 14.2). Stakelines [781] and [783] pinned the hurdle screen on either edge and were also a mixture of alder and hazel.

### 14.2.3 Episode 3

The wood used to construct the defensive perimeters around the settlement during this episode was predominantly oak. The roundwood oak posts used in the palisades and rampart revetments on either side of the entranceway were neither large nor old; they were 0.19 m diameter on average (0.085 m–0.3 m) and 59 years old on average (25–118 years). In contrast the oaks used in Palisade 4 came from a much more ancient woodland (Chapter 17.2.4.2). The planks were similar in dimensions to those used in ST2 (Table 14.1) but they had been converted from much larger oak trees, some up to 1.63 m in diameter. These planks were amongst the oldest oaks found on the site; [701/4] was at least 384 years old.

### 14.2.4 Fuel

Just over 2,500 fragments of charcoal from across the settlement, retrieved during the processing of the bulk samples, were identified to species. Figure 14.7 shows the species composition of the total charcoal assemblage for all episodes. Although nine species are present, the assemblage is dominated by hazel and alder which together account for 79% of the total. Oak accounts for another 10% and there are smaller amounts of ash (6%), birch (4%) and willow (1%). There are trace amounts of Maloideae (6 frags), cherry (3 frags) and blackthorn (2 frags). This must reflect the composition of the woodland resource available to the settlement (Chapter 17.2.3).

It is assumed here that the bulk of the charcoal represents the burning of wood as fuel. However, there is evidence in several of the structures for conflagrations which have destroyed structural components so, wherever possible charcoal which probably represents burnt flooring, ie [029] in ST1, [1127/1128] in ST3, [1003] in ST4 and [658] in ST6 for instance, has been extracted and the data included with the structural evidence. Nonetheless, there is likely to be some burnt structural debris included in the charcoal assemblage.

Figure 14.8 compares fuel use in the Episode 1 roundhouses (ST1, ST2 & ST5) and the Episode 2 roundhouses (ST3, ST4 & ST6). The same range of species are represented but the major change is that alder decreases from 51% in Episode 1 to only 22% in Episode 2, while hazel takes its place, increasing from 35% in Episode 1 to 54% in Episode 2. This probably relates to changes in the woodland resource around the settlement (see Chapter 17.2.3). The proportion of oak used as fuel is small but remains similar throughout Episodes 1 and 2.

## 14.3 Woodworking

*Anne Crone*

In this section the evidence for woodworking, from conversion of the tree to dressing and joinery, are examined. All timbers displaying evidence of modification were recorded (Table 14.3) but for reasons of space this list excludes horizontal logs with chopped ends and stakes and posts with pencil tips (see below). The modified assemblage is remarkably small given that the entire settlement was built primarily with wood. It is therefore presented here, not by episode and structure, but by the various categories of modification on display.

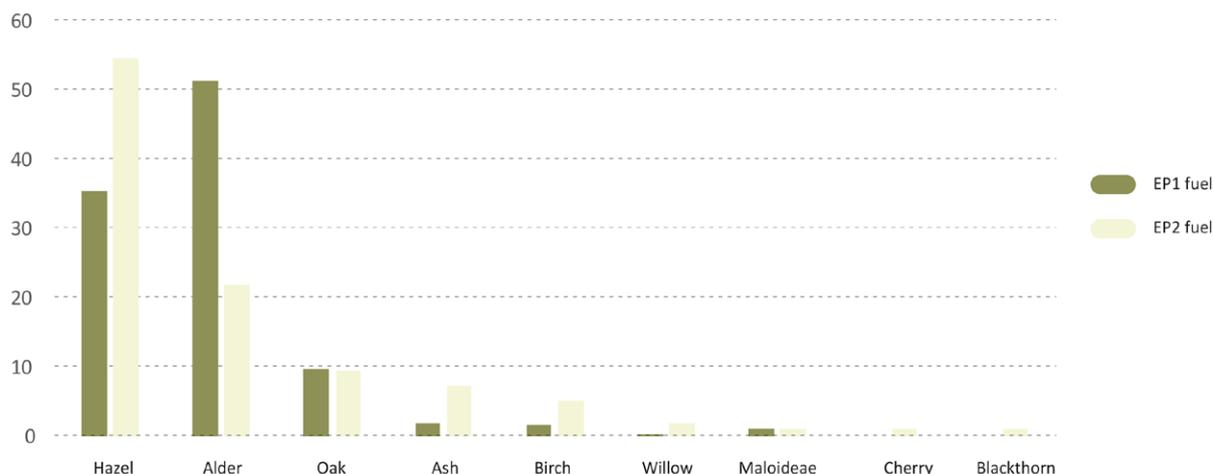


Figure 14.8. Fuel use; differences between the Episode 1 & Episode 2 houses.

### 14.3.1 Conversion

There is very little evidence of complex conversion of the timber used in the construction of the settlement; the majority of timber was used as undressed roundwood, the only shaping being to the tips of stakes or ends of horizontal logs. Of the 100 timbers in Table 14.3 some 50% were undressed roundwood and a further 11% had been only very roughly trimmed from the round. Those timbers which have been more fully converted include the sillbeam [223/1], the alder logs [258] in the hearth framework and the entrance posts, [307], all in ST2, all of which had been hewn to a roughly square or rectangular cross-section. Half-logs were very occasionally used, as in posts [757] in the Episode 3.1 entrance and [TP1/1], one of the posts in the post-ring of ST2. In ST3 the sillbeam of hurdle screen [1754] had been fashioned from a half-log of alder and then hewn to a rectangular cross-section.

The most common type of conversion observed on the settlement was the tangential cleaving of large oak logs, accounting for 32% of the worked timbers and used to make the planks in the outer wall of ST2, ST5, the threshold timbers of the trackway, and the planks in Palisade 4. Massive oak logs were cleft in half first and then each half cleft into two or three sections, a central (CT), inner (IT) and outer tangential (OT), the latter usually displaying the curved bark edge of the log (see Figure 14.27 B & C).

In ST2 all but one of the wall planks of [243] were outer tangentials, implying that the inner parts of the logs had been used elsewhere (possibly along the unexcavated stretches of the outer wall?). Unfortunately, many of the [243] planks displayed severely compressed ring-patterns and so they could not be correlated with the other wall planks [305], [306] and [323] to determine whether they had been cleft from the same trees (Chapter 7.2.2.2). However, amongst those that were successfully dendro-

dated there are some correlations between planks which are significant enough to suggest that they had indeed been cleft from the same tree, ie [306W] (CT) and [306E] (OT), [323/2] (OT) and [323/5] (CT), and [243/2] (CT) and [323/3] (OT); it is noticeable that they form pairs of central (CT) and outer (OT) tangentials. Of the 40 planks recovered from the site, either *in situ* or fragmentary, 27 (67.5%) were OT conversions. Darrah's experimental work suggests that OT planks may have been preferentially used, particularly where visibility was important because radial cracking often caused CT and IT planks to split in half (Chapter 14.6).

There are also a few offcuts which have been tangentially cleft and could have derived from either the initial dressing of these planks or their cutting down for re-use. Some of these offcuts suggest that tangential cleaving was not restricted to the conversion of large oak logs; [251/1] and SF104 are tangentially cleft alder offcuts (Table 14.4). The oak packing staves described below were probably produced during the cleaving and shaping of tangentially cleft planks.

There is only one possible example of a radially cleft timber from the settlement, oak plank [248/1] from the ST2 entrance but, given the preponderance of tangential cleaving, this is more likely to represent half of a central tangential. The two oak pegs in the ST2/Phase 1 entrance structure (see below) were also fashioned from cleft oak.

Tangential conversion was practised throughout prehistory, from the Mesolithic at Star Carr (Bamforth et al 2018, 361–365), during the Neolithic, in the Somerset Levels trackways (Orme & Coles 1983: 25–26) and the mortuary chamber at Haddenham (Darrah 2006a), and in the Bronze Age at sites like the timber circle of Holme II (Robertson 2016) and Flag Fen (Taylor 2010). Tangential conversion was also the primary means of reduction at Cults Loch 3 where both oak and alder had been converted

Context	Sample	Description	Conv code	Species	Joints	Dressing	Holes	Tow-holes	Bases
<b>Episode 1</b>									
<b>ST1</b>									
021/C	021/C	post in post-ring	A	oak					concave
021/D	021/D	post in post-ring	A	oak			Y		concave
46	15	log in foundation	A	alder				C	
<b>ST2</b>									
TP1/1	1	post in post-ring	B1	oak				C	concave
222	T2/17	horizontal	A	alder	Y	Y			
223	1	sillbeam	A	alder	Y		Y		
225	1	post	A	oak					concave
225	2	post	A	oak					concave
225	3	post	A	oak					concave
225	4	post	A	oak				C	concave
225	5	stake with tip	A	oak		Y check			pencil
225	T2/16	horizontal	A	oak				R	
243	T2/14	wall plank	OT	oak				R	
243	T2/15	wall plank	OT	oak				R	
248	1	plank	D	oak				R?	
251	T1	offcut	CT	alder					concave
258	1	hearth framework	A1	alder					
261	SF104	Plank offcut	CT	alder					
262	1	sillbeam? #13	A	alder			Y		
263	1	large stake	A	oak				C	concave
263	2	large stake	A	alder		Y			
263	3	post	A	oak				C	flat
263	5	post	A	oak					flat
263	6	post	A	oak				C	concave
263	7	post	A	alder		Y			
305	1	planks in entrance	CT	oak					
305	2	planks in entrance	CT	oak					
306W	1	planks in entrance	CT	oak				R	
306E	1	planks in entrance	OT	oak				C	
307W	1	post in entrance	A1	oak					chisel
307W	2	post in entrance	OT	alder					chisel
307E	1	post in entrance	A1	oak					flat
307E	2	post in entrance	CT	oak					chisel
307E	3	post in entrance	A1	oak					flat
316	1	horiz in entrance	A1	oak	half-lap				
316	2	plank in entrance	IT	oak					
322	5A	carbonised offcut	E1	oak			Y		
322	5B	carbonised offcut	CT	oak				R?	
323	2	wall plank	CT	oak				R	

Context	Sample	Description	Conv code	Species	Joints	Dressing	Holes	Tow-holes	Bases
323	4	wall plank	OT	oak				R	
ENTRANCE STRUCTURE (only timbers with joinery listed here)									
	106	notched tangential	A1	alder	Y	Y			
	107	notched tangential	A1	alder	Y	Y			
	108	notched tangential	A1	alder	Y	Y			
	113	mortised radial	A1	alder	Y	Y	Y	R	
	114	mortised radial	A1	alder	Y	Y	Y		
OUTSIDE HOUSE									
281	1	trackway	A	alder				C	
281	2	trackway	A	alder	Y				
309	1	log surface exterior	A	alder				C	
309	2	log surface exterior	A	alder				C	
309	5	log surface exterior	A	alder				R?	
15006		isolated post	A	oak				C	flat
TRACKWAY & PALISADE									
15010		post in Ep1 palisade	A	oak			Y	C	flat
15056		post in post-shoe	A	oak		Y	Y	R	flat
15055		post-shoe		ash	mortice				
18025	4	longitudinal in track	A	oak			Y		
18034	11	threshold timber	OT	oak	Y				
775		threshold timber	OT	oak	Y				
15002	0	threshold timber	OT	oak	Y				
ST3									
1160	2	plank under hearth	E/OT	oak	notch				
15007	33a	stake in wall	A	hazel		Y			pencil
15036		post in post ring	A	alder				R?	concave
15051	1	post in post ring	A	ash				R	pencil
1754		hurdle sillbeam	B1	alder		squared	Y		
1760	21	stake in Arc 1	A	hazel					oblique
1760	26	post in post ring	A	alder		Y			concave
ST6									
637	1	post in mortise hole	A1	oak		Y?		R?	flat
636		mortised horiz	A	alder	mortice				

Context	Sample	Description	Conv code	Species	Joints	Dressing	Holes	Tow-holes	Bases
<b>Episode 3/1</b>									
707	1	post	A	oak					flat
707	2	post	A	oak					flat
707	3	post	A	oak					blunt chisel
707	4	post	A	oak					pencil
730	1	post	A	oak					pencil
757	1	post	B1/OT?	oak		halved			flat
757	2	post	B1/OT?	oak		halved			flat
<b>Episode 3/2</b>									
770	1	post	A	oak					blunt chisel
770	2	post	A	oak					flat
726	1	post	A	oak				R	flat
715	1	post	A	oak				R	flat
736	1	post	A	oak					pencil
792	1	post	A	ash				C	blunt chisel
T8		post in palisade	A	oak				R	pencil
TP3	1	post in palisade	A	oak				R	pencil
609	8	post in palisade	A	alder				C	pencil
609	9	post in palisade	A	alder				C	pencil
609	?	post in palisade	A	alder				R	pencil
609	?	post in palisade	A	alder				R	pencil
701	2a&b	plank in palisade	OT	oak				R	
701	3	plank in palisade	CT	oak				R	
701	4	plank in palisade	CT	oak				R	
701	5	post in palisade	B	oak				R	blunt chisel
701	6	plank in palisade	CT	oak				R	
701	7	post in palisade	C	oak				R	flat
701	9	plank in palisade	OT	oak				R	
701	10	post in palisade	A	oak				R	blunt chisel
701	11	plank in palisade	OT	oak				C	
701	12	plank in palisade	OT	oak				C	
701	13	plank in palisade	CT	oak				R	
701	14	plank in palisade	OT	oak				R	
701	15	plank in palisade	OT	oak				R	
<b>Episode 3/3</b>									
Burn	1	isolated post	A	oak				R	pencil

Table 14.3. Summary of the woodworking evidence (for conversion codes see Crone & Barber 1981 & text). Tow-holes: C = complete, R = remnant.

in this manner (Cavers & Crone 2018: 123), and on the Iron Age trackways of Corlea and Derraghan More in Ireland (O'Sullivan 1996: 327 & fig 427). Splitting a log tangentially is technically more challenging than splitting it radially, ie along the rays so there must have been practical reasons for this choice. At Corlea, O'Sullivan observed a correlation between the width of the plank produced and the type of conversion used, tangential conversions producing the widest possible planks while radially-split planks were amongst the narrowest. The builders at BLoM may have required exceptionally wide planks to form impressive facades for the houses and the palisade, hence the use of tangential conversion. Taylor (2010: 91) has pointed out that tangential conversion of such large trees (ie over 750 mm in diameter) will result in large heavy baulks and that 'domestic structures built using them would be seriously over-constructed', a description which could readily be applied to the outer wall of ST2.

### 14.3.2 Dressing

The surfaces of a few of the roundwood posts in ST2 and ST3 had been carefully dressed. In ST2 alder posts [263/2] and [263/7], both of which had had their bark carefully removed by paring so that the surface was covered in fine shallow facets between which thin strips of bark had occasionally survived. A horizontal alder timber, [222/17] which lay just in front of [263/2], had also been treated in the same fashion. In ST3 hazel stake [15007/33a] in the outer wall and [1760/26], one of the posts in the post-ring, had been fully stripped of their bark leaving a similar pattern of shallow lenticular facets. There is an aesthetic quality to the manner in which the bark has been removed. Bark is often stripped off logs to reduce insect infestation but, as on many wood-rich prehistoric sites (Bamforth et al 2024: 114) the bark has been left on the majority of the posts so it is not clear why these particular posts had been treated differently.

The surfaces of the planks in ST2 and Palisade 4 had also been hewn but not consistently across each face. Experimental work suggests that the plank surfaces were hewn, not to achieve a flat surface for aesthetic purposes, but to reduce overall thickness (section 14.6).

### 14.3.3 Joinery

There is very little evidence of complex joinery on the settlement. Where horizontal joints were necessary the builders appear to have favoured simply notching the end of the timber to create an open-ended joint. The threshold timbers in the trackway all have square notches cut out of each end into which a post was driven through to secure them in position (Figure 3.8). A rougher, more expedient version of this joint was found on one of the sillbeams in ST2; at one end of [223/1] a roughly square notch has been cut out so that it could fit around a post but at the other end

a forked branch junction had been employed for the same purpose (Figure 3.29). The ends of the horizontal beams in the foundation framework, [277] in ST2 were also curved to fit around the posts (Figure 3.31). Simple notches to fit around posts may also have been employed; in ST2 a shallow curved notch had been cut out of horizontal timber [222/17], possibly so that it could fit around post [263/3].

Large, roughly square through-mortises which penetrated the timber were occasionally employed to house posts; these are mostly exemplified in the ST2/Phase 1 entrance structure (see below). Mortised horizontal timbers have been found in many wetland constructions but they mainly consist of single mortises at one or both ends of the timber (Cavers & Crone 2018: 129). The closely-set multiple mortises in the ST2/Phase 1 entrance structure bring to mind the object now known as the Dumbuck ladder, from the late Iron Age crannog at Dumbuck, on the Clyde River. This object, initially described by the excavator as a 'mortised log' (Bruce 1900: 439) is an oak beam 4.6 m long with six closely-set square through-mortises at one end (Hale & Sands 2005: Figs 11, 16 & 31). This spacing has led to its description as a ladder but there are no mortises for at least 40% of its length; this end could have been inserted into the muds of the Clyde for stability but one other possible interpretation that now arises in light of its similarity to the mortised entrance timbers at BLoM is that it formed a sillbeam for a wall of squared posts.

There were also two examples of central mortises cut into short horizontal timbers: [15055] lay at one end of the threshold timber 15002/0 and consisted of a massive ash log with a flat-based oak post [15056] *in situ* within the mortise, which did not penetrate the log (Figure 14.9 top & see Figure 3.15). A vertical hole ran along the central axis of the block, from the end nearest the threshold into the mortise-hole; a pole inserted into this hole could have jammed the post in position. It may have been that [15055] operated like a pivot-stone, a door or gate hinging off the post in the hole. A similar arrangement was found in ST6; [636] was a short horizontal block of alder with a flat-based oak post [637] still *in situ* (Figure 14.9 bottom & see Figure 4.54). In this example, the mortise penetrated the block, the base of the post sitting directly on the ground surface. If [646] also functioned like a pivot-stone then it is possible that this formed part of the entrance into the structure. They are referred to here as post-shoes and, like the concave post bases described below, they were a specific adaptation to building over an unstable substrate. Similar objects were found at the bases of the piles of many of the circum-Alpine pile-dwellings, for instance at Hornstaad-Hornle, Germany and Greifensee-Boschen, Switzerland, where they prevented sideways movement of the piles (Menotti 2012: Figs 4.1 & 4.6). Excavations at the Iron Age wetland settlement at Hyndford have revealed similar objects within two of the roundhouses (O'Connell 2021). The post-shoes were both

found *in situ* close to the central hearth and both were secured to the ground with pegs on either side of a post which sat within a central hole but, as with [636], the post was not driven into the ground surface. Here the location suggests that the post-shoe was designed to secure and stabilise an isolated post which was possibly moveable.

In a number of specific instances shallow ledge-like steps had been cut along the long axis of horizontal timbers. All the threshold timbers in the trackway displayed these steps; the rise of the steps on the inner two thresholds faced inwards (Figures 3.4 & 3.9), while that on the outermost threshold faced outwards, possibly because it had been moved and re-used. The steps may have acted as sills, against which the gate or door swung shut. Shallow ledges were also cut into the main radials of the ST2/Phase 1 entrance structure but here the stumps of a peg set immediately in front of the rise suggests that planks may have been secured on the ledge to create a flat surface (see below).

An oak log [316/1], re-used in the ST2 entrance area, displays a similar step at one end. At 50 mm the step is deeper and more sharply cut than those described above. That end has also been reduced in thickness by half so it may have been intended as a rudimentary tenon.

#### 14.3.4 Post, plank and stake bases

The vast majority of posts and stakes used throughout the construction of the settlement were a mixture of either pencil-tipped or chisel-tipped roundwood logs trimmed to blunt points with a few axe strokes and driven into the peaty substrate. However, there were other types of base which had been designed for different functions (Figure 14.10). The most innovative design was the concave-based post. These were used specifically in the post-rings of the roundhouses. There are examples in ST1, ST2 and ST3. The most complete post-ring was uncovered in ST2 and here, in the outer post-ring, all but one of the six posts had a concave base (see below). The concave base was designed to sit over the roundwood radials of the sub-floor structure, and this would have had the effect of spreading the compressive load of the combined weight of the ring-beam and roof. If pencil-tipped posts had been used in the post-ring, the weight of the roof would have driven the posts into the soft substrate. Pencil-tipped posts appear to have been used when it was necessary to secure elements of the superstructure into the foundation framework. The use of different post bases is most clearly seen in ST2 (Figure 3.19). In the outer post-ring the only pencil-tipped post, [225/5] (Figure 14.10, A), lies at the junction between the sillbeam and the entrance structure and therefore had a different structural function to the other posts, because it had to secure the superstructure to the entrance framework [277]. In the inner post-ring there was a greater mixture of post bases, the variation presumably reflecting the function of the posts around



Figure 14.9. Top: post-shoe [15055]; the rectangular hole through one end into the mortise socket is visible. Bottom: post-shoe [636] after removal of post [637].

the circle. Two flat-based oak posts sat on either side of the hearth where it abuts the entrance structure; they may have rested on the framework [277] and provided a supporting rather than load-bearing role for a ring-beam at this point on the circuit. A pair of pencil-tipped oak posts lay behind the hearth on an axis that bisected the hearth and entrance and may have provided an anchoring function for this inner ring. Between the pencil-tipped posts and the flat-based posts lay a concave-based post presumably to spread the load of the ring-beam at this



Figure 14.10. Post & stake bases: A) pencil tipped post [225/5] in ST2; B) concave-based post [21/C] in ST1; C) flat-based post [15010] in Palisade 1.

point; it is assumed that the conjectured fifth post to the E of the hearth would also have been concave-based. Dendrochronological analysis has demonstrated that all the sampled oak posts are contemporary with each other and with the oak planks in the outer wall (Chapter 7.2.2.2) so the differences in base design cannot be dismissed as later refurbishments.

On the whole, flat-based posts appear to have been used when load-bearing was not a requirement or where their bases were secured within mortise-holes, as for instance, the posts in the post-shoes described above, [636] in [637] and [15056] in [15055]. All the oak posts found in the mortise-holes of the ST2/Phase 1 entrance radials were either flat-based or blunt chisel-based (see below). The oak post terminating Palisade 1, [15010], was also flat-based (Figure 14.10, C), presumably because it was secured in the open-ended notch at the end of the threshold timber [15002/0] but also because it did not need to be load-bearing as there was no roof structure. For the same reason, posts [726] and [770] in Palisade 3 were either flat or blunt chisel-based.

The planks used to build the outer walls of ST2 and Palisade 4 displayed relatively flat bases which indicates that, although the cuts could not be detected (Chapters 3.2.2.2 & 6.3.3), they must have been inserted into prepared slots in the peat. The basal edge of the planks had either been roughly chopped flat or had been reduced to a short chisel edge, by axing away the thickness on one or both faces of the plank (Figure 14.11). The bases of some of the planks were not completely flat but sloped down at a shallow angle from both edges to form in effect a gentle curve; Darrah (2022) has suggested that this is a relict feature relating to the felling or cross-cutting of the tree in the woodland (see section 14.6).

### 14.3.5 Tow-holes

Tow-holes were observed on 49% of the timbers on which woodworking detail was recorded (Table 14.3). They would often be trimmed away during the shaping of posts and planks, surviving as oddly irregular notches and holes, and it was only when complete examples were found that these relict features were fully understood (Figure 14.12). It remains possible that some notches interpreted as relict tow-holes, such as the V-shaped cut at the end of plank [248/1] and the wide notch across trackway log [281/2] had other functions, particularly as the latter was only 0.11 m in diameter and therefore surely too small to require towing.

Tow-holes were always located at one end of the log and on vertical components they were invariably found on the tips of stakes and at the bases of the vertical planks where they would be buried from sight. It is assumed that these were used to facilitate the movement of logs onto and around the site, and to aid in the positioning of posts



Figure 14.11. Plank [306/E] from ST2. The chisel-shaped edge of the base can be seen in the cross-section and, although broken, the curved profile of the base is clear on the left edge

and vertical planks, a rope through the hole being used to control the tip as it was inserted into slot or posthole. They were hour-glass shaped, having been cut through with an axe from opposing directions on one side of the log leaving a narrow bridge with a roughly rectangular hole below, through which a rope could be threaded. The bridge had often been damaged and decayed away, leaving only the base of the hour-glass shaped cut. The design and positioning of the through tow-holes would have reduced wear on the ropes being used to tow them (section 14.6). A variety of tow-hole types were observed on the large oak planks and experimental work by Hamish Darrah suggests that some of the variation was probably dictated by the way in which the planks had been converted (section 14.6).

Tow-holes were found on timbers in Episode 1 ST1, ST2, the palisade and the trackway, in Episode 2 ST3 and ST6, and throughout the post and plank palisades of Episode 3. It is easy to see why tow-holes were employed to manhandle the massive oaks used to make the plank walling for ST2 and the planks in Palisade 4 but they were also used on smaller timbers, such as the posts in the post-ring of ST2 which were on average 0.18 m in diameter. The presence of relict tow-holes implies that the timbers were brought to the settlement, or at least to the shore where they were then converted and shaped.

Tow-holes have now been recognised on many other prehistoric sites; these include the Scottish crannogs at Cults Loch (Cavers & Crone 2018: 126–127), Loch Arthur (Henderson & Cavers 2011: 111 & illus 8), Milton Loch 1 (Piggott 1953: Fig 6), Oakbank (Dixon 2007: 257 & Figs 2



Figure 14.12. Complete tow-holes (L-R); [225/4], one of the post-ring posts from ST2 & [15010], the gatepost in Palisade 1. Incomplete tow-holes; [T8], one of the Palisade 4 posts.



Figure 14.13. Post [021/D] from ST1.

& 3) and Erskine Bridge (Hanson 2022: 13 & Fig 8). In England they have also been identified in the Bronze Age causeway at Must Farm (Ballantyne et al 2024: 58–60), Holme I (Brennand & Taylor 2003: 17 & Fig 15), Holme II (Robertson 2016: Fig 10), Sutton Common (Thomas 2007: 99 & Figs 27a, c & d) and Ashton-on-Trent (Guilbert & Garton 2001: 198–199, Fig 3), and in Ireland on the Corlea trackway (O’Sullivan 1996: 340) and Navan (Lynn 1993: 18). None of these sites have produced tow-holes in the quantities seen at BLoM but the widespread distribution of the evidence confirms that this was a universal means of moving and managing large logs throughout the Bronze Age and Iron Age. At Must Farm it has been suggested

that the tow-holes might have been used for lashing logs together to form rafts for river transportation, for instance (Knight & Robinson Zeki 2024: 74).

#### 14.3.6 Other holes

Holes were observed on a handful of timbers; in some cases their function was obvious because they were found on *in situ* timbers, but on others their presence seems to be redundant and may be evidence of re-use.

Those in sillbeams [223/1] and [1754] were clearly designed to house the sails of the wickerwork screens they supported. The five holes in [223/1] were all oval, on average 45 × 50 mm and 70–100 mm deep while the only complete hole in [1754] penetrated the sillbeam and was much smaller at 15 × 46 mm. The hurdles associated with this sillbeam had paired sails (see above) and the hole had been made by cutting out two adjoining holes to accommodate them.

The two radials in the ST2/Phase 1 entrance, [113] and [114], both had holes in the same position, on the flattened surface just in front of the step (see below). They were 55 mm and 54 mm diameter, respectively and both retained an oak peg *in situ*, presumably to secure the planks in position.

Oak posts [15010] and [15056] on either side of the trackway threshold [15002/0] bore single holes (Figure 14.10). On [15056] the post had broken off across the hole leaving only an impression; it is an estimated 65 mm in diameter and 105 mm deep and lies some 0.63 m above the base of the post. That on [15010] lies some 1.4 m above the base and is about 75 × 50 mm and 81 mm deep. These holes may relate to the operation of a gate across the trackway at this point.

Post [021/D] is one of the posts in ST1 (Figure 14.13). It bears two holes, the lower lying only 85 mm above the concave base and the other some 250 mm above that. Both are 50 mm in diameter but the lower penetrates the post by 80 mm with the upper is 50 mm deep. These holes could

have housed small horizontal poles to form a low barrier around one side of the central hearth. The dendro analysis shows that the post is part of the primary construction of the house so it is unlikely that these are redundant holes in a re-used timber (Chapter 7.2.2.1).

Three other timbers bear single holes for which there is no obvious function. Horizontal timber [262/1] in ST2 bore a single hole 55 × 70 mm and 40 mm deep; [18025], one of the longitudinals in the trackway, bore an oval hole 30 × 35 mm and 34 mm deep; [322/5a], a plank offcut found in the cavity of the ST2 outer wall, bore a hole 25 × 34 mm which penetrates the plank.

It is noticeable that the majority of these holes are oval-shaped; for some this may relate to differential drying but in others the long axis of the hole cuts across the grain and this probably relates to the manner in which they were made (see Figure 14.10, C). Gouge-like chisels with curved blades appear to have been used (see Chapter 14.5) and this may have made achieving a round hole more difficult. There is evidence for the use of an augur on one of the offcuts but this was small (see below) and would not have been used in the manufacture of the larger holes described above.

#### 14.3.7 Offcuts

There were surprisingly few offcuts found on the settlement (Table 14.4), either because a lot of the primary woodworking was done offsite or because the debris was burnt as fuel. Of the 50 offcuts retrieved 46% were alder and 42% were oak, with some hazel, willow and ash, reflecting the composition of the structural timber used on the site. The majority of these offcuts are small and thin, with cleft surfaces and oblique chopmarks at one or both ends. Some have clearly come from the dressing of small roundwood.

There are some caches of offcuts, notably those from the primary deposits under ST1, [050] and [051]. These deposits appear to have been laid down over the peat to form a dry surface on which the primary woodworking for the construction of the house was carried out. The use of woodworking debris to consolidate ground has been noted on other wetland sites (Bamforth 2024: 419).

In ST2 there are caches from [308], the surface outside the roundhouse, and from [320], a deposit found between the double outer walls. Several larger pieces of woodworking debris, ie [322/5] which had clearly been chopped off larger objects, had also been dumped in the cavity between the walls. Within the house itself, embedded in one of the floor deposits, was an offcut which had come from the reworking of a concave post.

In ST3 [1737], the primary deposit forming the foundation of Hearth 5, consisted almost entirely of wood and woodworking debris, among which were splinters cleft during the trimming of roundwood, some with chopmarks at one end.

Three large oak offcuts had been found on the peat surface underneath ST3. As there was little oak used within this structure it seems most likely that they had originated during Episode 1 from the working of large oaks such as the threshold timbers and their pinning posts in the nearby trackway. SF268 and SF309 were from the dressing of roundwood posts, while SF238 probably came from the shaping of a large plank. They were all from slow-grown oak; SF268 came from a tree 88 years of age. Large, radially cleft offcuts of slow-grown oak were also found in the packing [18028] of the fence slot [18020], probably also from the dressing of large oaks used in the trackway construction.

An oak offcut SF291 came from the midden deposit [18027]. This is different from the offcuts described above in that it appears to have come from the reworking of a finely hewn plank (Figure 15.13). The offcut is 170 mm long and 40 × 45 mm in cross-section. Two opposing faces are cleft and the other two opposing faces are finely hewn, with small facets covering both faces. The thickness of the original plank would have been 45 mm. Both ends have been chopped off at an oblique angle and at one end there is the concave shadow of a drilled hole which would have penetrated the original plank at an angle. The hole is 14 mm across at its maximum width and appears to taper towards the end. The original plank would have been a central tangential conversion from an old slow-grown oak, much like the planks used in the outer walls of ST2 but thinner and more finely hewn.

#### 14.3.8 Packing staves

Long thin splinters of oak, stave-like in appearance, were used as packing around postholes (Table 14.5).

Three *in situ* examples of this type of post-packing have been found at BLoM. In ST1 three staves, SF18, SF19 and SF20, formed a roughly triangular setting at the end of stakeline [40] (Figure 3.68). Along the side of the trackway four oak staves [15046] had been inserted into a mortise at the end of one of the longitudinal logs (Figure 14.14). In the entrance area, four oak offcuts had been inserted around post [761] in a similar fashion. The staves used in [040] and [15046] were long and thin, with an average length of 466 mm and average cross-sectional dimensions of 55 mm x 82 mm. The offcuts around post [761] were similar in cross-sectional shape and dimensions but they were much shorter, between 55 mm and 160 mm in length. A single splinter of oak SF239 was found lying over the wattle panel [777] in the entranceway, charred down one face. Its overall morphology and dimensions suggest that it could originally have been a packing stave.

All the staves had been cleft off larger radial or outer tangential planks producing roughly trapezoidal to triangular cross-sections, some of which retained sapwood. The parent oaks had all been very slow-grown,

Dimensions (mm)							
Context	SF/Sample	Species	Conv	L	W	Th	Charred
<b>Episode 1</b>							
<b>ST1</b>							
021	A/2	Alder	D1	195	85	35	
40	SF21	bark		115	70	25	
46	SF23	Alder		76	60	10	
50	RT	Alder		50	34	6	
50	RT	Bark					
51	RT	Oak		55	21	18	
51	RT	Alder		87	70	18	
51	RT	Alder		67	44	10	
51	RT	Alder		57	28	13	
51	RT	Alder		40	34	10	
51	RT	Alder		50	25	6	
51	RT	Alder		32	24	4	
51	RT	Alder		35	21	4	
51	RT	Alder		30	22	6	
51	RT	Alder		30	21	8	
51	RT	Alder		44	24	4	
51	RT	Alder		28	19	4	
<b>ST2</b>							
251	T1	Alder	CT	165	190	85	
261	1	Alder	CT	150	95	25	
267	1	Oak	D1	140	40	55	
308		Oak x 2					
		Alder x 2					
		Ash x1					
320		Oak	D/E	125	70	25	
		Alder					
322	5A	Oak	E/OT	390	155	50	charred
322	5B	Oak	E/OT	450	70	80	charred

Dimensions (mm)							
Context	SF/Sample	Species	Conv	L	W	Th	Charred
322	1	Oak	D	180	180	60	charred
325		Oak	E1/OT	240	70	50	
<b>Ditch midden</b>							
800	218						
	E	Oak	D/E	100	72	27	
	F	Willow	OT	130	67	30	
18027	291	Oak	CT	170	45	40	
<b>Trackway</b>							
789	235	Hazel	E	100	70	17	
18028	RT						
	a	Oak	D1	110	57	53	
	b	Willow	E	150	90	60	charred
	c	Oak	D1	96	37	35	
	d	Oak	D1	130	54	20	
<b>Episode 1?</b>							
nat peat	238	Oak	CT/D?	210	220	75	charred
nat peat	268	Oak	A1	140	130	90	
nat peat	309	Oak	A1	160	140	140	
<b>Episode 2</b>							
<b>ST3</b>							
1737	RT	Alder x 4					
		Willow x 1					
		Hazel x1					
<b>U/S</b>							
TP3	1	Oak x 4	D	180	85	37	

Table 14.4. Offcuts (for conversion codes see Crone & Barber 1981 & text). RT = from bulk sample.

like the planks used in the outer wall of ST2 and palisade [701], so the staves may have been the offcuts from the dressing of similar planks.

Small oak staves had also been used to define the edges of Hearth 8 in ST3 (Figure 4.26). They had been similarly cleft but from faster-grown lengths of roundwood and were much shorter in length, 205 mm on average.

### 14.3.9 Re-use

There is very little unambiguous evidence of re-use in the form of redundant joints and pegholes on *in situ* timbers. One of the fragmentary oak planks [1160/2] in the ST3 Hearth 5 displayed a notch indicating that they were re-using old timber to build up the foundation of the

Context	SF/ Sample	Species	Conv	L mm	W mm	Th mm	Description	Charred
<b>Episode 1</b>								
<b>ST1</b>								
40								
	18	Oak	D1/OT	350	90	60	Cleft surfaces. Chisel-edged tip	
	19	Oak	D1/OT	405	75	80	Cleft & dressed surfaces. Single facet at tip. Top chopped off	
	20	Oak	E1	580	150	60	Rectangular – both faces dressed. Tip chisel edged	
<b>Trackway</b>								
15046								
	A	Oak	D/OT	490	75	60	All cleft surfaces. Tip shaped to blunt edge	
	B	Oak	D/OT	480	62	55	All cleft surfaces. Tip shaped to chisel edge	
	B	Oak	D/OT	415	70	40	All cleft surfaces. Tip shaped to chisel edge	
	D	Oak	D/OT	543	50	28	All cleft surfaces. Tip shaped to flat chisel edge	
761	A							
	A1	Oak	D/OT	55	65	40	Square cross-section	
	A2	Oak	D	95	95	37	Thin, rectangular cross-section	
	A3	Oak	D/OT	160	70	70	Triangular cross-section	
	A4	Oak	D/OT	155	80	65	Square cross-section	
<b>Episode 2</b>								
777	239	Oak	D/OT	530	40	25	Rectangular cleft stave	charred

Table 14.5. Packing staves (for conversion codes see Crone & Barber 1981 & text).



Figure 14.14. Oak staves [15046] packed into a mortise in one of the longitudinal trackway logs.

hearth, while offcuts SF291 and [322/5] also demonstrate that wood was being reworked and re-purposed.

Dendrochronology has highlighted some instances of re-use. For example, [727] and [729], fragmentary planks in the entrance area were dendro-dated to Episode 2 but were found stratigraphically in Episode 3; it is easy to imagine that old planks were simply lifted and relaid during refurbishments to the entrance surface. Less easy to imagine is the re-use of very old timbers that must have been lying around for hundreds of years, but dendro analysis indicates that [701/7], one of the oak timbers used in Palisade 4, had probably been felled some three centuries earlier in the late 7th/6th century BCE while post [15056], associated with the Episode 1 palisade, was felled over a century earlier. Dendrochronology has also identified the re-use of old timbers at Must Farm, Cambridgeshire (Tyers et al 2024: 1280) where it has been suggested that they were curated, incorporated into the new settlement as an act of continuity (Robinson Zeki et al 2024: 427).

## 14.4 The entrance structure in ST2

Alex Wood

### 14.4.1 Introduction

The construction of the primary Phase 1 entrance into the Episode 1 roundhouse ST2 was the most complex example of multi-component carpentry in the settlement, with parallel sleeper beams penetrated by large, squared mortise-holes, framing tangential timbers, some with hewn upper surfaces secured together with pinning runners (Figures 14.15 & 14.16). For this reason the woodworking is described in detail in this section. The entire structure was not fully exposed, the innermost end unfortunately lying under an excavation baulk, so the means by which it was jointed into the foundation framework [277] and the sillbeam ring [233] is unknown. Furthermore, there are almost certainly components missing, the evidence for which will be discussed below.

### 14.4.2 Description

The entire horizontal framework of the Phase 1 entranceway was built using alder, except for a single stake of willow. The sides of the entranceway were defined by two radial sleeper beams, both measuring 2.3 m in length. Both western [113] and eastern [114] sleepers were converted from the round and tapered in diameter from 0.44 and 0.47 m respectively at their inner ends to 0.35 m and 0.33 m respectively at their outer ends, presumably reflecting the natural tapering of the log along its length. The outer ends of both were hewn flat while the broader inner ends had been hewn, to a rounded profile on [113] (Figure 14.17) and a chisel profile on [114]. Both sleepers bore remnants of tow-holes at the inner ends.

Both sleeper beams displayed three closely-set squared mortise-holes midway along their lengths. Each mortise measured approximately 230 mm by 220 mm and penetrated the full depth of the log. These had been created by removing the bulk of material with axes from both above and below while the final shaping was carried out with a gouge-type chisel (Figure 14.18 & see Chapter 14.5). The latter was done from above so the final dressing may have taken place with the sleepers already *in situ*. The mortise holes lined up with the plank-built walls so the posts set into the mortises would have spanned the wall cavity to form a lined entrance area.

The sleeper beams were set 1.70 m apart and the space in between was filled with tangential logs. There were seven logs in total but the innermost was not sampled as it lay partially under the baulk. The outer three sampled logs [104], [105] and [112] were undressed, bark surviving intact, while the inner three sampled logs [106], [107] and [108] had been hewn flat on their upper surfaces (Figure 14.19). The inner logs were secured together by runners [102] and [103] which had been set into V-shaped notches *circa* 12 mm wide cut into the logs (Figure 14.19). The unsampled innermost log was also hewn and secured by the runners. The runners were lengths of small roundwood, 80 mm and 100 mm in diameter. The surfaced logs lay within the outer annulus of the roundhouse, between the inner wall and the post-ring, while the undressed logs lay outside the outer wall. The difference in treatment suggests an inner and outer entrance area, probably with a door defining the junction (see below). The inner logs were probably hewn to provide a stable surface, possibly for an upper floor of planks which have not survived (see below). The bark surviving on the outer logs implies that they were covered, probably with brushwood or hurdle screens.

Logs [104] to [108] had been trimmed flat at each end and fitted snugly between the sleeper beams. However, there were another two undressed roundwood logs, [100] and [101], whose ends lay over the sleeper beams. Log [101] is similar in diameter and length to the outer logs and may have just shifted out of position but [100] is slightly bent and at 1.98 m is considerably longer so it would never have sat between the sleepers. It is positioned over the gap between the inner and outer logs and lies over the ends of the runners. It may have been placed there later to fill an increasing void, possibly as levelling in preparation for the Phase 2 refurbishment of the entrance.

The gap was probably intentional, possibly serving as a drain between the inner and outer entrance area. A rubble drain [330] was uncovered in the same position in the Phase 2 entrance, suggesting a need for drainage at this point.

It seems likely that a plank floor, a continuation of the speculative floor which lay over the inner logs, also covered the gap. The evidence for this lies in the shaping of the sleeper beams at this point. The surfaces of both had

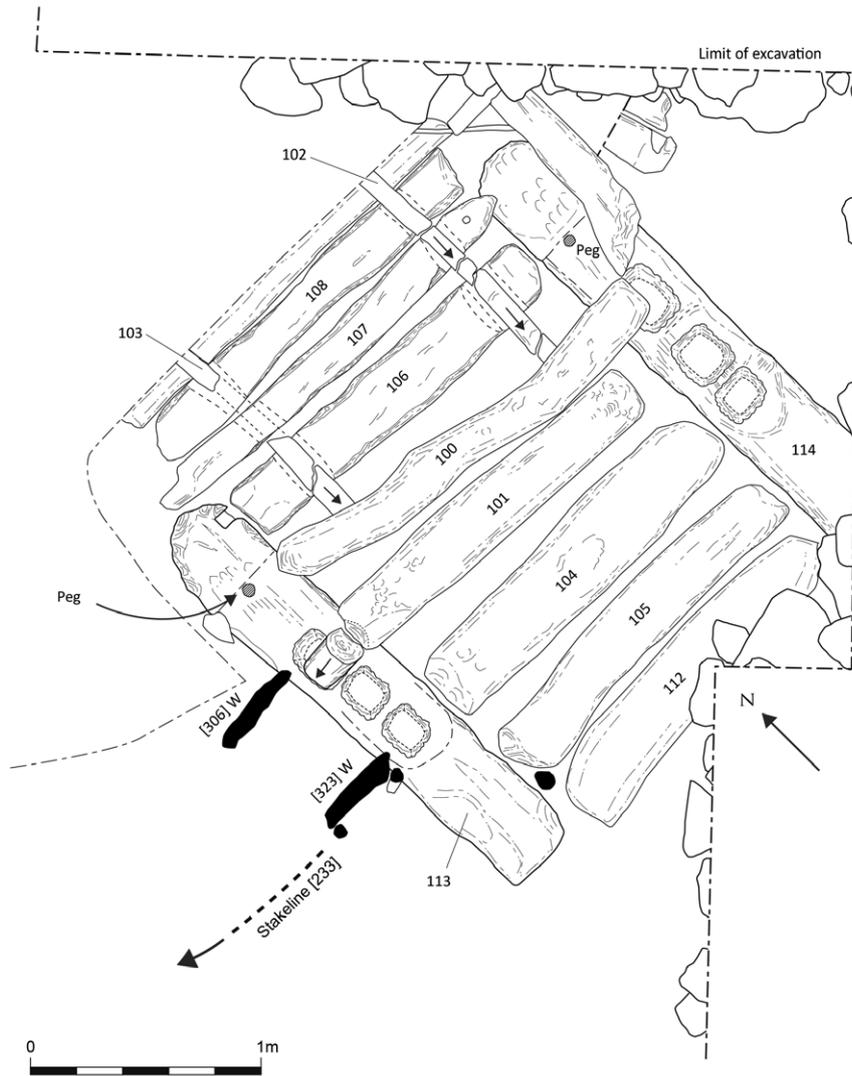


Figure 14.15. Plan of the ST2 entrance with timber numbers.



Figure 14.16. The entrance structure with the interior of ST2 lying beyond the upper right of the photo.

Figure 14.17. Timber [113] being recorded after lifting. The rounded end to the left is the inner end. The flat surface created by cutting into the log is visible, the remains of an oak peg sitting just in front of the inner step.



Figure 14.18. Interior of one of the mortises in [113]. The scalloped tool marks of the gouge-like tool are visible.



been hewn flat from a line roughly 0.4 m from their inner ends for a distance of 1.2 m on [113] and 1.25 m on [114]. The mortise-holes described above were positioned along this flattened area (Figure 14.17). A shallow step, 44 mm deep on [113] and 48 mm on [114], had been created by the dressing at the inner end and immediately in front of this step, on both sleepers was the remains of a large oak peg, 70 mm in diameter on [113] and 54 mm on [114]. It is proposed here that in the space between the step and the first mortise, a distance of 0.3 m, a plank had been laid over the gap, secured in position by the pegs. This speculative plank would have lain just inside the inner face of the outer wall, creating a clear distinction between the inner and outer entrance area. The thin oak planks [305] which formed part of the Phase 2 entrance may have been re-used from the Phase 1 entrance described here.

The Phase 1 entrance construction to ST2 displays a variety of technical approaches to working with substantial roundwood timbers to create a monumental entrance way (Figure 14.20). It represents the most advanced carpentry seen at BLoM, employing mortise and tenon joints, notches for pinning logs and dowels for securing components.

## 14.5 Toolmarks

*Graeme Cavers*

### 14.5.1 Introduction

Many of the timbers excavated at BLM displayed clear evidence of woodworking, including evidence for the felling of timbers, their transport and manipulation and in some cases conversion from the round and shaping. Recording



Figure 14.19. The inner three logs, their surfaces hewn flat and the runners lying in their V-shaped runners.



Figure 14.20. The ST2 entrance as reconstructed in the Whithorn roundhouse, showing the planks flanking the entrance and the radial sleeper beams with squared posts forming a lined hallway into the roundhouse.

of these toolmarks can provide valuable information on the techniques used in working the timbers, but also in the range of tools possessed by the woodworkers and even, by extension of inference, an indication of team sizes involved. Analysis of toolmark evidence in conjunction with woodworking techniques has been successfully used to demonstrate the probable population of tools employed in the construction of a single site, as well as the number of people involved in felling and dressing timbers (Brennand & Taylor 2003: 25–29). Sands' pioneering 1997 study of the signatures left by damaged axes on crannog timbers demonstrated the potential value in correlating axes to

crannog structural timbers in a complex settlement but, as noted since, the approach has seen limited subsequent use, in part due to the rarity with which toolmark signatures survive. A limited number of studies have built on this approach to tool signature studies in recent years (Sands 2019: 6) and the potential of such analyses has been identified in excavated assemblages (Jennings 2008), but for the most part studies of toolmark evidence has been limited to the analysis of blade morphology and tool types. Such studies can nonetheless provide valuable insights into the processes of procurement and preparation of structural timbers, as well as the range and sophistication

of the toolkit that is otherwise not preserved. Aside from the iron ploughshare from ST1 (Chapter 15.7), no iron tools were recovered from BLM, so that the toolmarks present on waterlogged timbers, as well as waste material from timber dressing and turning, represent the extent of such evidence.

Although tool markings are commonly observed on waterlogged timbers from Iron Age wetland settlement excavations, studies are not numerous, and despite Scotland's wealth of structural timbers from crannog sites, only a small number of assemblages have been analysed. Coupled with the near complete lack of iron woodworking tools from early Iron Age Scotland, there are relatively few comparative data with which to contextualise the Black Loch toolmark assemblage. In general, both the techniques used and the character of the toolkit bear close similarity with studies of Iron Age waterlogged wood assemblages both locally and elsewhere in the UK, including at Cults Loch (Cavers & Crone 2018), Fiskerton (Field & Parker Pearson 2003), Sutton Common (Thomas 2007) and Oakbank crannog (Sands 1997), although with a few indications of additional tools and techniques not observed on these sites.

#### 14.5.2 The worked timbers

The approach to felling and conversion of structural timbers, planks, posts and stakes is discussed above. At the lower levels of the site where preservation was generally excellent, virtually all timbers showed some evidence of working, ranging from single faceted stakes sharpened with a single axe blow, to concave-based piles evidently designed to resist being forced into soft peat deposits when under load. However, while most timbers showed working evidence, complete jam curves were not common; with only a limited number of timbers displaying full curves. In several cases, near-complete jam curves were present, and a reasonable estimate of the blade width could be attempted based on the projected curve. In some cases, discussed below, the blade width could not be estimated but the concavity of the facets suggested use of a blade that may have been larger than any jam curve recorded, but this is less easy to demonstrate with confidence. Blade damage signatures were less frequently observed, although some timbers displayed these very clearly with non-oak species typically displaying these most distinctly. Figure 14.21 shows those timbers where full blade curves were identifiable, against timber species and diameter.

The terminology used in this report follows that set out by Fletcher and Thomas (2001) and Brunning (2010), with the approach to blade estimation following procedures described by Sands (1997: 11–13) and Brennan & Taylor (2003: 22). Posts and stakes at Black Loch displaying chisel, wedge and pencil tips were recorded (Fletcher & Thomas 2001: 281), while the principal other woodworking features were the very common tow-holes for the manipulation of large timbers, mortise joints

and dowel holes. Several posts featured concave bases, discussed above.

#### 14.5.3 Recording methods

Those timbers displaying the most complete facets and jam curves were recorded in 3D, initially using laser scanning but latterly relying more on structure from motion photogrammetry (SfM). Each technique has its benefits and drawbacks, and these are worth noting here, not least since the potential of 3D recording methods in speeding up timber tool mark recording is often cited (Brunning 2010; Lobb et al 2010). While laser scanning is more time consuming at the data collection stage, the product can be worked with more rapidly, requiring far less processing. SfM datasets, on the other hand, can be acquired rapidly and, if calibrated scales are used, can provide equally accurate 3D geometry. However, the data processing stage is considerably more time consuming, and obtaining high-quality photographs suitable for 3D data production from dark brown or black, shiny waterlogged wood can be challenging. Even within the seven-year timeframe of the BLoM project, however, software and hardware improvements have meant that photogrammetric approaches are the most efficient means of capturing high-quality datasets, and at the present time seems most suitable for future application to waterlogged wood.

Timbers recorded using SfM were photographed using Canon DSLRs and the resulting images processed using Agisoft Metashape Pro, with scaling established by CHI calibrated photogrammetry scales. The 3D datasets were visualised orthographically and measurements of jam width and sweep were taken; for selected timbers the curves were extracted to 2D profiles in CAD. The 3D datasets can allow very precise measurements, at sub-mm level, but the distinction between precision and accuracy should also be noted here. While jam curves can be measured very precisely, it is often not possible to be certain that the curve reflects the true width of the blade, particularly where the direction and angle of the blow cannot easily be determined (see discussion by Sands 1997: 13). This issue, combined with the likelihood of blade resharpening and deformation during use, should be accepted as a limitation on the reliability of the measurements, but does not detract from the overall pattern presented.

#### 14.5.4 Axes and adzes

By far the most commonly observed tool marks on timbers from Black Loch were oblique facets resulting from blows from an axe. As noted, in levels where preservation was good and no significant decay had occurred, most timbers displayed evidence for trimming or shaping. In general, the level of finishing was in line with the visibility of the timber in the finished structure, ie the bases and ends of posts, stakes and foundation logs were typically roughly shaped

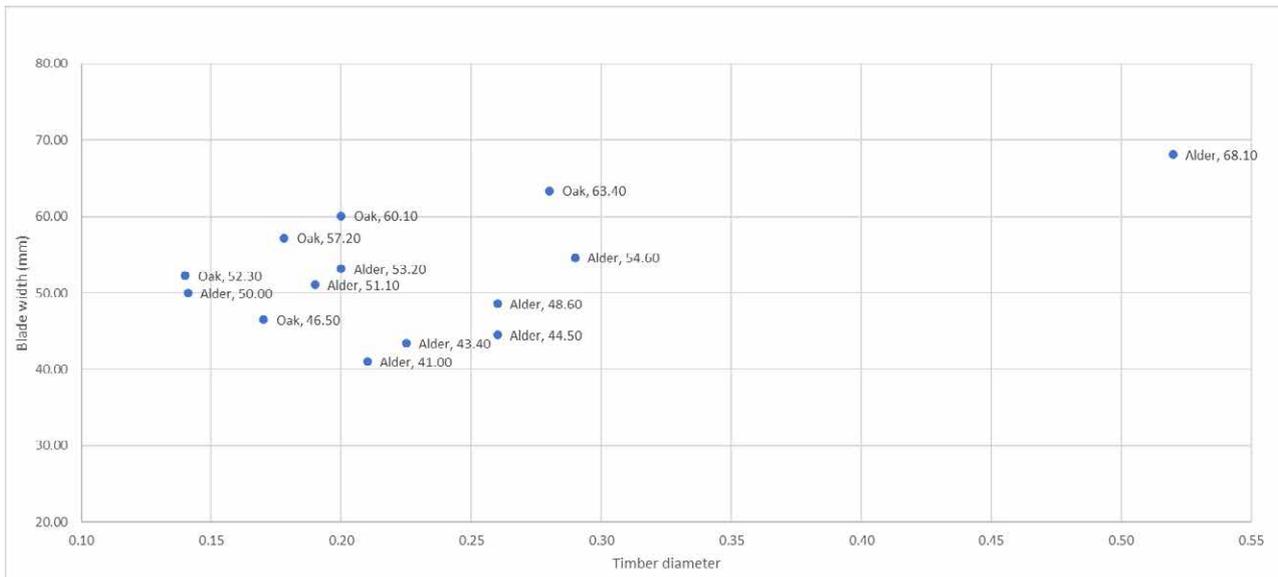


Figure 14.21. Scatter plot of full jam curve widths against timber diameter.

to chisel or concave ends, whereas timbers designed to be visible in superstructures, such as planking, were more carefully finished. As such, the assemblage of jam curves recorded is likely to be biased towards those tools used for rough shaping of timbers, while finishing tools that were used on superstructure timbers will inevitably be less well represented.

All of the jam curves identified were likely to have been produced by very similar axes. All were in the range 40–70 mm, typical of earlier Iron Age axe blade widths, with the majority evidently produced by axes between 41 mm and 63 mm wide. Blade curvature ratios, ie the ratio of width to sweep (Brennand & Taylor 2003: 25) ranged from 0.9 to 0.16, again typical of the range for both socketed bronze and iron axes. One blade curve is at the larger end of the range; on timber [15055], the post-shoe associated with Palisade 1, one of the tools used for dressing the block may have had a width of at least 68 mm, suggesting the use of a much heavier axe, or perhaps more probably, an adze, reserved for heavy timbers where shaping was more critical.

It was possible to identify the probable use of the same axe within the foundation timbers [277]: [277/2] and [277/4] were probably worked using the same tool, with close correspondence in the width and ratios of the blade curves indicating an axe *circa* 54 mm wide. Timber [277/1] however, displayed very well-preserved jam curves indicating the use of a slightly smaller axe 52 mm wide (Figure 14.22).

These attributes place the BLoM axes in a very similar category to those analysed by Sands from Oakbank crannog, Loch Tay, which typically have curvature indices in the range 7% to 16%, with widths ranging between 40 and 60 mm (Sands 1997: 82), as well as those from Cults Loch, which were typically in the range of 50 to 60 mm in width (Cavers & Crone 2018). The nature of the axes in use at the time that

Oakbank, Cults Loch and BLoM were constructed is not straightforward to determine: the blade widths and depths are in line with those of socketed bronze axes of the late Bronze Age (Coles 1960: 31–34), as well as the very limited number of socketed iron axes from Scotland (such as those from Traprain Law (Cree & Curle 1922) and Lochend Loch, Coatbridge (Monteith & Robb 1937)) and drawing a distinction between the two forms on the basis of tool facets is virtually impossible. Whilst the extent to which socketed iron axes replaced bronze versions across Scotland is difficult to gauge, by the 5th century BCE iron tools were well established and it seems most likely that the BLoM axes were iron, and of the socketed form. Shaft-hole axes appear from the middle Iron Age onward, and it is not possible to be certain that the BLoM axes were not of this type, but the socketed form is considered more likely prior to the last two centuries BCE (Fell 2003: 67). Later Iron Age and Roman socketed axes are typically wider-bladed and heavier (Ulrich 2007: 22–24).

The use of adzes is indicated on several timbers. This was probably the tool used to finish the large oak planks used in the facade of ST2, as well as in finishing other oak offcuts and planks and perhaps in shaping the post-shoe [15055]. The large, concave facets on both the oak planks and the post-shoe suggest that such tools may have been reserved for much heavier timbers; the correlation between timber diameter, species and blade width does suggest that larger blades were more often used on oak timbers or timbers with larger diameters (Figures 14.21 & 14.23); it is possible that these larger blades were adzes suited to dressing larger timbers. Finds of iron adzes are effectively unknown in early Iron Age Scotland, though a small number are known from the Eckford, Carlingwark and Blackburn Mill hoards (Piggott 1952), albeit that these comprise a somewhat later context. A possible exception is an unstratified adze, with partially intact haft,

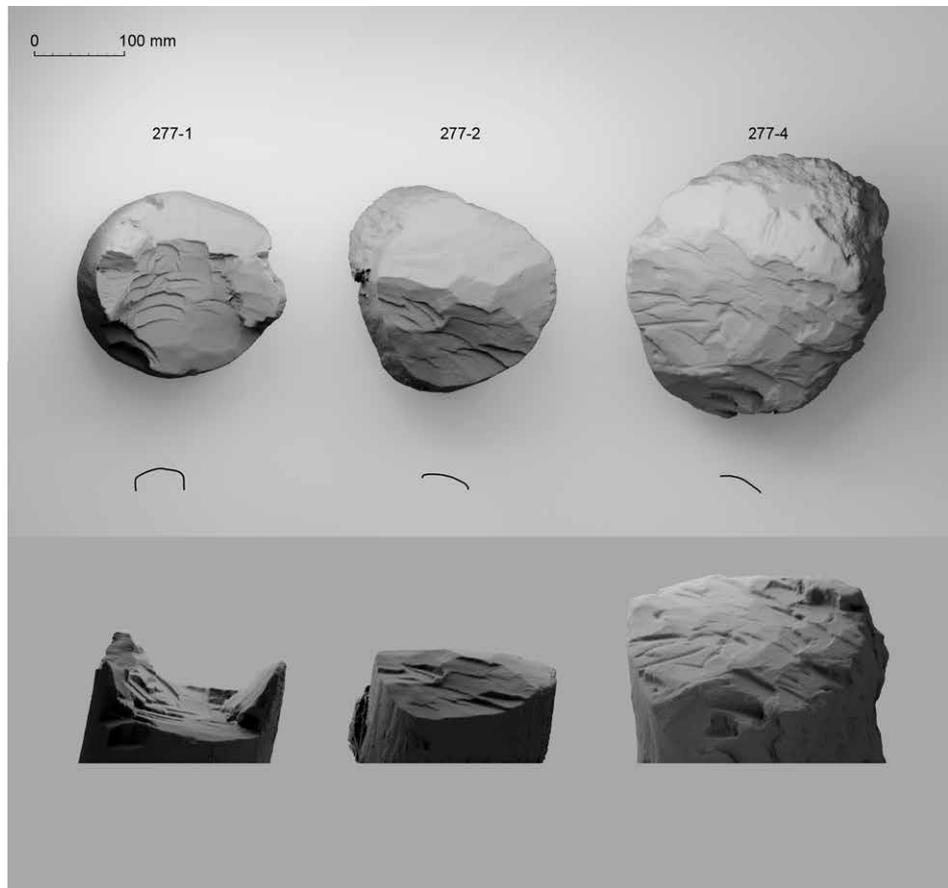


Figure 14.22. Jam curves on [277/1], [277/2] & [277/4]; [277/2] and [277/4] were likely worked with the same axe, but [277/1] was worked with a slightly smaller tool with a deeper sweep-width ratio.

recovered from High Pasture Cave on Skye; the date of the object is uncertain but High Pasture Cave was in use in the third quarter of the 1st millennium BCE (Cruickshanks *pers comm*). An indication that similar narrow-bladed adzes were part of the BLoM toolkit is suggested by SF221 (Chapter 15.4.5.4), a possible haft for a small socketed adze.

### 14.5.5 Chisels and gouges

In addition to the facets left by axe and adze working, many timbers showed evidence of the use of chisels and gouges, particularly in the production of notches, mortises and grooves. Most commonly, these seem to have been used in creating the tow-holes found near the ends of almost all large logs used in the construction of the settlement. In some instances, the tow-hole was apparently roughed out using an axe or small adze of similar dimensions to those described above, before perforating with a smaller chisel-like blade; in the case of [255/5] this was probably a blade around 20 mm in width (Figure 14.24).

Several of the timbers from ST2 show evidence of the use of curved gouge-type chisels, particularly in the creation of mortise joints in sleeper timbers [113] and [114] in the entrance to ST2 (Figure 14.18). Several tools are represented; on [113] and [114] these were gouges with a tightly curving blade, *circa* 22 mm in diameter, while those on perforation

holes on [243/15] and [322/5A] were somewhat smaller, around 17 mm. Curve-bladed gouges were also used in hollowing out dowel holes on the post [21/D], again with a narrow blade diameter of around 9 mm. On [114], the impression of the gouge blade is apparent on the upper, worked surface of the log, as though the blade was leant on by the woodworker on completion of the mortises (Figure 14.25).

The only other woodworking tools for which there is direct evidence are those related to turning; the interior of the wooden bowl found in the midden deposits displays striations left by a sharp-ended turning chisel (Figure 14.26). It is likely that tools related to wood turning were specialised and dedicated to the purpose; there are no parallels for wood turning equipment of this date in northern Britain.

### 14.5.6 Other tools

Evidence for other tools is limited, although it is reasonable to infer the use of other small blades, perhaps spokeshaves or knives, which would be required in the production of the tight-fitting dowels found in sleepers [113] and [114]. In keeping with other early Iron Age waterlogged sites, evidence for saw marks is conspicuously absent. Although a pull-saw was among woodworking tools found at Fiskerton,

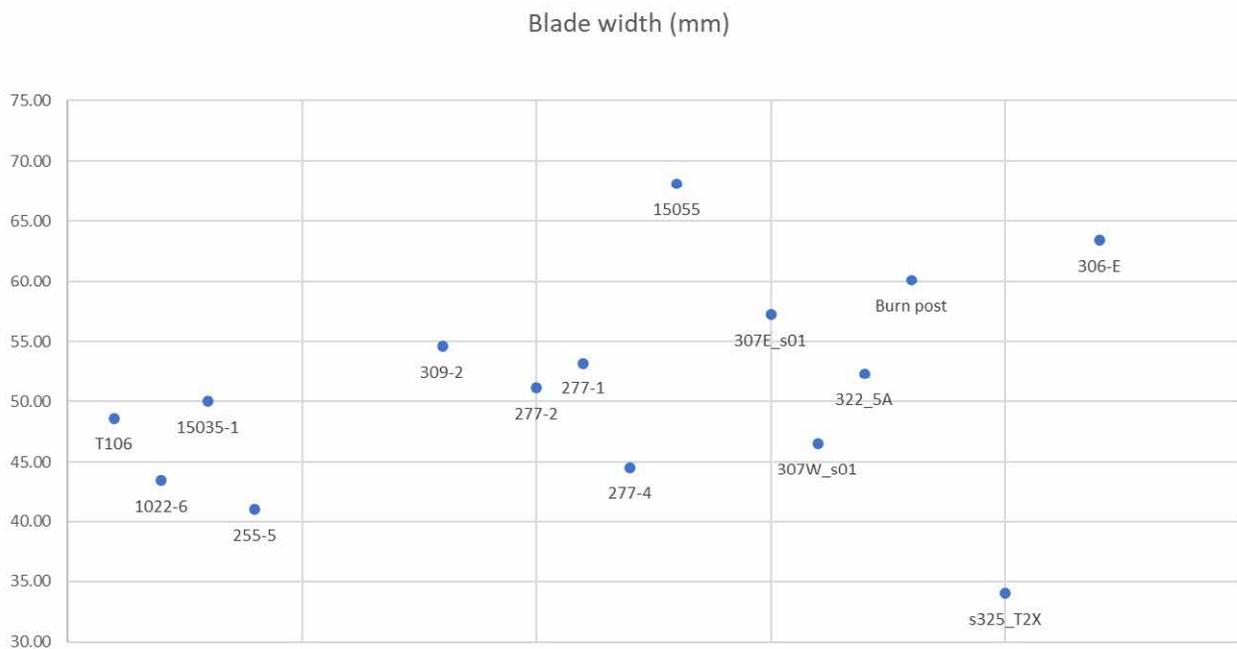


Figure 14.23. Blade widths recorded by timber.



Figure 14.24. Timber [255/5], a typical 'hourglass' notch perforating the timber, started with a small-bladed axe and finished with a flat chisel.

a site which was certainly in use through the second half of the 5th century BCE, the dating of the saw itself is less secure and, given the La Tène style decoration on the handle, seems more likely to be of late 3rd century BCE date or later (Stead, in Fell 2003: 71). On the basis of the available evidence, it seems that saws were not commonly used in woodworking on Iron Age sites in Scotland.

## 14.6 Making tangentially split oak planks in the Iron Age; observation and understanding through doing

*Hamish Darrah*

### 14.6.1 Introduction

As described above, tangential splitting was the most commonly used conversion at BLoM and has now been observed at a wide range of other prehistoric sites. The benefits of tangential splitting is that the resultant planks span the full width of the log's diameter so that the widest possible planks can be produced and it also produces planks of relatively standard thickness, which in theory require less dressing and therefore produce less waste material. Nonetheless, tangential splitting across the grain of the tree is more difficult than radial splitting, which follows the grain and from at least the Roman period on became the commonest form of timber conversion. A practical experiment in the manufacture of tangentially split planks was undertaken for an MSc thesis, to better understand the reasons why woodworkers in prehistory might choose to adopt this approach (Darrah 2022). As some of the insights offered by this experiment are important in the interpretation of the evidence from BLoM, a brief summary of the experiment and its key observations is presented in this section.

There have been a few experiments in the manufacture of tangentially split oak planks (Darrah 2006b; Pillonel 2007) and the thesis builds and expands on those earlier studies.

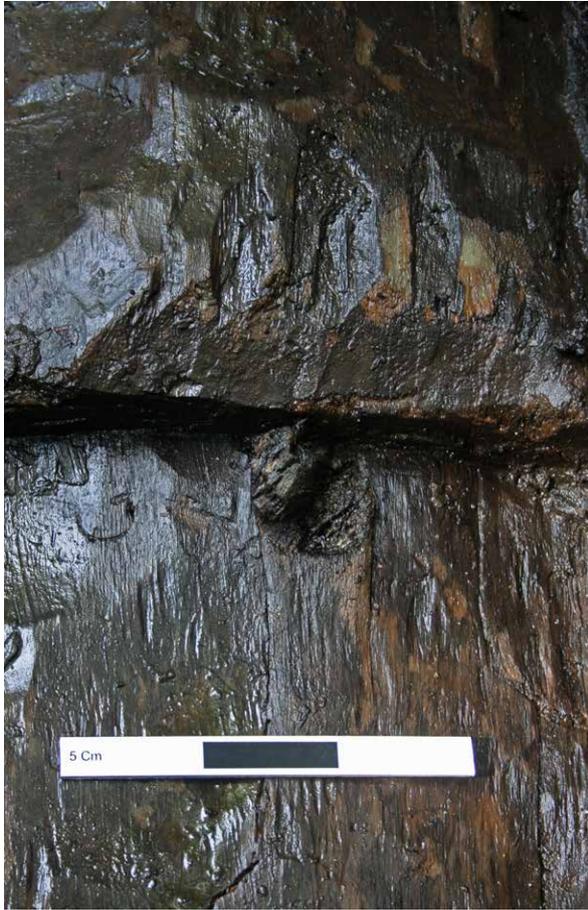


Figure 14.25. Sleeper log [114], showing the oak dowel and the impression of a gouge-type chisel, *circa* 50 mm to its left.

This study has approached the timbers in a biographical manner, exploring their life history from their beginnings as standing trees to their final use in construction at BLoM. In particular, the thesis has considered the dressing and working required to transport the planks, but also extends to other aspects of their biographies, including their final appearance. Amongst other issues the thesis discusses the toolkit used, the use of wedges and the marks they leave on the timber.

For the experiment, a single oak (*Quercus petraea*) trunk was made available by the Gifford Community Woodland (GCW), East Lothian (Figure 14.27, A). The woodland where the tree was felled also provided the site for the experiment. The trunk was cut to a 2 m length, weighing approximately 0.5 tonnes, although in retrospect a 3 m length would have been a better replication of the projected original length of the planks (see Chapter 14.7.2.1). In many other respects, the GCW oak was comparable to the oak trees used at BLoM. At 0.62 m in diameter at the base the trunk was a close match to the diameter ranges indicated at BLoM (Table 14.1). The tree was grown within a closely



Figure 14.26. Striations on the interior of a fragment of the wooden bowl, left by a turning chisel.

planted plantation of sessile oaks and appeared straight from the outside, with limited knots. It was 215 years old when felled and was relatively slow grown. Six large planks were successfully split from the log.

## 14.6.2 Key observations

### 14.6.2.1 Splitting and face dressing

The tree had been felled and cut to length by chainsaw and this probably made it much easier to start a split from a flat chainsawn face than from an axe-cut face. The tree had also been felled 10 months prior to the experiment and the ends had begun to dry out, an effect which would have an impact on the splitting. However, the dendro dates from BLoM indicate stockpiling over a few years so the builders may have had to deal with similar problems, unless of course the trees were split into planking immediately after felling.

The log was initially split in half using wedges driven in from the end and then followed through along the grain. Each half-log was then halved in turn and the innermost plank halved again, thus replicating the central (CT), inner

(IT) and outer tangential (OT) planks observed at BLoM (Chapter 14.2). The direction of split was varied, on one half from the basal end of the log and on the other from the upper end (Figure 14.27, B). This demonstrated that it was easier to split from the greener upper end. However, in terms of practical arrangements it was easier to split from the basal end of the log as this did not require moving the log away from the crown of the felled tree and afforded a more useful area for working, especially considering the need for swinging the maul for splitting. Furthermore, it seems most likely that most of the work would have been done at the base of the tree, because in terms of removing the planks from the felling site, dragging a plank away from the direction of the crown of fallen branches would be much easier.

The splitting caused large radial cracks to appear on the CT and IT planks but with minimal splitting on the OT planks (Figure 14.27, C). It is possible that some of the planks at BLoM that were recovered as halves, ie [323/1], [701/3] and [701/6], had either cracked in half radially as a result of this issue or had been deliberately split in half to mitigate the

impact of the cracking. This may have made the OT planks more valuable because they were less prone to splitting and may explain why 67.5% of all the planks found on the settlement were OT conversions.

Despite the appearance of straight growth, there were both knots and a twist along the length of the log which made the splitting of evenly thick planks difficult to achieve. This meant that some further splitting off of large sections and a considerable amount of adzing were required to dress flat the surface of the planks. However, the faces of the BLoM planks themselves were only partially hewn with limited areas of adzing, possibly because the surviving buried portions of the planks would have been invisible. This suggests that the purpose of some of the adzing was likewise to reduce the overall thickness or to flatten, rather than achieve a flat surface for aesthetic purposes.

#### 14.6.2.2 The tow-holes

A key element of the experiment was the replication of the tow-holes observed on many of the planks. Firstly, this



Figure 14.27. A) Removal of bark on either side of the trunk to judge the direction of grain and course of the split. B) Basal view of primary splitting. C) Upper view of primary splitting. D) The follow-through of the tow-hole cut onto the plank surface below it, as seen on plank [323/2].

confirmed that the planks had been split before the holes were made; some, such as the hourglass-shaped tow-holes on planks [243/14] and [701/9], could only have been made by flipping the plank, thus working it from two sides. Similarly, the direction of the axe cuts in the tow-holes of planks such as [701/15] indicate that the holes were made working from the inner to the outer face, so the plank must already have been split off.

The experiment also demonstrated that at least some of the holes were made whilst the planks were still stacked one above the other (Figure 14.27, D). The triangular notches seen on the surface of [323/2] were replicated by cutting a tow-hole into the plank above it; as it was a CT plank it would have lain at the bottom of the stacked planks and the axe accidentally gouged out the triangular notches.

One of the most significant elements of the experimental work stemmed from the replication of the OT planks and their associated tow-holes. The OT planks were almost twice as thick as their CT and IT counterparts but because there was a higher proportion of sapwood on the OT plank it was not possible to successfully split off an additional outer plank. This is confirmed by experimental work at Hauterive-Champréveyres, which found that due to a higher ratio of sapwood in OT planks, there is greater tendency for the split to run out, as the sapwood is so soft compared to the heartwood (Pillonel 2007: 253).

OT planks [306-E/1] and [701/15] exhibit ridges at their bases through which tow-holes were cut. The experiment to replicate plank [306-E/1] suggests that the ridges arose from the need to remove the outer sapwood to make planks of the desired thickness. As the BLoM woodworkers had to remove so much waste material, it would have been possible to leave ridges of predominantly sapwood proud. The advantage of this type of design was that during towing wear on the rope threaded through the holes was reduced significantly, in comparison with rope threaded through the simpler tow-holes cut through the IT and CT planks (Figures 14.28, A & B). It is possible that some of the other OT planks originally displayed a similar sapwood ridge and tow-hole but the sapwood had decayed away. Similar steps to improve towing in terms of rope wear reduction may also have been applied to [243/15] which displays a central groove along one face running between the two tow-holes and ending in a V-shaped notch at the base.

#### 14.6.2.3 Colour

One notable observation about the GCW planks was the distinction in colour between the innermost and OT planks. The exposed heartwood of both types of plank was a bright gold brown in colour. In the case of the OT planks parts of the bright pink sub-bark cambium and dark orange sub-bark cambium were exposed once the bark had been stripped off, the pinkness creating an almost flesh-like resemblance (Figure 14.28, C). The differences in colour between the plank

types would have changed with time and weathering but, nonetheless, this initial colour contrast could have played an important aesthetic role in the earlier stages of the construction of the structures.

At the end of the experiment, the planks were erected to create a mock wall and entrance (Figure 14.28, D). This reconstruction brings home the imposing and impressive scale of the golden wall of planks – something which is much harder to appreciate from the decayed, peat-darkened stubs of the planks from BLoM. The planks would have been a bold representation of the skills, resources and organisation available to the community and therefore very probably a display of status.

#### 14.6.2.4 Recording time

The production of six large planks with tow-holes took 11 days to complete. Many archaeological experiments are concerned with the time and labour involved in tasks but there are so many variables to consider in terms of relative skill, urgency and the size of the workforce involved which are very difficult to replicate in any meaningful way. For example, the author's tool proficiency in terms of swing precision and other skills may be closer to that of an Iron Age woodworker than other modern day non-woodworkers but it was nonetheless limited in terms of tangential splitting. The value of recording time as a valid parameter was also brought into question by the accelerated time requirements for each individual task as confidence and familiarity grew. However, a safe estimation would suggest that to produce the same number of planks, days rather than weeks would be necessary, depending on the relative skill of the woodworkers, urgency and labour availability.

### 14.7 From bills of quantities to energy costs

*John Barber & Anne Crone*

#### 14.7.1 Introduction

Abundant evidence has been recovered from BLoM for the materials used in the construction of the roundhouses. The superstructure of each of the Episode 1 roundhouses was built entirely of wood; oak and alder logs for posts, alder for sub-floor structures and primarily hazel, alder and willow for the wickerwork walls and screens. Rushes, sedges and bracken were used for flooring and clay, boulders and stone slabs were used to build the hearths. Similar materials were used in the construction of the Episode 2 roundhouses with the significant difference that oak was not employed, either as stakes, posts or planks. This suggests that oak was not available to the occupants of Episode 2, perhaps implying a difference

in the status or function of structures in Episode 2, or that a difference existed in the perceived value of each building. In this section we estimate the bills of quantities for the wood needed to build ST2, ST3, Palisade 1 and Palisade 4 and explore the differences between them in terms of energy output or labour costs.

Labour cost studies cannot provide precise measurements of building costs, because there are too many unknown or uncertain parameters involved. Nonetheless, the relative costs incurred by specific structures can indicate the relative scales of social investment they represent (Boswinkel 2021: 9). For example, ST3 contained no large oaks and no large stones and thus had significantly smaller transport costs. This could indicate differences in the population group building the structures or differences in the functions of the structures. The comparative results should constrain the scope of potential hypotheses and by the application of a consistent methodology, preserve the merit of the revealed comparative values. All numerical models are

wrong, but some of them are useful and the main use of this modelling lies in its comparative value.

### 14.7.2 Bills of quantities

In Tables 14.6 and 14.7 the volumes of wood used in ST2 and ST3 have been derived from the observed data. The species of each piece of structural wood used is listed together with sufficient of its measurements to allow calculation of its original volume and from this, its mass. The assumptions underpinning the data in Tables 14.6 and 14.7 are presented below.

#### 14.7.2.1 ST2

In ST2 we have direct evidence of the dimensions and species of wood used for almost all the main structural components, except for the ring-beams and rafters. We have assumed that these will also have been oak, like all the other major elements of the superstructure, and that they will have been of similar dimensions to the surviving posts, which were selected to support them. The heights of the posts in the post-



Figure 14.28. A) Dragging using the ridge tow-hole of replicated plank [306E/1] with holly withy rope. B) Alternative tying configuration with 'simple' tow-hole. Note the potential for dragging wear on the underside of the rope. C) Pink, flesh-like cambium and dark orange sub-bark bast on an OT plank. D) Uprighted planks creating a mock entrance with the author for scale.

rings and the lengths of the rafters have all been derived from architect Hazel Smith's plans for the reconstructed roundhouse at Whithorn, which was developed on the basis of the excavated plan of ST2 and assumed a roof slope of 45° and an external wall height of 1.5 m. In addition, we have made the following assumptions:

### 14.7.2.2 ST3

The evidence for the superstructure of ST3 is rather sparse, presumably because much of it had been dismantled. As there is no evidence for the use of oak in ST3 we have assumed that all the elements of the superstructure are likely to have been a non-oak species such as alder. While less of its wooden superstructure survived, sufficient exists to support the assumption that its construction was a scaled down model of the ST2 structure described above. Thus, we assume a proportionate spacing of 1.6 m for the posts of the post-ring, based on the average spacing of posts in ST2 (1.9 m), modified for the smaller size of ST3, and we have assumed, as we have with ST2, that the ring-beams and rafters were similar in diameter to the few surviving posts in ST3. Similarly, the rafter lengths and post lengths have been calculated on the

assumption that the roof had a 45° pitch and that the walls were 1.5 m high.

### 14.7.2.3 The wickerwork

Although numerous hurdle screens were used as sub-floor surfaces in the houses, few of them were fully exposed (Table 14.2) so we have based our calculations on a *standard horizontal hurdle* unit of 2.5 m x 2 m. It is argued that 2.5 m is the shortest usable length from a coppiced hazel stem (Harmer 2004: Table 2), and 2 m is roughly the width of both the inner and outer annuli in both houses in which the flooring hurdles were laid down. The area of each annulus was calculated and divided by the area of a *standard hurdle* to provide an estimate of the number of hurdles used.

The walls of both houses were also of wickerwork construction, but they were not built using prefabricated hurdles; rather the stakes were inserted into the ground and the withies woven around them *in situ*. However, to facilitate estimating the quantities of wickerwork a *standard vertical hurdle* unit has been employed. The wickerwork screens supported in the sill beams in ST2 are 2 m wide and, as per the Whithorn reconstruction, we have assumed a wall height of 1.5 m to model a standard vertical screen

Posts:	all flat or concave, no below-ground depth
Outer ring-beam:	the same length as the sillbeams + 0.5 m for mortises at each end
Inner ring-beam:	the same length as between the posts + 0.5 m for mortises at each end
Rafters:	one rafter per post with intermediate rafter in between
Wall planks:	1 m below-ground depth

Component	Quantity	Diam	Length	Species	Vol m3 per item	Oak tot vol	Alder tot vol	Green oak tonnes/m3	Green alder tonnes/m3
<b>Timbers</b>									
Posts in outer post-ring	13	0.18 av	3.5	oak	0.09	1.16		0.83	
Posts in inner post-ring	5	0.18 av	6	oak	0.15	0.76		0.55	
Sillbeams	12	0.4	2	alder	0.25		3.02		1.66
Outer ring-beam	12	0.18 av	2.5	oak	0.06	0.76		0.55	
Inner ring-beam	5	0.18 av	3.5	oak	0.09	0.45		0.32	
Rafters	26	0.18 av	10	oak	0.25	6.62		4.76	
Entrance	2	0.45	2.3	alder	0.37		0.73		0.40
Entrance	7	0.3	1.7	alder	0.12		0.84		0.46
Entrance posts	6	0.17	2	oak	0.05	0.27		0.20	
Wall planking (entrance)	16	0.8	3	oak	1.51	24.13		17.37	
Wall planking (side)	6	0.8	3	oak	1.51	9.05		6.51	
<b>Stakes</b>									
Wall stakes outer (3 per m)	121	0.07	2	mixed			0.93		0.51
Wall stakes inner (3 per m)	113	0.07	2	mixed			0.87		0.48

Component	Quantity	Diam	Length	Species	Vol m3 per item	Oak tot vol	Alder tot vol	Green oak tonnes/m3	Green alder tonnes/m3
<b>Wickerwork</b>									
Outer wall (vertical hurdle)	16			mixed	0.69				0.3768
Inner wall (vertical hurdle)	15			mixed	0.64				0.3533
Flooring (horizontal hurdle)	19			mixed	1.09				0.5998
Screens in sillbeams (vertical hurdle)	12			mixed	0.51				0.2826
					<b>Totals</b>	<b>43.19</b>	<b>6.39</b>	<b>31.10</b>	<b>5.18</b>
					<b>Gross volume</b>		<b>49.58</b>	<b>Gross tonnage</b>	<b>36.28</b>

Table 14.6. Calculations of mass for ST2; on the left are the estimated quantities and dimensions of the wood and on the right are the volumes and tonnage derived from those figures. Green oak density can be expressed as 740 kg/m<sup>3</sup>. Green alder can be expressed as between 420–680 kg/m<sup>3</sup>; for these calculations a median value of 550 kg/m<sup>3</sup> has been used (density values derived from [https://www.engineeringtoolbox.com/wood-density-d\\_40.html](https://www.engineeringtoolbox.com/wood-density-d_40.html)).

Component	Quantity	Diam	Length	Species	Vol m3 per item	Alder tot vol	Green alder tonnes/m3
<b>Timbers</b>							
Post-rings	10	0.16	3.8	alder/ash	0.08	0.76	0.42
Ring-beams	9	0.16	2.1	alder	0.04	0.38	0.21
Rafters	20	0.16	7.22	alder	0.15	2.90	1.60
<b>Stakes</b>							
Wall stakes outer (3 per m)	90	0.07	2	mixed	0.01	0.70	0.38
<b>Wickerwork</b>							
Walling (vertical hurdle)	12			mixed	0.51	0.51	0.28
Flooring (horizontal hurdle)	14			mixed	0.80	0.80	0.44
					<b>Totals</b>	<b>6.06</b>	<b>3.33</b>

Table 14.7. Calculations of mass for ST3; on the left are the estimated quantities and dimensions of the wood and on the right are the volumes and tonnage derived from those figures. Green alder can be expressed as between 420–680 kg/m<sup>3</sup>; for these calculations a median value of 550 kg/m<sup>3</sup> has been used (density values derived from [https://www.engineeringtoolbox.com/wood-density-d\\_40.html](https://www.engineeringtoolbox.com/wood-density-d_40.html)).

of 2 m x 1.5 m. Experience in the Whithorn reconstruction suggests that a screen this size would have required roughly 47 withies and proportionately a horizontal hurdle 2 m wide would have required 63 withies. The volume of a vertical hurdle with 47 withies 0.002 m diameter and 2.9 m long (length increased to allow for tie-off) has been calculated as 0.04 m<sup>3</sup> and the volume of a horizontal hurdle with 63 withies of similar size has been calculated as 0.06 m<sup>3</sup>.

#### 14.7.2.4 Palisades 1 and 4

In Table 14.8 the quantities of timber needed to build Palisades 1 and 4 are calculated. These figures are much more speculative than those for the roundhouses because we have

no evidence for the type of construction around the entire circuit of the settlement, or even whether the settlement was completely encircled. For the purposes of this exercise we have assumed that the palisades did encircle the settlement.

For Palisade 1 we have estimated a diameter of 40 m and therefore a circumference of 126 m. The alder posts along the section that survived under ST4 were contiguous with an average diameter of 0.30 m; if the palisade was constructed in the same way around its entire circumference there would have been 419 posts.

For Palisade 4 we have estimated a diameter of 55 m and therefore a circumference of 173 m. There is no evidence that the oak planks continued more than 20 m on either side of

Palisade	Quantity	Radius	Length	Species	Vol in m3	tonnes/m3
<i>Palisade 1</i>						(vol x 0.55 kg)
Posts	419	0.15	3	Alder	29.61	<b>21.32</b>
<i>Palisade 4</i>						(vol x 0.72 kg)
Posts	664	0.15	3	Oak	46.93	33.79
Planks	80	0.11	3	Oak	13.2	9.50
					60.13	<b>43.29</b>

Table 14.8. Calculations of mass for Palisades 1 and 4. Green oak density can be expressed as 740 kg/m<sup>3</sup>. Green alder can be expressed as between 420–680 kg/m<sup>3</sup>; for these calculations a median value of 550 kg/m<sup>3</sup> has been used (density values derived from [https://www.engineeringtoolbox.com/wood-density-d\\_40.html](https://www.engineeringtoolbox.com/wood-density-d_40.html)).

the entrance way; we have therefore allowed for 80 planks, each 0.5 m wide. Beyond them a palisade of contiguous oak posts 0.2 m in diameter is envisaged, for which 664 posts would have been required.

### 14.7.3 Energy costs and calculating a labour force

Based on the calculations in Tables 14.6 and 14.7 ST2 required 36.28 tonnes of wood while ST3 only required 3.33 tonnes. Thus, ST2 required more energy output than ST3 by a factor of 11. The calculations in Table 14.8 suggest that Palisade 1 required 21.32 tonnes of timber while Palisade 4 required 43.29 tonnes, thus suggesting that Palisade 4 required twice the energy output of Palisade 1. However, the evidence from BLoM illustrates how difficult it is to translate these figures into a labour force.

Dendrochronological studies of ST2 indicate that timber for its construction had been stockpiled for up to 18 months. This could suggest that the size of the available labour force was a constraint on development, which could imply that the population group building the ST2 house was smaller than that building the ST3 house. Harding (2023: 227) raises another possible variable that impacts on calculating a labour force. He has suggested that felling need not have been undertaken by the building crew. It might well have been the case that when the stockpile of timbers had run out its builders could have acquired their wood (by theft, trade or gift) from other woodland owners, all of whom would probably have kept modest stockpiles of felled timber for the maintenance needs of their farms or estates. Thus, access to building timber may have been constrained as much by the social landscape as by the available labour on the individual construction site.

The location of the woodlands from where the timber had to be transported is another variable which is hard to quantify. At Black Loch it is reasonable to assume that the alder timbers derive from around the wetland margins of the Black Loch, so roughly within 0.5 km of the settlement. It is similarly reasonable to assume that this wood could

have been transported by water to the construction site, towed behind a canoe using the ubiquitous tow-holes. It is more difficult to estimate where the oak woodland was located; the lack of oak charcoal suggests it was far enough away for the carrying of woody debris to be uneconomic, while more prominent fluctuations in the oak taxa in the WLoM vegetation record (Chapter 17.1.5.2) suggests that the oak was being exploited closer to the White Loch than the Black Loch. We might therefore assume a distance of 1.5–2 km for the oak woodland, so the builders were transporting the heavier oak over a greater distance.

Despite all the caveats expressed above, the volumes of timber speak for themselves; the comparative results indicate that there was a significantly larger investment of energy and resources in the construction of ST2 than in that of ST3, and that twice the amount of energy and resources was invested in the construction of Palisade 4 in comparison with Palisade 1. The comparison between ST2 and ST3 is particularly revealing; in terms of ground plan alone, often the basis on which status and function are judged (see Pope 2003: 107), ST2 has 1.5 times the floor area of ST3, so it would always have been judged the more ‘important’ structure, but with the physical remains of the wooden superstructure available to calculate tonnage, which shows that ST2 required 11 times the energy costs needed to build ST3, it becomes clear that the amount of investment in ST2 was disproportionate to the gain in floor area. This suggests that it was the perceived value of the building, its significance to the community, which drove the investment, and not simply factors like the size of the labour force or the availability of woodland resources.

### 14.8 Summary

Wood was the primary building material at BLoM, used in the construction of walls, floors, roofs, trackways and palisades. It was also the primary source of fuel. The extraordinary degree of organic survival on the site has provided one of the more comprehensive insights into Iron Age woodland exploitation and woodworking. Although

woodworking tools were not found, proxy evidence has been used to identify the toolkit of the woodworkers, small axes for all general work, adzes for dressing the larger timbers, and chisels and gouges for preparing mortises and dowel-holes.

While the choice of species will have been partly dictated by what was available in the local woodlands certain species were clearly preferred for specific functions. Alder was invariably used for the major horizontal building elements, ie the trackways, the sub-floor structures etc, so its ability to survive damp ground conditions was well understood by the builders. The flexibility of coppiced hazel was employed in the manufacture of hurdle screens for both flooring and walling. Oak was used where strength and resilience were needed; its use was restricted to vertical structural components such as the posts in the post-rings and the threshold timbers along the trackway which would have borne a lot of wear. Oak was also used to fashion large wide planks for walling and palisades, but this may have been more to do with aesthetics and a display of wealth than the need for strength. These planks were of a monumental scale, converted from the types of trees defined by Taylor (2010) as *Big Trees*. She observes that monumental timbers have not been found in prehistoric domestic contexts, in England at least (*ibid* 95-96), so ST2 is a rare example of the use of monumental timber in a domestic setting, perhaps reflecting the status of the settlement (Chapter 18.3.2.6). Experimental work has also highlighted the more sensory aspects of working with such timbers, showing that the bright colours of freshly hewn timbers could have been an important consideration in their display.

The carpentry that survives could be described as a rough-and-ready vernacular but there are glimpses of a more sophisticated expertise, much of it employed to

combat the problems arising from building on peat, the complex joinery of the ST2 entrance for example, the post-shoes and the concave-based posts, the latter of which are currently unique to BLoM. The squaring of timbers was undertaken where appearance was important, as in the ST2 entrance structure, while the finely dressed surfaces of some of the posts also suggests an aesthetic sensibility. The oak offcut, SF291 also hints that there may have been finely made boards furnishing the interiors of some of the houses. This level of woodworking expertise is also seen in several of the artefacts, the bowl and the baton (Chapter 15.4.7). Scott (1976: 37–38) had seen the ‘elaborate’ carpentry on display on some of the southwestern crannogs as reflecting Roman influence but there is a growing body of evidence that indicates that sophisticated carpentry skills were present in the region long before that.

These skills were also embedded in the community because they did not change over the two centuries between the construction of ST2 in 435 BCE and Palisade 4 in 243 BCE. Identical methods were employed to make the planks in the two structures and the way in which tow-holes were manufactured was also the same (Darrah 2022). These particular woodworking skills must thus have been sustained over the centuries, implying that they were practised extensively enough to be passed on from generation to generation. The ancient oak woodlands that produced the timber for the planks must have been managed and curated over the two centuries too (Chapter 17.2.3.3), so from the wood assemblage we glimpse a community intimately connected to their natural resources which enabled them to continue building with oak on a monumental scale elsewhere in the landscape between the late 5th and mid-3rd century BCE.

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# The artefacts

## 15.1 The coarse stone

*Dawn McLaren*

### 15.1.1 Introduction

A large assemblage of stone, totalling over 380 individual items, was collected during excavations at BLoM between 2013 and 2019. The assemblage can be split broadly into two categories: a moderate number of items of worked stone (Q = 74) including quern stones, cobble tools demonstrating a variety of wear, and a small number of other items such as spindle whorls and large quantities of unworked pebbles brought to the site for other purposes (Q = 308). Although unworked cobbles and pebbles typically invite little comment within narratives of site activities, here there is little doubt that these have been brought to the site intentionally and there are certain patterns and consistencies to the contexts of recovery which hint at deliberate placement of at least a proportion of these pebbles within the sub-floor levels or refurbished flooring in many of the structures. A similar pattern has been noted elsewhere (eg, Cults Loch, Wigtownshire; Cavers & Crone 2018) and the findings from BLoM may provide evidence of a wider practice, not readily identifiable on terrestrial domestic sites.

There are hints of selective deliberate breakage and purposeful deposition of individual items which can be connected to wider practices involving the symbolic destruction and disposal of symbolically charged objects. The cobble tools display a variety of use-wear attesting to a range of functions including use as abrasives, pulverising, sharpening and fire-lighting tools as well as working surfaces. More specific use-wear can be determined in the form of smoothers which were probably used in hide processing activities. A significant proportion of the cobble tools display combinations of wear which attest to multifunctional use. Use-wear analysis seeks to draw more detail from these cobble tools on their use, longevity and disposal.

This report will discuss each of the broad categories of worked stone recognised amongst the assemblage and will investigate overarching concerns such as raw materials and access to resources, the distribution of finds across the site and what this can tell us about the possible function of the structures.

The composition of the assemblage is summarised in Table 15.1.

### 15.1.2 The assemblage

#### 15.1.2.1 Resources and raw material

The worked stone tools have been produced from range of stone types with a preference towards locally available quartzite-rich, granite/granodiorite and sandstone/greywacke ovoid cobbles. The robust durable quality of quartzite-rich stone makes them particularly suitable for use as heavy pounding or abrasive tools, whilst fine-grained lithologies such as siltstone and fine sandstone appear to have been preferred for the smoothers and whetstone. Most of the assemblage comprises naturally water-rounded cobbles which would have been readily available at local water-sources and probably came from the body of water next to the

Type	Number present
<i>Food Processing</i>	
Saddle querns	5
Rubbing stones	9 (+2)
Indeterminate (upper/lower)	3
Quern or grinding surface	1
<i>Cobble tools</i>	
Grinders	13 (+9)
Pounders	8 + (10)
Smoother/polishers	4
Strike-a-lights	2
Whetstones	3 (+1)
Multifunction tools	14
<i>Textile production</i>	
Spindle whorls	3
<i>Miscellaneous</i>	
Working surfaces	4 (+4)
Hollowed stone	1
Perforated stone	1
Haematite	1
Possibly worked	2
<i>Other</i>	
Fire-cracked fragments	27
Stained stones	2
Possible manuports	23
Quartz pebbles/pebble caches	245
Natural	11
<b>Total</b>	<b>382</b>

Table 15.1 Summary of the BLoM stone assemblage ('+' denotes number of combination tools recognised with this form of use-wear).

settlement. These cobble tools saw no modification to the shape prior to use.

The larger tools amongst the assemblage – the saddle querns – also utilise naturally water-worn stone of greywacke and quartzite but these may be glacial erratic boulders which could have been collected from the local area.

### 15.1.2.2 Food processing tools

Saddle querns and rubbing stones functioned in pairs to grind grain into flour; the larger dished lower stone, the saddle quern, would be set on the ground surface and remains stationary whilst a smaller upper stone, often referred to as the rubbing stone, was drawn back and forth across its surface. The grain would be poured by hand between the two stones and then ground until the

flour was as fine or as coarse as desired. As a general rule of thumb, saddle querns have a neutral or concave profile across the grinding face whilst rubbing stones have a neutral or convex grinding face.

Five saddle querns (SF5/SF11, SF50, SF86, SF234 and SF253) (Figure 15.1), nine rubbing stones (SF29, SF39, SF53, SF81, SF103, SF193/250, SF262, SF271 and SF295) (Figure 15.2) and three undefined quern fragments which could be upper or lower stones (SF27, SF51 and SF65) were recovered.

Also present is a rounded corner of a grinding surface of a quern stone (SF255) which cannot be classified more closely due to the very limited use-wear. Also of note are two multifunction tools (SF101 and SF116) (Figure 15.3) described below which saw primary use as rubbing stones.

On most sites, saddle querns and grinding stones appear to have been used in food processing tasks, yet they could have been put to use to grind down all manner of foodstuffs and materials. At the Iron Age settlement at Culduthel, Inverness there is evidence that at least one of the saddle querns had been used to grind down iron ore prior to smelting (McLaren 2021a: 128), as indicated by the iron-rich staining observed on the grinding face. At BLoM there is no staining or unusual wear patterns to suggest that these tools were regularly used for anything other than grain processing. This provides a valuable insight into aspects of culinary practices and diet as well as illustrating the day-to-day food processing activities seen in the surviving macroplant remains (Chapter 115.2.5).

In the main, the form of the querns conforms to Peacock's type 1 saddle quern, the most common form in use during the prehistoric period in Britain (2013, 14-15, fig 2.5). In a Scottish context, this type of quern is often classified as a 'slug' quern (Engl 2008: 210, 215). Modification of the stone shape on these types of quern tends to be minimal but, as demonstrated by many of the examples from this site, rudimentary dressing of the edges and grinding face can be present. The flat quern could be used in any direction in conjunction with a rubbing stone and concavity of the grinding surface tends to be the result of use rather than deliberate shaping (Peacock 2013: 14). Pitting and polish resulting from wear often concentrate towards the centre of the grinding face or around the edges of the facet where the rubbing stone abraded directly against the face of the saddle quern. This can provide insights into the extent of use the stones had seen prior to deposition. One saddle quern (SF50) consists of a kite-shaped greywacke boulder, its base modified to create a flat surface for the stone to sit on during use. The grinding face does not exhibit extensive use, but patches of abrasion particularly along one long edge reflect the idiosyncrasy of the user and a preference for working the rubbing stone at a particular angle.



Figure 15.1. Saddle querns SF5/SF11 & SF253.

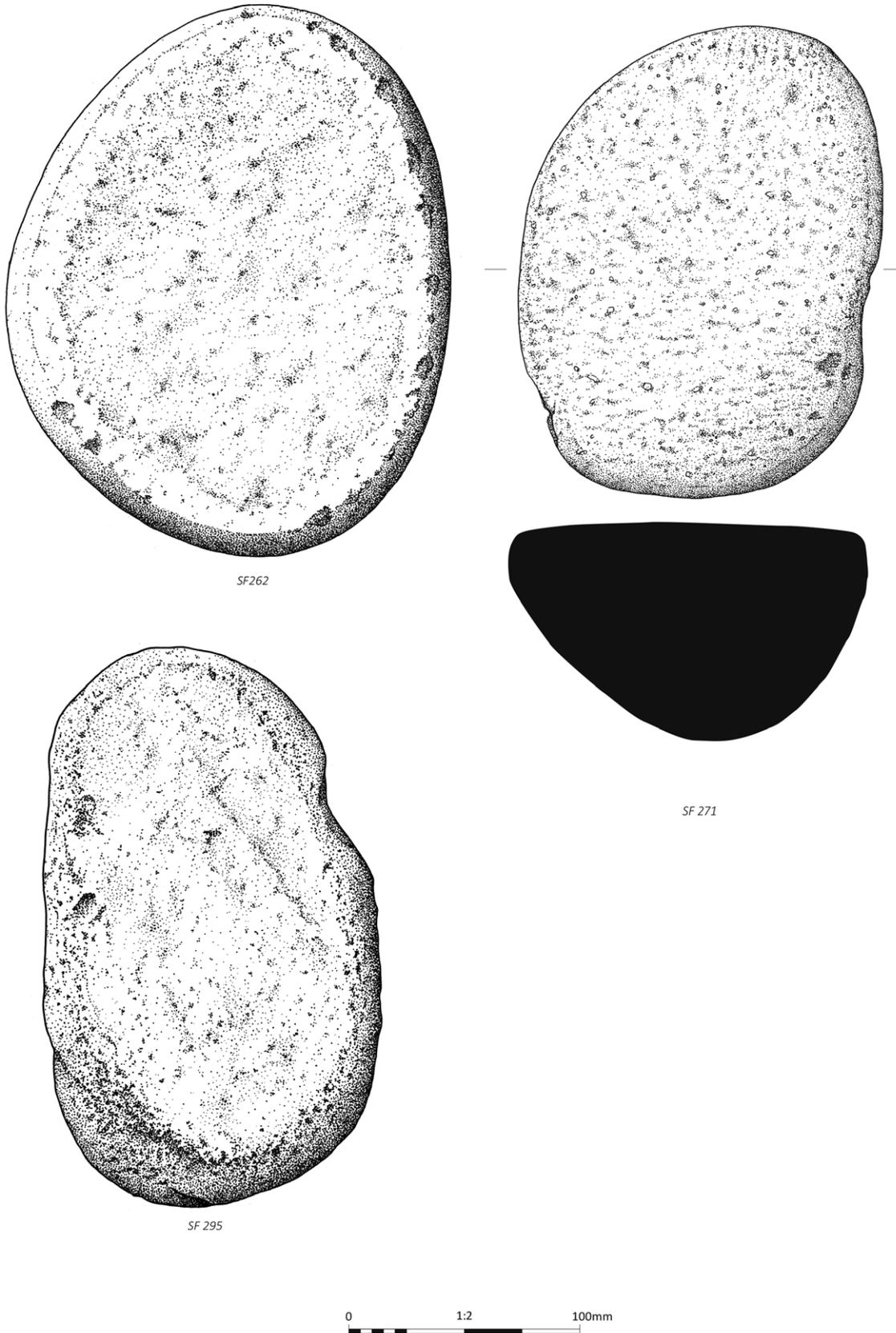


Figure 15.2. Rubbing stones SF262, SF271 & SF295.

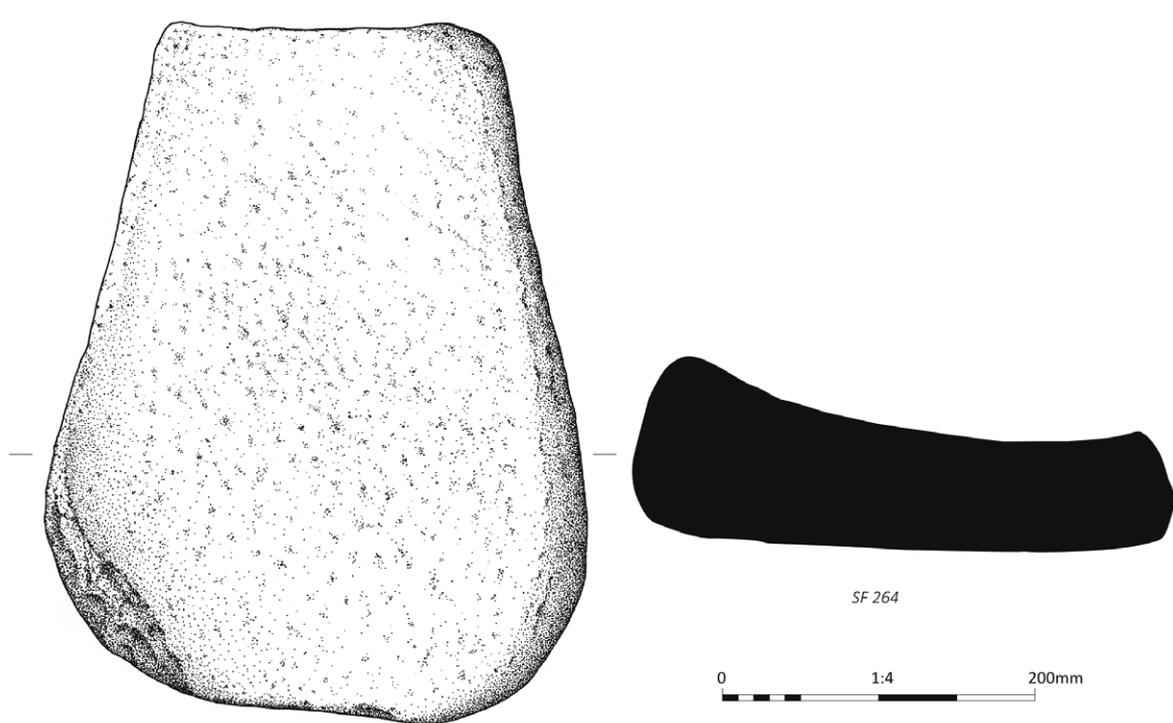
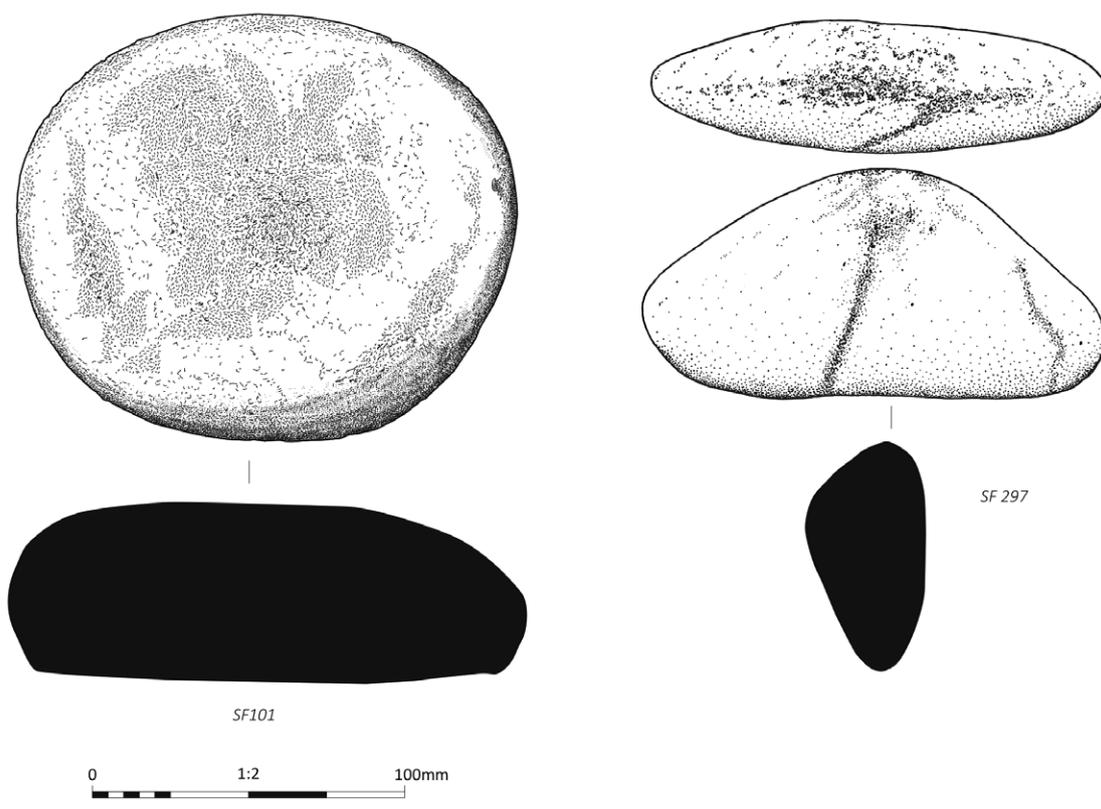


Figure 15.3. Multifunction tool SF101, quern SF264 & smoother SF297.

Intact quern SF264 is rather different in form to the majority of the querns from the site, not simply because of its complete condition but because of the slightly greater degree of shaping which occurred prior to use (Figure 15.3). This stone conforms more to Engl's (2008) saucer quern where there is a defined lip around the perimeter of the grinding face but still lacks the extent of shaping and wear of a trough quern (Close-Brooks 1983).

Two further saddle querns are noteworthy: SF5 and SF11 represent multiple fragments of an incomplete and heavily fractured quern produced from a dense, thick, glacial erratic dolerite or granite boulder. Although the stone would have been portable in the sense that it would have been possible to move the tool around the site, the robust form makes it unlikely that the damage happened accidentally by, for example, being dropped from a height onto a hard surface. The fracture pattern of the surviving pieces implies that portions of the external surfaces were deliberately knocked off and the stone shattered by force across its centre. The physical effort required to fracture this stone implies that its breakage was a deliberate and purposeful act. The pieces then appear to have been dispersed, with many but not all of the pieces being incorporated around the Phase 3 Hearth 3 in ST1.

This pattern of deliberate breakage and purposeful deposition of saddle querns complements the evidence from the Iron Age crannog and palisaded enclosure at Cults Loch, Dumfries and Galloway, where several of the querns (both saddle and rotary types) appear to have been deliberately damaged prior to discard or abandonment (McLaren 2017: 111). Not every Iron Age quern was subject to special treatment after it had come to the end of its use but the deliberate destruction, fragmentation and defacing of quern stones, particularly rotary querns, occurs widely across Iron Age assemblages in Britain (Hingley 1992; Pope 2003: 267; Heslop 2008: 69; McLaren 2013). The incorporation of the broken quern fragments around Hearth 3 in ST1 emphasises the possible significance that quern fragments could hold despite their incomplete condition. The association of Iron Age quern fragments (saddle and rotary) and hearth features is one that can be widely paralleled across Scotland, including examples from Burland, Shetland (McLaren & Hunter 2014) and Grantown Road, Forres (Engl & McLaren 2016: 39), to name a few. More broadly, the purposeful placement of both saddle and rotary querns in thresholds, floor surfaces and ditch terminals is well attested throughout the Iron Age (Hingley 1992: 32; Heslop 2008: 65–68) and evidence for this has recently been reviewed in a SW Scottish context (Hunter et al 2017: 201–203). At BLoM, a further suggestion of such purposeful deposition comes in the form of the substantial sub-rectangular quern (SF234) which was recovered from the midden-rich fill [800] of the Episode 1 ditch terminal.

The rubbing stones from the site were found in greater numbers than the saddle querns. With the exception of one example (fragments SF193 and SF250, which rejoin) all of the rubbing stones were intact at the time of their deposition and subsequent recovery. Most were formed on naturally rounded, water-worn ovoid cobbles, either favouring stones with at least one naturally flat face that could be fashioned into a grinding surface or had been split across the thickness to create a fragment with a flat face and, typically, plano-convex cross-section. Evidence of rudimentary dressing of the grinding face was noted in SF262 where the face had been pecked to remove any natural undulations of the surface but also to roughen the surface to make grinding more efficient. Some of the rubbing stones have abraded and polished facets of wear around the short edges of the grinding face and edge of the stones, reflective of the stone grinding directly against the dished face of the lower saddle quern during use.

No pairs of saddle quern/ rubbing stones were recognised amongst the assemblage. The disparity in the numbers of saddle querns and rubbing stones implies that rubbing stones were more readily sourced and discarded or else wore out rapidly, whilst saddle querns enjoyed a longer span of use and may have been subject to a different practice of disposal.

It is notable that rotary querns were absent in this assemblage, but this is likely to be due to chronological factors as well as cultural ones, as the activity at BLoM is on the very cusp of the first evidence of rotary quern use in Scotland. Long-held ideas of rotary querns replacing saddle querns at approximately 200 BCE (Caulfield 1978) have since been disproved with more recent excavated examples indicating that rotary querns were in use alongside saddle querns from as early as the 5th or 4th century BCE (Harding 2006: 74; McLaren & Hunter 2008a: 105).

None of the querns or rubbing stones were *in situ*. Most appear to have been re-deposited after they had gone out of use. There is a notable concentration of querns (SF52 and SF86), rubbing stones (SF29, SF39, SF53, SF81 and SF103) and indeterminate fragments (SF7 and SF51) from ST2, suggesting that this structure had particularly close links to grain processing and emphasising that it may have been used differently to the others within the settlement (see Chap 11.3).

### 15.1.2.3 Cobble tools: wear patterns and aspects of use

Cobble tools form a significant component of most Iron Age stone tool assemblages in Scotland (Clarke 2006: 1) and BLoM is no exception with 44 examples. Classification of tool types here is based on the nature of the wear, following the scheme used in the Howe report (Ballin

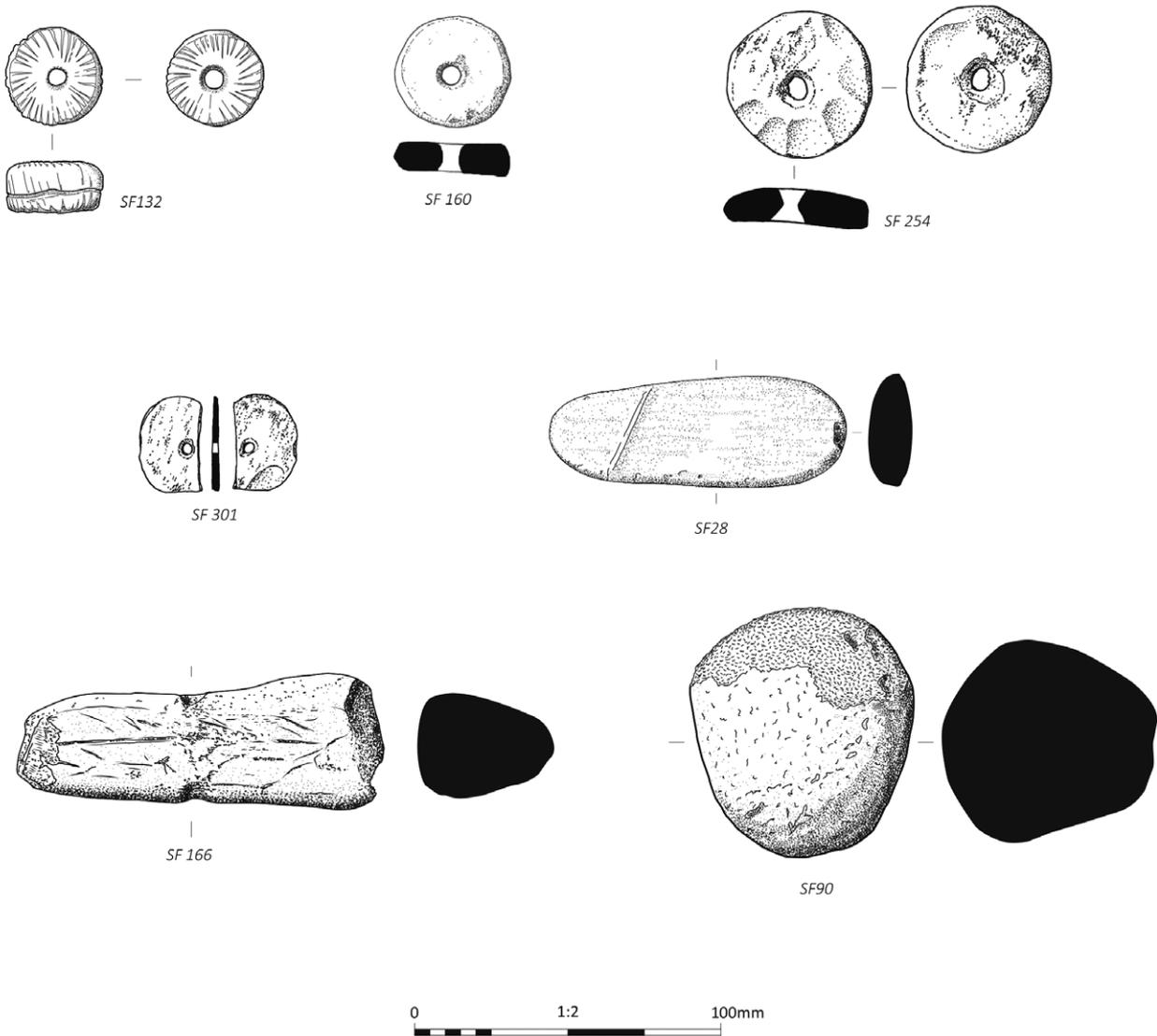


Figure 15.4. Miscellaneous worked stone: smoother SF28, whetstone SF166, grinder SF90, spindle whorls SF132, SF160 & SF254 & perforated disc SF301.

Smith 1994: 196). This approach aims to identify differences in wear which most likely reflect different functions. This form of classification enables a more comprehensive understanding of the mechanics of use but falls short of identifying the precise tasks that these tools may have been used for. Looking closely at the wear provides evidence not just of what sort of function they might have been put to but allows avenues into observing idiosyncrasies of use and the user as well as allowing comment on how extensively the stones were used prior to their discard or deposition. It should be noted, however, that this approach describes wear rather than function and is complicated by the fact that different stone types will wear differently due to their varying properties. In addition, many tools display combinations of wear patterns indicating a range

of functions. These multifunction tools are discussed after consideration of single-function tools.

The cobble tools from BLoM display a varied range of wear: abrasion from grinding, pitting from pounding, pecking and fracturing from use as working surfaces, polish and staining from use as smoothers for hide-processing, and dished abrasion from whetting metal blades. Grinders dominate the single-function cobble tools (Q = 13). These are best understood as general-purpose tools used for abrading organic and inorganic materials and could have seen use in food preparation as well as various craft activities including preparing raw clay for potting and grinding pigments.

A total of eight pounders were recognised, displaying pitted and pecked wear formed as the result of pounding to crush or pulverise various materials. Past interpretations

of their significance were often based on the assumption that these tools were used exclusively for food processing, but they could have been used to prepare a variety of material types and are not necessarily associated with the preparation or consumption of foodstuffs, without precluding this function.

Smoothing stones, polishers and whetstones display surface smoothing and, in some instances, staining as the result of use. They are differentiated here by the concavity of the surface as an indication of whetting and by the presence of dark red-brown residue which is typical of those with convex wear formed as the result of rubbing. This follows the criteria adopted at Dunadd, where large numbers of smoothing stones/ burnishers were found (Lane & Campbell 2000: 178, 179, 185) and have been interpreted as hide processing tools due to the presence of organic staining from animal fat. One definite smoother (SF297) (Figure 15.3) was recovered from the Phase 2 active floor surface [1743] in the SE quadrant of ST3, a possible smoother (SF85) came from hearth debris [244] around the Phase 3 Hearth 2 in ST2, while another possible smoother (SF28) (Figure 15.4) came from the active floor surface [209] around one of the post-ST2 hearths, Hearth 1. A single polisher (SF15) which displays an area of smoothing associated with a high sheen but lacks the distinctive staining of a smoother came from hearth debris [035] associated with the Phase 3 Hearth 3 in ST1.

Three whetstones (SF28, SF166, SF288) were recognised (Figure 15.4). Although their use is not limited to sharpening and maintaining metal blades, this is their primary use and on sites such as this where ferrous metals do not typically survive, they provide a valuable proxy record of the use of metal blades. One, SF166, was recovered from topsoil in Trench 13 and displays abraded linear scores on the surfaces in addition to the more typical dishing through abrasion of the surfaces. These scores could either have been made as a result of sharpening a blade by scoring the tip of the blade across the stone or as the result of sharpening or finishing metal or bone points, pin or needle tips. The other two whetstones were recovered from the active floor surface [213] around the post-ST2 Hearth 1, and a deposit of hearth waste [19002] possibly associated with activity in Episode 3 (Chapter 4.3.6).

Two strike-a-lights (SF120 and SF187) attest to fire-lighting. The relative rarity of strike-a-lights amongst cobble tool assemblages is undoubtedly a bias of modern recognition rather than a genuine absence as they must have been in common use. The two recognised amongst the BLoM assemblage are very simple tools consisting of quartz-rich cobbles that are marked on one or both surfaces with sets of fine linear red-brown striations, resulting from an iron fire-steel or pyrite being struck against the surface to create a spark. This strike against the surface of the stone leaves a red-brown rust-coloured

trail similar to those known from other Iron Age sites such as Bac Mhic Connain, North Uist (Beveridge & Callander 1932: 49), Broch of Burrian (MacGregor 1974, 93) and Gurness, Orkney (Hedges 1987: 152, 249), *inter alia*, but the BLoM examples lack the distinctive abraded and worn groove across the surfaces of the sub-type of strike-a-light more commonly referred to as 'tracked stones' (Childe 1936: 233, pl.XLIV). Unfortunately, SF120 was unstratified but SF187 came from [1113] a halo of hearth debris surrounding the Phase 8, Hearth 7 in ST3, a roundhouse which appears to have been associated with episodic metalworking activities.

Most of the cobbles display single-function wear ( $Q = 30$ ) although a further 14 cobbles display multifunction use with a minimum of two different types of wear being recognised. Two were rubbing stones with secondary use as working surfaces (SF101 and SF116). No distinctive size differences between the tool types (eg grinders and pounders) is noted at BLoM as has been identified at elsewhere (eg Braehead, Renfrewshire; McLaren & Hunter 2007: 224). However, there was a certain similarity noted in the forms of wear amongst many of the single function grinders and combination tools that had principally been used as grinders in both ST3 and ST4, with a dominance of bipartite abrasion facets, some of which are slightly misaligned and asymmetric, reflecting the idiosyncrasy of their use and user. This of course describes details of the wear pattern surviving on the stones and not the function that they were put to, but the repeated combination of abrasion (grinding), pitting (pounding), and pecking/ gouging (working surface) displayed on cobble tools associated with the later phases of ST3 in particular implies a commonality of processes that led to the formation of this wear which might provide insights into their use. The evidence of metalworking, in the form of crucibles and vitrified material, and woodworking from ST3 suggests that this roundhouse may have had a different function to the other roundhouses in the settlement at least during periods of the Episode 2 occupation (Chapter 18.3.2.4). Could many of these cobble tools have been used to pulverise ore used in metalworking? Could they have been used as expedient anvils and hammers for working the metal?

A range in the level and extent of wear is also noted amongst the assemblage. For example, grinder (SF130) and pounder or hammerstone (SF91) display very limited, perhaps single use. In contrast, three circumferential grinders (SF90, SF97, SF140), (Figure 15.4) each made on sub-spherical quartzite cobbles with well-developed bands of faceted abrasion around the circumferences of the stones were clearly extensively used before they were discarded. Despite the level of wear noted, most were intact at the time of deposition and could presumably still be functional. Only a small quantity, including

grinder fragment (SF20), are fire-cracked, probably from secondary use as a pot-boilers.

#### 15.1.2.4 Spindle whorls

Three spindle whorls (SF132, SF160 and SF254) attest to the spinning of yarn from wool or other fibres (Figure 15.4). A small disc-shaped spindle whorl (SF132), produced from fine sandstone, came from an active floor surface [209/210], around post-ST2 Hearth 1. The surfaces of the stone are discoloured as the result of heat-damage. It has flat faces which are decorated with a series of closely spaced incised lines which radiate out from the edge of the central bored perforation onto the gently rounded near-vertical edges.

This represents one of the very few items from the site which displays any embellishment of the surfaces by decoration. Incised radial decoration is one of the most common forms of decoration observed on Iron Age spindle whorls and several examples are known from Iron Age sites such as the broch of Burray, North Ronaldsay (MacGregor 1974: 91, fig 18: 249), Dun Ardtreck, Skye (MacKie 2000: 337, illus 25: 65); Dun an Iardhard, Skye (MacLeod 1915: 67) and most recently the Clachtoil, Assynt (McLaren 2023). Incised radial decoration of spindle whorls is not confined solely to the Iron Age, however, with several examples known from medieval and post-medieval contexts in Scotland, such as those from Smailholm Tower, Roxburghshire (Good & Tabraham 1988: illus 14: 3 & 4). Other local examples, mostly stray finds which lack datable associations, include those from Balmurie (NMS: X.BE 152; Anon 1892: 81), Kirkmaiden, Balcraig and an undefined findspot, all Wigtownshire (NMS: X.BE 194, X.BE 197, X.BE 199; Anon 1892: 82).

The simplicity of the radial design of the BLoM spindle whorl not only finds parallels with other whorls in the record but is also one of the most common decorations on Iron Age rotary quern stones. The similarity of decorative motifs observed on Iron Age stone querns and spindle whorls has been noted previously (McLaren & Hunter 2008a: 119). Consideration of this practice has stressed the apparent conceptual links grounded on the significance of the raw material in both instances as well the rotational movement of these tools during use which would modify the decoration from a static motif into a dynamic ornament (*ibid*: 119).

The second whorl (SF160), again disc-shaped and produced from fine red sandstone, came from [1103], one of the deposits of debris around the Phase 8 hearth in ST3. It is intact and shows signs of use. The third example (SF254) came from topsoil over the SE quadrant of ST3. It is disc-shaped and intact but displays unusual and distinct faceted abrasion from shaping on both faces and edges and the bored perforation is slightly lopsided and

off-centre, suggesting that this whorl might be unfinished, perhaps abandoned at a late stage of production.

A thin disc-shaped piece of slate (SF301) (Figure 15.4) which has broken across its width to one side of a small biconical perforation has laminated from a thicker disc. It is tempting to see this as a fragment of a fourth whorl but, if so, the perforation is so narrow that it must have broken in the process of manufacture. It was recovered from the Phase 2/3 active floor surface [1743] in ST3.

#### 15.1.2.5 Other items of worked stone

A small and irregular pink-red haematite pebble, sub-square in plan and rectangular in section, came from one of the dumps of hearth debris [723] used in the construction of the Episode 3.2 Rampart 2. The surfaces of the fragment are heavily eroded which makes it impossible to distinguish tool marks but the angular straight edge between one extensive face and the near-vertical adjacent edge leaves little doubt that the shape of this pebble has been altered by abrasion. Haematite has a long currency of use, favoured for its bright pigmentation and relative ease of working. Typically, during the Iron Age it saw use as a polishing or burnishing tool for pottery and perhaps hides (eg, Hurly Hawkin, Angus: Henshall 1982: 239), as a source of pigment (McLaren & Hunter 2008b), as crushed inclusions within the clay to modify the fabric colour of the vessel, or to add temporary markings to livestock (*ibid*: 93). Haematite could be used as a burnisher for non-ferrous metalworking or ground down to a powder to use in suspension as a rouge in finishing fine metalwork (Maryon 1971: 257, 259; Bayley 1992: 791) as postulated for a small abraded conical fragment from Eilean Olabhat, North Uist (McLaren & Hunter 2008b: 93). The proximity of the BLoM find to ST3 where evidence was recovered of non-ferrous metalworking is of interest.

A small number of stones saw use as expedient working surfaces, often taking advantage of cobble tools already to hand. This wear is defined by the presence of a series or sets of irregular scratches, deep gouges, peck marks and fracture damage to the surfaces. Hollowed stone (SF311) has more concentrated use centred in the middle of one face of an irregular sub-square cobble. The surfaces are so degraded due to natural erosion that it is difficult to distinguish what tool or types of tools might have made these marks, but it certainly is a deep enough facet to suggest repeated and extensive use.

#### 15.1.2.6 Fire-cracked stone

Fragments of fire-cracked cobbles were found across the excavated area. These are distinctive due to their heat-affected discoloured appearance, hair-line cracks and fractured angular break edges. These are probably the remains of pot boilers – natural water-rounded cobbles



Figure 15.5. Cache of quartz pebbles.

that were deliberately placed on the fire to heat and then plunged into a container of water to transfer the heat from the stones to the liquid. This acute change in temperature can often lead the heated cobbles to fracture and break apart. Following use, these were simply discarded and are often found amongst spreads or dumps of hearth debris or found scattered around domestic hearths as is the case in ST2 and ST3 and, in association with ST4 although it is assumed that most fragments would have been discarded off-site. Occasionally, cobble tools saw secondary use as pot boilers as two grinder/ pounder fragments (SF20 and SF30) from ST3 attest.

#### 15.1.2.7 Stained stones

Two pebbles with darkly stained surfaces were recovered from ST3, from contexts [1731], a patch of hearth debris associated with use of the Phase 6 hearth and [15013], part of the foundation deposit for the Phase 8 Hearth 7. They display no evidence of deliberate modification but their surfaces display well-defined staining. This may simply be from transfer during contact with a particularly dense patch of charcoal-rich soil and are certainly not the result of use as smoothers but they are worthy of note.

#### 15.1.2.8 Quartz-pebble caches

In addition to the cobble tools and quern fragments already discussed, a total of 282 small white water-rounded pebbles were found across the excavated area. The discovery of water-rounded pebbles during excavation is fairly ubiquitous in Scotland and in most instances is nothing remarkable but at BLoM in ST2 and post-ST2 deposits alone, a total of 15 caches of stones were recognised (Figure 15.5).

The majority of these pebbles are of quartzite but other lithologies were also noted. The caches referred to here define closely-set clusters of pebbles whilst individual hand-retrieved quartzite pebbles were often observed forming conspicuous linear arrangements amongst the wickerwork screens, suggesting their placement was not random. Although the pebbles are likely to have been collected locally, they have undoubtedly been brought to the site as their water-rounded surfaces indicate they derive from a water source and the similarity of size and colour suggests deliberate selection and collection.

This practice at BLoM was observed in association with all of the excavated roundhouses but was particularly apparent in ST2 and ST3. In terms of recovery and retention of these stones during excavation, those from ST1 and ST2 were most extensively recorded and collected whilst those from ST3, ST4 and ST5 were so similar in morphology to that observed in the earlier structures that only a sample of the pebbles from these structures was collected for comparison to the more comprehensive assemblage from ST2. This means that the quantity noted in this report is a minimum count and there is a modern bias imposed on the distribution for all structures other than ST2 due to on-site selection methods. Significant concentrations and alignments in these other structures are noted in the primary records and structure descriptions. For the purposes of this report, detailed analysis and discussion of their significance will focus on those found in caches in ST2 only.

Table 15.2 provides a summary of the caches and outlines the contexts and quantities of hand-retrieved individual pebbles within ST2 and post-ST2 deposits. The caches comprise a wide range of quantities of pebbles with a minimum of three pebbles to a maximum of 26 pebbles making up individual groups.

The caches are dominated by small ovoid, often egg-shaped water-rounded pebbles which range in length from 15 to 64 mm, in width from 12 to 65 mm and 11 to 36.5 mm in thickness. The average dimensions of the pebbles are: 36.7 mm in length, 28.6 mm in width and 21.2 mm in thickness. Most are intact water-rounded pebbles but some fractured, angular fragments are also present, alongside occasional fire-cracked and heat damaged examples. Most of the stones are quartzite in shades of brilliant white, off-white and pale grey, some with veins and pitted surfaces. Amongst the quartzite pebbles are occasional water-rolled flint/ chert and calcite-rich stones with similar shape and external colouration as the quartzite, suggesting that it was the colour that was the primary motivator in selection rather than strictly the material type. The stones lack any evidence of wear or use except for one small pounder (SF88) which was found amongst the cache of 19 stones from [241], a large spread of charcoal associated with the post-ST2 Hearth 5.

SF	Context	Quantity	Lithology	Shape	Condition	Colour	L mm	L (av) mm	W mm	W (av) mm	T mm	T (av) mm
<b>ST2 caches</b>												
45	224	24	Quartz/ quartzite (17); flint/ chert (6); sandstone (1)	Ovoid; sub-ovoid; sub-rec- tangular; pyramidal	Water- rounded (19); fractured (5)	Bright-white; white; pale grey; banded green-grey/white	15-55.5	31.2	12.5-48	24.3	7.5-35.5	18.2
72	224	5	Quartzite (4); siltstone (1)	Ovoid; sub-rec- tangular; flattened spherical	Water- rounded (3); fractured (2)	Bright-white; white; white with green veins	21-44.5	33	17.5-42	26.6	11-24	17.4
88	241	19	Quartzite (18); sandstone (1)	Ovoid; sub-ovoid; flattened ovoid; triangular	Water- rounded (16); fractured (3)	Bright-white; white; white with green veins	14-64	28	11.5-43	21.8	7.5-27.5	16.1
89	244	20	Quartz/ quartzite (19); Calcite-rich stone (1)	Ovoid; flattened ovoid; sub-rec- tangular; sub-square	Water- rounded (14); fractured (6)	Bright-white; white; pale grey; white with green veins	19-70	37.8	17.5-65	30.5	12-40	22.2
96	244	5	Quartz/ quartzite (5)	Ovoid; asymmet- ric	Water- rounded (2); fractured (3)	Bright-white; white; white with green veins	22.5-70	45	14.5-52.5	30.8	17.5-36.5	24.3
105	251	3	Quartz/ quartzite (3)	Ovoid; sub-rec- tangular	Water- rounded (2); fractured (1)	White; off-white	41-60.5	56.1	34.5-59.5	46.8	22.5-37	29.6
119	250	5	Quartz/ quartzite (5)	Ovoid; sub-ovoid; flattened ovoid	Water- rounded (5), one heat damaged	Bright-white; white; banded grey/off-white	21-52.5	38.4	16-40	26.4	17-36.5	23.8
141	284	4	Quartz/ quartzite (4)	Sub-ovoid; sub-rec- tangular	Water- rounded (4)	Bright-white, white; off-white; pale grey	37-49.5	43.7	30-41	35.3	20.5-27	23.2
<b>Post-ST2 caches</b>												
3	201	6	Quartz/ quartzite (5); sand- stone (1)	Ovoid; sub-ovoid; flat triangular	Water- rounded (1); fractured (5) inc 2 fire- cracked	white; off-white; pale grey	18.5-51	32.8	12-44.5	26.1	11-31.5	17.8
40	209	4	Quartzite (4)	Flattened ovoid; asymmet- ric	Water- rounded (3); fractured (1)	white; grey-white (mottled)	45-48.5	47.1	29-39	35.7	15-31	25.1
57	202	3	Quartz/ quartzite (2); veined arkose(1)	Sub-oval; flat triangular	Water- rounded (2); fire-cracked (1)	bright-white; off-white; brick red with white quartzite vein	32-44.5	36.3	15.5-36.5	27	12.5-21	15.5
66	213	4	Quartz (4)	Ovoid; sub-rec- tangular	Water- rounded (4)	white	15-33	25.5	13-28	21.6	11-23.5	18.3
128	209	26	Quartz/ quartzite (24), ? (2)	Ovoid; sub-ovoid; sub-rec- tangular; sub-square	Water- rounded (25); fractured (1)	white; off-white; pale grey	19-63	32.6	19-55	26.6	12.5-34	21.1
130	209/210	5	Quartz (3); chert (1); ? (1)	Sub-ovoid	Water- rounded (4); fractured (1)	Off-white; pale grey	28-46.5	33.9	24-30.5	27.2	12.5-33	22.5
131	209/210	8	Quartz/ quartzite (8)	Ovoid; sub-ovoid; triangular	Water- rounded (8)	White; pale grey	27-60	34.8	20-45.5	27.8	17.5-34.5	23
134	209/210	5	Quartz/ quartzite (4); flint/ chert (1)	Ovoid; sub-ovoid	Water- rounded (5)	Bright white; white; pale grey; unusual banded cortex (flint/ chert)	21-44.5	32.4	18.5-31.5	24.5	14.5-17	21.1

Table 15.2. Caches of hand-retrieved individual pebbles from ST2 & post-ST2 deposits.

In addition to the caches described above, further individual pebbles were hand-retrieved from contexts [202], [230], [204], [209], [210], [211], [213], [219], [221], [224], [241], [244], [248], [250] and [251].

A similar cache of stones was noted during excavation of the crannog at Cults Loch where a spread of approximately 50 small, unworked, water-worn, white quartzite pebbles was discovered under the plant litter floor of one of the structures (Cavers & Crone 2017: 27). They covered an area approximately 0.50 m in diameter.

Although these stones lacked evidence of wear from use as tools, the similarity of size, shape and colour suggests that they had been specifically selected and deliberately imported on to the site, although the purpose of this deposition remains unclear. They all seemed to be in contexts relating to construction, for instance under a sub-floor structure, at the base of wickerwork walls, or just by a post, as though deliberately incorporated into the structure during its erection or period of refurbishment.

To glimpse at the possible functionality of such items, the discovery of similar numbers of small pebbles from the Pictish monastery at Portmahomack on the Tarbat Peninsula may prove instructive. A total of 238 small, smooth pebbles, primarily white, red and rose-coloured quartzite or quartz were recovered from around a hearth in a yard with extensive evidence of craft and industrial activities (Carver et al 2016: 202). Like those from ST2, the Portmahomack pebbles had clearly been collected selectively and deliberately brought to the site for a specific purpose which was, in the latter instance, for use in conjunction with vellum production. To successfully produce vellum (writing parchment) from animal hides, the skins would have to be stretched on wooden frames for cleaning, thinning and smoothing. The pebbles were folded into the edge of the skins which were wrapped around and tied to the frame with binding cords to avoid piercing the edges of the hide which would create further damage to the skin under tension (*ibid*: 209). Although there is no direct evidence to suggest that parchment or vellum production was taking place during the Iron Age at BLoM, it is possible that the pebbles were used in

a similar manner to that interpreted at Portmahomack for suspending animal hides during preparation and working. A similar modern process has been recorded for working sheepskins (Seymour 1984: 121).

Yet the use of quartzite for special, possibly even magical purposes, is well known throughout prehistory into early medieval times in Britain (Lebour 1914; Ritchie 1998: 176). Pure white quartz pebbles appear to have been favoured for such special depositions, perhaps due to the colour or triboluminescent properties of the stone. Recurring connections with early prehistoric funerary structures and individual burials have long been observed such as the inclusion of quartz pebbles within early Bronze Age cist burials at Beech Hill House, Perthshire and West Water Reservoir, Peebles-shire (Stevenson 1995: 204; Hunter 2000: 132), the scattering of quartz round the kerb-stones of a cairn at Culcharron (Peltenburg 1972) and at Archarn Cairn 2 (Ritchie et al 1975: 19) both in Argyll and the link with kerb-cairns more specifically (Lynch & Ritchie 1975: 31). The association with burials and quartz pebbles is a long one, with the practice continuing into the early medieval period, such as that seen at Whithorn, Dumfries & Galloway (Hill 1997). Such depositions are not restricted only to mortuary contexts (Lebour 1914; Tilley 2017) as the Iron Age scatters/ caches of quartz pebbles in the bog at Deskford, Morayshire (Hunter 2019) demonstrate.

Perhaps more instructive for comparison to the quartz caches at BLoM are the white quartz pebbles from the Bronze Age sites at Flag Fen and Bradley Fen, Peterborough where they were found scattered alongside the timber trackway with other offerings (Pryor 2001), presenting an evocative image of travellers deliberately dropping pebbles into the marsh at specific points on their journey. Looking further afield to SW Sweden, this tradition of depositing white stones as votive offerings has been demonstrated at the Iron Age sacrificial site at Käringsjön (Carlie 1998). Deposits including deliberately broken tools particularly those related to agriculture, clay vessels containing food offerings, and large quantities of quartz pebbles have been interpreted as sacrifices made by Iron Age agricultural communities to promote fertility, successful harvests and safeguarding of their livestock (*ibid*: 19). From this, the idea of deliberate deposits at key locations and times seems quite plausible.

### 15.1.3 Distributional analysis of the stone assemblage; Episode 1

#### 15.1.3.1 ST1

Six items of stone were recovered from ST1 (Table 15.3). The only item associated with this structure that cannot be closely assigned to this episode is a lightly used pounder (SF01) which came from topsoil.

Small Find	Context	Phase	Short description
1	1		Flattened ovoid cobble, some ephemeral pitting (erosion rather than wear) at one end
5	4	3	Saddle quern fragment (matches SF11)
10	8	2	Combination tool: grinder/?rubbing stone
11	4	3	Saddle quern fragment (matches SF05)
15	35	3	Possible polisher
16	8	2	Small egg-shaped ovoid white quartzite pebble (unworked)

Table 15.3. Summary of finds recovered from ST1.

The most significant finds are the fractured fragments of an incomplete saddle quern, SF005 and SF011, recovered from hearth clear-out [004] around the Phase 3 Hearth 3. The quern fragments make up only a small proportion of the original stone and their pattern of breakage, as already discussed, is not consistent with damage during use. Rather, the stone may have been deliberately smashed and the edges removed, with some of the fragments being re-used and incorporated in the deposit. It is unknown where the missing pieces of the quern were deposited.

A possible polisher (SF15) was recovered from hearth clear-out [035] from Hearth 3 whilst a combination grinder/ rubbing stone (SF10) was recovered from stony surface [008]. Also from [008] were small unworked egg-shaped or ovoid water-rounded quartzite pebbles of which SF16 is a representational sample. Although there is evidence of deliberate placement of quartz pebbles in some of the other structures (see above), no distinct pattern to the distribution was recognised in ST1.

The general paucity of items of worked stone from ST1 implies that the building was kept clean and that casual discard of stone tools in the interior space was not a regular occurrence.

### 15.1.3.2 ST2

As the most fully excavated of the Episode 1 roundhouses, it is not unexpected that the largest stone assemblage was recovered from this structure (Table 15.4). In total 136 individual stones were recovered, the vast majority of which are small water-rounded quartz pebbles lacking any evidence of use or modification (see Table 15.2).

#### Phase 1

No tools were found amongst the primary floor levels but three caches of quartzite pebbles (SF45, SF72 and SF106), collectively comprising 31 pebbles, were found amongst and below the wickerwork sub-floor [224]. A further single example (SF113) came from a deposit of branchwood and brash [248] laid over [224].

A further cache of quartzite pebbles (SF105) and individual pebbles (SF107) were recovered from the active floor surface [251], found alongside several fire-cracked stones (SF108 and SF118). The latter are probably fire-cracked as a result of use as pot-boilers that have subsequently been casually discarded or accidentally incorporated within the flooring surrounding the hearth. A possible manuport (SF87) consisting of an unworked greywacke cobble came from active floor surface [221] alongside a single small unworked white quartzite pebble (SF34). To the NW of the hearth, a single granite rubbing stone/ working surface (SF116) was recovered from a trampled floor surface [265].

#### Phase 2

Within the build-up of soils thrown into the hearth to extinguish the fire [284] were a small number (Q = 5) of unworked water-rounded quartzite pebbles (SF141). Four coarse stone tools were found embedded in the active floor surface [250]. These comprise a pounder (SF93), a multifunctional tool (rubbing stone, working surface and pounder) (SF01), a circumferential grinder (SF102) and a rubbing stone (SF103). Also from this floor surface was a cache of five unworked quartzite pebbles (SF119) and a single isolated quartz pebble (SF98).

The worked stone from this phase forms an interesting group: the pounder (SF93), multifunction tool (SF101) and circumferential grinder (SF102) were all extensively worn prior to their incorporation in the floor deposits. They may have been considered exhausted and were discarded as a result. For example, the pounder is heat-damaged and fire-cracked, implying that it had been thrown into the hearth and perhaps used as a pot-boiler, whilst the grinder is damaged at both ends, not sufficient to have rendered it useless but it may have impinged on its effectiveness. The rubbing stone (SF103) by contrast displays only signs of light use with some damage towards one end.

#### Phase 3

One of the greatest concentrations of coarse stone tools (Q = 10) from this structure came from an active floor surface [244] that had been laid down around Hearth 2. These include three grinders found in five fragments (SF90, SF92, SF95 & SF97), two pounders (SF83 and SF91) (Figure 15.6) and a smoother for use in hide processing (SF85), as well as two caches of small water-rounded chert and quartzite pebbles (SF89 & SF96) and numerous unworked small water-rounded pebbles of various lithologies (SF47, SF77, SF94, SF99, SF100, SF114 & SF117). Floor [244] lay directly below [219], interpreted as decomposed flooring material. From this flooring material a grinder (SF140), rubbing stone (SF39) and working surface (SF9) were recovered alongside fire-cracked stones (SF65) and water-rounded pebbles (SF47, SF48, SF2, SF64 & SF69).

Phase	Context	Quantity	Short description
Phase 1	265	1	Granite rubbing stone/working surface (SF116)
Phase 2	250	4	Pounder (SF93); Multifunction tool (SF101); Grinder (SF102); Rubbing Stone (SF103)
Phase 3	219	3	Grinder (SF140); Rubbing Stone (SF39); Working Surface (SF59)
Phase 3	226	1	Grinder (SF115)
Phase 3	244	6	Pounder (SF83 & SF91); Smoother (SF85); Grinder (SF90, SF92; SF95/97)
Isolated feature	231	1	Working surface (SF80)

Table 15.4. Summary of worked stone from ST2 (Phases 1–3).

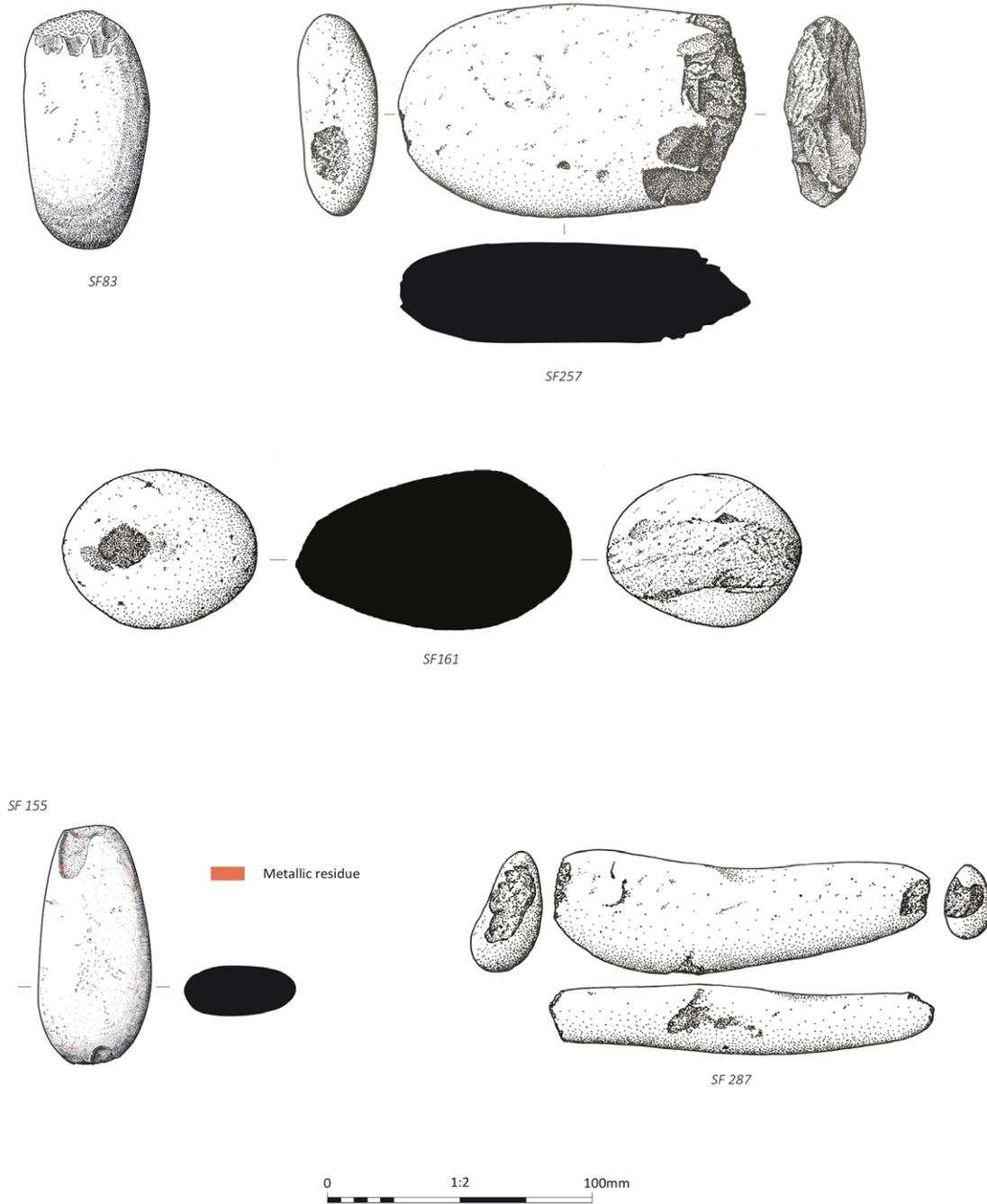


Figure 15.6. Miscellaneous worked stone; pounder SF83, cobble tool SF257, grinder SF161, multifunction tool SF155 & pounder SF287.

Fire-cracked stones (SF150) came from clay surface [240], which also produced fragments of burnt bone, ash and coprolites that are thought to have been swept up and perhaps dumped together.

A grinder (SF115) had been incorporated into the clay lining of hearth [226].

### Summary of ST2

It is possible to discern some subtle changes in character of the groups deposited throughout the phases of use of ST2 in terms of quantity, range and condition. The first point is that the number of tools increases over time. Only one tool, a rubbing stone, was associated with Phase 1, suggesting that the interior space was kept very clean and free from detritus. In Phase 2, only four tools are present,

a grinder, a pounder, a multifunction tool and a rubbing stone. All except the latter are extensively worn and may have been considered to be exhausted at the time of their discard and incorporation into the floor surfaces. This is exemplified by the pounder (SF93) which had been heat damaged as the result of secondary use as a pot-boiler. The greatest number and widest range of tools from this structure is associated with Phase 3. Ten worked stone tools were recovered, mostly from floor surfaces surrounding Hearth 2 and include pounders (some of which saw vigorous physical force), grinders, a rubbing stone, a smoother and a working surface. They survive in a range of conditions from intact to incomplete, some seeing only limited, if not single, use while others appear exhausted as the result of extensive use. Abrasive tools in the form of grinders dominate the Phase 3 assemblage but variety in the patterns of wear facets and how the stones were held suggest a range of functions. Although two rubbing stones (SF39 & SF16) were recovered from ST2, no saddle quern or saddle quern fragments were present. This may suggest that if any cereal processing took place within the structure, the valuable querns were removed for use elsewhere.

#### 15.1.3.3 The ditch fill

An intact saddle quern (SF234) came from the midden-rich fill [800] of the ditch. It shows evidence of wear and use (see catalogue entry for details) but was still functional at the time of its deposition; there was no damage that would have prevented its use and the grinding face was still rough enough to have formed an efficient grinding surface. This suggests that another, less pragmatic reason may lie behind the choice to bury it.

### 15.1.4 Distributional analysis of the stone assemblage; Episode 2

#### 15.1.4.1 Post-ST2 activity

Activity over the abandoned stance of ST2 continued during Episode 2. In total 156 items of stone were recovered, including large quantities of unworked water-rounded pebbles, possible manuports and other natural stones. Only 19 stones displayed evidence of working (Table 15.5).

A quern stone (SF51) had been re-used within a post-setting [215]. Within a discrete cluster of boulders [236] was an inverted saddle quern (SF86).

Spreading out around Hearth 1 and Hearth 6 were numerous patchy and discontinuous occupation surfaces which contained quantities of coarse stone tools. Contexts [209], [210] and [213] merged into each other and probably represent (active floor surfaces like those found around the hearths in the other structures Chapter 5.2). The presence of saddle quern fragments and rubbing stones suggests that grain processing was taking place here whilst other

foodstuffs and substances were prepared and processed using cobble tools, displaying evidence of grinding and pulverising. A strike-a-light attests to fire-lighting and fire-cracked cobbles represent the heating of water. There is little by way of other items to indicate craft activities, with the exception of a whetstone and spindle whorl.

Topsoil finds [202] are listed in Table 15.5.

#### 15.1.4.2 ST3

The stone associated with ST3 is summarised in Table 15.6. Phases 1 and 2 both appear to be associated with the primary construction of the roundhouse. No stone finds were recovered from Phases 1, 4 & 7. It was not possible to distinguish between the floor levels of Phases 2 and 3 so these are described together below.

#### Phase 2/3

The active floor deposit within ST3 relating to these periods of activity comprised [1153] in the SW quadrant, [1743] in the SE quadrant and [1518] in the northern half. Stone was recovered from the northern half and the SE quadrant but worked stone was absent from the SW quadrant. Although it is likely that the various lenses of plant matter that comprised these floor layers represent sequential overlain floor deposits, it was not possible to distinguish individual surfaces by eye but stratigraphically these deposits must contain the active floor surfaces associated with both Phase 2 Hearth 2 and the subsequent Phase 3 Hearth 8.

Within the active floor [15018] seven fragments of fire-cracked stone (SF211 and SF249) were recovered. These are likely to have become incorporated in the refurbished floor layers alongside hearth debris from Hearth 2 or 8. The only item of possible worked stone from this area is a small cobble (SF201) with fracture facets at both ends. It appears as though the cobble has been struck at the tip of both short, rounded ends, resulting in a single flake becoming detached from each end, and was then discarded. The intention was perhaps to use this as a small hammerstone but the lithology was more brittle than anticipated and the stone fractured after a single strike to both ends. The impression given from these finds is that they represent day-to-day detritus incorporated in the active floor surface to the N of the hearth.

In contrast, the finds from the SE quadrant [1743] provide a different pattern of deposition. These comprise an intact rubbing stone (SF295), an intact smoother used in hide-processing (SF297) and a broken and laminated perforated small stone disc (SF301). The rubbing stone (SF295) displays evidence of use across the grinding face, which is smoothed and polished around the circumference of the face. The grinding facet covers much of the face but is asymmetric. It does not match

Context	Worked stone	Pebble caches	Pebbles	Fire-cracked stones
202	Strike-a-light (SF120)			
202	Grindingstone or smoother (SF11)			
203	Grinder (SF8)		SF4, SF5, SF6, SF7, SF12, SF13	
204	Grinder/pounder fragment; ?fire-cracked (SF20)		SF17, SF19, SF21	
209	Pounder, single use (SF49)	SF40, SF128	SF23, SF24, SF36, SF38, SF41, SF42, SF44, SF46	
209	Possible smoother fragment (SF25)			
209	Rubbing stone (SF53)			
209/210	Grinder (SF130)	SF66, SF130, SF131, SF134		
209/210	Decorated spindle whorl; heat-affected (SF132)		SF26, SF31, SF35, SF54, SF55, SF60, SF61, SF67, SF134, SF135, SF136	SF68, SF70
210	Possible quern fragment (SF27)			
210	Grinder/pounder fragment; ?fire-cracked (SF30)			
210	Saddle quern, light use (SF50)			
213	Probable whetstone (SF28)			
213	Rubbing stone (SF29)			
213	Grinder (SF32)			
215	Rubbing stone/saddle quern (SF51)			
236	Saddle quern (SF86)			
241	Possible rubbing stone (SF81)			
241	Pounder: One of 19 water-rounded pebbles (SF88)	SF88	SF71, SF73, SF75, SF78	

Table 15.5. Summary of worked stone associated with post-ST2 deposits.

any of the saddle querns found on the site. The small, perforated stone fragment (SF301) could be a spindle whorl fragment broken in the process of manufacture and lost amongst the various flooring materials. Harder to explain are the intact rubbing stone (SF295) and the smoother (SF297) which are unlikely to have been accidentally incorporated in the flooring deposits. The implication is that the SE quadrant of ST3 during these early phases is likely to have been an active working area and that like ST1, it is possible to argue that some objects were deliberately sealed over during the refurbishment of the floor surfaces or deliberately incorporated.

#### Phase 5

One item, a circumferential grinder/ pounder cobble tool (SF303) came from [1745], the active floor surface around Hearth 4. This was one of many patchy deposits in the SE quadrant of the roundhouse interior (see also [1735], [1736] and [1744] with no worked stone) which represents the build-up of floor surfaces associated with the hearth into which domestic debris had been trampled. SF303 is not a large cobble (see catalogue) but still large enough to question whether accidental loss through trampling is likely. The extent of wear on the edges of the stone demonstrates that this was a well-used tool, and one which

could still have been functional at the time of its loss or deposition amongst the floor surfaces.

#### Phase 6

Two definite worked stones, an intact grinder (SF266) and a sharpening stone/ working surface (SF276), were recovered from the SE quadrant relating to Phase 6, but none from the northern half.

#### Phase 8

The largest group of stone from ST3 came from Phase 8, relating to deposits in the northern half and SE and SW quadrants. The only item from the northern half comprises a simple stained stone (SF184) from amongst a deposit of fire-cracked stones [15013] under Hearth 7. It displays hairline fracturing across the surface and discolouration consistent with heat-damage. The staining relates to its exposure to fire on the hearth rather than any other process.

In contrast, groups of tools were found in the southern quadrants. From the SE quadrant, three multifunction cobble tools (SF256, SF257 and SF259; see catalogue for details) (Figure 15.6) came from [1704], a spread of sharp angular stones which had been laid down as a foundation for Hearth 7. Their incorporation within this spread means that their use was related to an earlier phase within the building.

The consistency in the use-wear displayed amongst these three cobble tools suggests a common source and a similarity in the processes that they were associated with.

From the foundation layer under Hearth 7 but in the SW quadrant was an incomplete rubbing stone. It had been heavily heat-fractured and only the central portion survived; both ends were missing, one of which was found unstratified (SF250), also in the SW quadrant of ST3. Although it could be argued that the heat-damaged condition of the tool was the result of it being built into the foundations of the hearth, none of the other items of worked stone from this foundation layer were heat-affected, suggesting its heat-damaged condition pre-dated incorporation into the hearth stones. A large stone tool such as this is unlikely to have become accidentally heat-damaged. Was it exposed to heat with the express purpose of facilitating its break-up into smaller pieces, effectively putting it out of use? A similar method of de-commissioning Iron Age beehive querns has been recognised in North Yorkshire (Heslop 2008) and was observed amongst the quern assemblage from Broxmouth (McLaren 2013) but is a less well understood practice in association with saddle querns and rubbing stones.

One of the stones which formed the surface of Hearth 7 was a rubbing stone (SF262). It displayed well-developed wear on the grinding face with bands of polish around the edges where the stone had rubbed against the surface of the saddle quern during use. Like the cobble tools from [1704] this rubbing stone displays evidence of expedient use as a working surface prior to its incorporation into the hearth stones.

In the SW quadrant of the roundhouse, a further seven tools were collected alongside a fragment of a fire-cracked stone.

Hearth debris [1113] associated with Hearth 7 contained a number of fire-cracked stones (SF203). Also amongst this material was a strike-a-light (SF187) used in fire-lighting, a pounder/ possible rubbing stone (SF194), a grinder (SF197) and a multifunction cobble tool (SF200). The latter is incomplete and shows use as a working surface after breakage.

Active floor surface [1120] contained SF204, a pounder with such slight use-wear that it may have seen only one episode of use.

A spindle whorl (SF160) retrieved from debris [1104] over Hearth 7 is probably associated with Phase 8 activity. The whorl was disc-shaped in form and displayed evidence of use.

Although the incorporation of coarse stone tools in hearth features at BLoM is paralleled amongst some of the other structures, the quantity of tools associated with Phase 8 Hearth 7 is unparalleled on site. Could this be an instance of pragmatic use of convenient stones, both worn and unworked, which were readily available, being put to use to hastily construct a new hearth structure? Was the

Phase	Quadrant	Context	Short description
2/3	N half	15018	Possibly worked (SF201); single use hammerstone?
2/3	N half	15018	Two -refitting fragments of greywacke cobble; fire-cracked (SF211)
2/3	N half	15018	Five refitting angular fragments from a fire-cracked cobble (SF249)
2/3	SE quad	1743	Rubbing Stone, intact (SF295)
2/3	SE quad	1743	Smoother (SF297)
2/3	SE quad	1743	Perforated stone fragment, possibly a whorl broken during manufacture (SF301)
5	SE quad	1745	Circumferential grinder/pounder (SF303)
6	SE quad	1731	Stained stone
6	SE quad	1722	Grinder (SF266)
6	SE quad	1706	Sharpening stone/working surface (SF276)
8	SW quad	1103	Spindle whorl (SF160)
8	SW quad	1113	Strike-a-light (SF187)
8	SW quad	1109	Rubbing stone fragment (SF193). Re-joins with SF250
8	SW quad	1113	Pounder/?rubber (SF194)
8	SW quad	1113	Grinder (SF197)
8	SW quad	1113	Grinder/working surface/pounder (SF200)
8	SW quad	1113	Fire-cracked stone (SF203)
8	SW quad	1120	Pounder (SF204)
8	N half	15013	Stained stone (SF184)
8	SE quad	1704	Grinder/pounder (SF256)
8	SE quad	1704	Pounder/hammerstone (SF257)
8	SE quad	1704	Grinder/Pounder (SF259)
8	SE quad	1702	Rubbing Stone, intact. (SF262)
Unphased	SE quad	1703	Saddle quern or grindingstone fragment (SF255)
Unphased	N half	15001	Multifunction tool (SF175)
Unphased	N half	15001	Circumferential pounder (SF176)
Unphased	SW quad	unstrat	Pounder (SF198)
Unphased	SW quad	unstrat	Rubbing stone fragment (SF250). Re-joins with SF193
Unphased	SE quad	1700	Spindle whorl, possibly unfinished (SF254)
Unphased			Cache of 39 rounded pebbles of a variety of lithologies from ST3 (SF312)
Unphased			Nine natural water-rounded cobbles. Probable manuports (SF313)

Table 15.6. Summary of the stone recovered from ST3 by phase and quadrant.



10 cm

Figure 15.7. Manuports collected from ST3.

incorporation of stone tools, many of which could still have been functional at the time of their deposition, simply a convenient way of disposing and re-using now unwanted tools? Or was the activity in this roundhouse different from the others in the settlement, requiring a separate set of parameters for disposal of objects?

### Unphased

Also of note in relation to ST3 are the unquantified number of small, ovoid and egg-shaped, smooth, water-rounded pebbles that were found amongst the sub-floor levels, some of the active floor layers and external surfaces including [1703]. Thirty-nine pebbles were collected from ST3 as a representative sample (SF312) of the shapes, sizes and lithologies present. The broad consistency in size, colour and shape implies that these were parameters sought after in their selection.

Nine larger water-rounded cobbles (SF313) were also collected from ST3 as a representational sample of possible unworked manuports encountered within the floor and hearth deposits (Figure 15.7). Like the small pebbles just described, these had been deliberately brought to the site perhaps with an intended purpose for use as either tools or as pot-boilers.

A further group of stones was recovered from turf and topsoil and unstratified deposits overlying ST3 but cannot be definitively proved to stratigraphically relate to ST3 specifically; the likelihood is that they were associated with activities that took place in this structure and its immediate vicinity.

These include a multifunction tool (SF175) and a circumferential pounder (SF176) from topsoil over the

Phase	Context No.	Quantity	Short description
1	1018	1	Saddle quern, incomplete (SF253)
3	1003	1	Grinder
3	1005	1	Grinder
?	1000	1	Grinder (SF154)
?	1002	1	Multifunction cobble tool (SF155)
?	1002	1	Grinder (SF156)
?	1002	1	Fire-cracked stone (SF157)
?	1000	1	Grinder (SF154)
	'sump' (unstratified)	1	Indeterminate quern fragment: saddle quern or rubbing stone fragment (SF165)

Table 15.7. Summary of the worked stone from ST4.

northern half of the roundhouse. Both tools displayed extensive evidence of wear. Like others from the later phases of use of the structure, the multifunction tool (SF175) displayed a combination of wear including a bipartite abrasion facet at one end, pitting from pounding at the opposite tip and dispersed pits and peck marks suggesting expedient use as a working surface.

From the SE quadrant came a possible unfinished spindle whorl (SF254) from topsoil [1700]. Out of the three definite whorls from the site, two of them (SF160 and SF254) come from ST3. A third possible example from this structure, also unfinished, is SF301, implying that the production and use of the whorls may have focused on this structure.

A fragment of a possible lightly used quern or grinding stone (SF255) was also recovered from an external surface [1703] outside the SE quadrant.

A single function pounder (SF198) was recovered as an unstratified find from the SW quadrant.

#### 15.1.4.3 ST4

Three phases of activity were noted within this structure. Items of coarse stone were recovered in small quantities from Phases 1 and 3, as well as the topsoil overlying the structure (summarised in Table 15.7).

The earliest object stratigraphically was a broken saddle quern (SF253) which was recovered from [1018], debris from Hearth 1 (Phase 1). It is likely that it relates to the earlier episode of activity on site and was subsequently incorporated into ST4's primary hearth. As a result, its use and function probably have little association with the building. Several phases of floor refurbishment followed without any worked stone inclusions being present but a grinder (SF159) was recovered from a thick deposit of heat-shattered stones [1005] that overlay the third refurbished floor layer and a further example (SF161) (Figure 15.6) came from the poorly preserved and burnt uppermost floor layer [1003].

Several cobble tools came from sub-soil [1002] and topsoil [1001] deposits overlying ST4. These comprise two grinders (SF154 and SF56) and a multifunction tool (SF155) (Figure 15.6). An indeterminate granite quern fragment (SF165), either deriving from a saddle quern or rubbing stone, was unstratified.

The group of cobble tools from ST4 is dominated by single function grinders (Q = 4) which are confined to contexts relating to Phase 3 and the overlying deposits. Although the definition of these tools as grinders classifies the wear rather than the specific function, it is interesting to note that there is a consistency in the way that the grinders have been used. Use-wear was concentrated at the rounded ends of the cobbles with three examples (SF154, SF156 & SF159) displaying wear at only one end whilst SF161 had been used extensively at both ends, the details of which can be found in the catalogue. In addition, multifunction tool (SF155) has been extensively worn from use as a pounder and the presence of adhering ferrous residues implies that it was probably used in association with ironworking despite there being no evidence of this activity from the structure itself.

### 15.1.5 Distributional analysis of the stone assemblage; Episode 3

Very few stone objects were associated with Episode 3 deposits and few of these could be confidently linked to particular structures, working areas or other features. These include a multifunction tool (SF190) from the stones of the eastern terminus [1114] of rampart [617]/[767] and a fragment of abraded haematite (SF180) from one of the deposits forming the rampart.

The others comprise a whetstone/ sharpening stone (SF166), a possible working surface (SF169) and a possibly worked stone (SF170) from turf and topsoil [13001] in Trench 13.

#### 15.1.5.1 The trackway and external features (Episodes 1–3)

Four items of worked stone were found in association with the trackway (Table 15.8). As the trackway was in use throughout the occupation of the settlement these cannot be assigned to particular phases or episodes of activity. These include an intact rubbing stone (SF271) from a discrete dump of waste [18027], a pounder/hammerstone (SF287) (Figure 15.6) from a further deposit of hearth waste [1902] and a hollowed stone (SF311) that was recovered from peat surrounding [19004], a rough track probably relating to Episode 3 activity.

### 15.1.6 Conclusions

Differentiation can be seen between the types and range of coarse stone tools between the structures and surrounding areas of the settlement. In particular, distinctive sub-groups

Episode	Context No.	Quantity	Short description
1 to 3	18027	1	Rubbing Stone, intact. (SF271)
1 to 3	19002	1	Pounder/hammerstone (SF287)
1 to 3	19002	1	Whetstone (SF288)
1 to 3	19005	1	Hollowed stone (SF311)

Table 15.8. Summary of worked stone associated with the Trackway and external features.

of tools between ST2 and ST3 suggest differences in the functions of these buildings at least during periods of their use. The Episode 2/3 activity overlying the abandoned ST2 is associated with many quern fragments and rubbing stones suggestive of food processing, in particular grain processing, cooking etc but due to the character of the deposits in this area, it is unclear whether these tools were re-used as building stones, had been purposefully deposited within the structure during its later refurbishment or had simply been abandoned after use when this area of the settlement went out of use. ST3, in contrast, is associated with a much wider range of cobble tools suggestive of various craft processes which suggest links to food processing, possible metalworking, woodworking, production of whorls and possible spinning of yarn as well as episodic hide processing.

Also striking amongst the BLoM stone assemblage is the evidence for possible purposeful or structured deposition in the form of caches of white quartzite pebbles and other small stones of other lithologies which appear to have been deliberately selected, brought to the settlement and deposited within the structures during their periodic refurbishment. This practice can be compared directly to that observed at Cults Loch and suggests that this practice may have been more widespread than hitherto acknowledged. There is also evidence amongst this assemblage for the break-up and deliberate damage of a selection of food processing tools and the practice of incorporating these fragments, as well as other items such as cobble tools, under the floor surfaces. Although some items could easily have been casual losses during use, or unused and exhausted tools re-used pragmatically as convenient building stones, this fails to explain the recurring presence of items of worked stone encountered between floor surfaces and foundation platforms for hearths, or the presence of intact objects (eg saddle quern SF234) within the fill of the ditch.

#### 15.1.7 Catalogue

To aid comparative analysis of the cobble tools, the classification system utilised at the Howe, Orkney (Ballin Smith 1994, 196), based on wear type, has been used. Abbreviations: L length, W width, T thickness, H height, D diameter. No catalogue descriptions are recorded here for the fire-cracked stones, pebble caches/unworked small pebbles,

possible manuports or natural stones but information relating to these categories are summarised above. Full catalogue descriptions of these items are presented in the archive. \*Denotes items that have been illustrated. W = width, RW = retained width, L = length, T = thickness.

### 15.1.7.1 Food processing tools

#### Saddle quern

*SF5 & 11*: Saddle quern; incomplete. Four joining angular fragments from one blunt rounded end of a badly damaged and fragmentary possible dolerite saddle quern, plano-convex in cross-section and sub-oval or sub-square in plan. Broken mid-length, shattering pieces from both sides and corners; one damaged end survives but the opposing end has been lost. Rounded edges of the surviving end of the stone are badly damaged with angular fracture facets from large spalls that have been detached from the surface. It is difficult to estimate the proportion of the grinding surface that is represented but patches of two opposing sides are present which confirms the full width of the original stone. The quern appears to have been produced from a glacial erratic water rounded boulder, probably locally sourced. Regular but shallow peck marks on the surviving edges show an attempt to shape and round off the edges but little modification of the plan of the original stone is indicated. The grinding face is dished on both long and short axes through use with regular pitting and well-developed polish around the circumference. The angular fresh condition of the fractured pieces, and the radial fracture pattern indicated by the re-joining fragments suggests that the stone was broken deliberately, and with some force. Remaining L 224 mm, W 255 mm, T 129.5 mm. Context [004]. ST1.

*SF50*: Elongated kite-shaped greywacke boulder, plano-convex in section with naturally squared ends. The apex of the convex face has been split away to create a flat base of small diameter for the tool to sit on. The opposite gently dished face has not seen extensive use as is still rough and uneven in patches but evidence of abrasion is observed particularly adjacent to one long edge. L 267 mm, W 70–186 mm, T 26–86 mm. Context [210]. ST2.

*SF86*: Complete but damaged large, rounded quartzite boulder, one end is rounded, the other is more angular, the edges converging on a blunt narrow rounded end. It is unclear if these angular edges are original or the result of damage and are obscured by post-depositional damage from the acidic soils which have caused deterioration of the surfaces of the stone. The grinding face is smoothed and strongly dished on both longitudinal and transverse axis. The base has been roughly pecked to flatten. L 338 mm, W 279 mm, T 124 mm. Context [236]. ST2.

*SF234*: Saddle quern, intact. Large, elongated, kite-shaped granite slab, probably split from a thicker glacial erratic boulder but otherwise devoid of obvious dressing with the exception of the grinding face. Both ends are naturally square with rounded corners, one of which is damaged, and the edges are vertical. The grinding face covers the extent of one extensive face (435 × 286 mm); abrasion and pitting from use extends to the extreme edge of the face at both ends and to the shallow lip of both long edges. Wear concentrates in a narrow band (*circa* W 35 mm) of abrasion and light polish towards the middle of each long edge of the grinding face whilst the centre of the face is more pronounced in concavity, implying that grinding was undertaken across the short axis of the stone rather than along its length. L 447 mm, W 204–336 mm, T 62–114.4 mm. Context [800]. Midden/ ditch fill.

\**SF253*: Saddle quern, incomplete. Oval granite boulder, plano-convex cross-section, water-rounded surfaces. One rounded end broken resulting in the loss of a portion of the grinding surface; adjacent rounded end is damaged but enough survives for the full length of the stone to be determined. A dished oval grinding facet covers the extent of the upper surface (L 234 mm, W 167 mm, Depth 22 mm); the facet is concave, particularly across the short axis of the stone, with a distinct lip surviving on the undamaged edge. Individual quartz grains of the grinding face are abraded flat from wear accompanied by a light sheen and pitting from the loss of detached clasts. The granite is friable as the result of post-depositional erosion. L 275 mm, W 247 mm, T 132 mm. Context [1018]. ST4.

#### Rubbing stones (see also SF101 and SF116)

*SF29*: Irregular ovoid greywacke water-rounded cobble, surfaces stained by iron pan/ rootlets. Plano-convex in profile, flat face is smoothed and abraded from wear with faint longitudinal scratch marks across the face which is gently convex on both plains from use. L 136.5 mm, W 101.5 mm, T 54.5 mm. Context [213]. ST2.

*SF39*: Ovoid, plano-convex sectioned granite cobble; most of the surfaces and the convex face have significantly deteriorated since deposition due to the acidic peaty soil resulting in very little of the original surfaces surviving. The worked surface is substantially intact; it is smoothed with patches of polish, particularly towards the rounded ends and is convex on the longitudinal axis of the stone. Approximately 50% of one face and the damaged edges are coated in a dark brown/ black residue from the burial environment. L 150.5 mm, W 126.5 mm, T 56 mm. Context [219], decomposed floor material. ST2.

*SF53*: Elongated ovoid quartzite-rich sandstone cobble, plano-convex in section, thicker along one edge than the

other, tapering in both directions towards blunt damaged tips. The angled working face is smoothed though abrasion with small pits where individual clasts have detached and been lost during use. This face is slightly convex on both planes. The rounded base is darkly stained towards one end only. L 274 mm, W 133 mm, T 59.5 mm. Context [209]. ST2.

*SF81*: Thick, sub-rectangular, water-rounded, greywacke cobble, wedge-shaped in profile with naturally square ends. One flat face has been smoothed as the result of abrasion with light striations across the face from use. L 115 mm, W 72.5 mm, T 26–60 mm. Context [241]. ST2.

*SF103*: Small ovoid greywacke cobble, asymmetric rounded ends, one of which is damaged, plano-convex in section. The flat face is naturally indented and uneven towards one squared end, the opposite end of the face is flat and smooth and lightly abraded from use. L 111.5 mm, W 78.5 mm, T 43.5 mm. Context [250]. ST2.

*SF193*: Rubbing stone (rejoins *SF250*). Fire-cracked fragment from the middle of a flattened ovoid or sub-rectangular water-rounded quartziferous gabbro cobble, broken across the width resulting in the loss of both ends and one long edge severely fractured but rejoins with *SF250* to re-create full width. Surfaces of the cobble are covered in hairline cracks indicative of heat-fracturing. The more extensive surviving face is naturally smooth and convex which is pitted towards the centre of the face with areas of abrasion corresponding to use as a grain rubber. What survives of the opposing face is also pitted and rubbed but this wear is less-well developed. Staining across all surfaces due to natural iron panning is observed. Original W 180 mm. Surviving dimensions: L 115 mm, W 175 mm, T 61.5 mm. Context [1109]. ST3.

*SF250*: Rubbing stone fragment (re-joins with *SF193*). Angular sub-rectangular fractured fragment, wedge-shaped in cross-section, detached from the rounded edge of a large flattened ovoid or sub-rectangular quartziferous gabbro cobble. Surfaces covered in hairline cracks suggestive of heat-damage and iron-stained rootlets adhere to fresh fractured faces indicating further damage to the stone as the result of centuries of root action. The surviving portion of the extensive convex face is pitted with some corresponding patches of abrasion from wear. Surviving dimensions L 96.5 mm, W 72 mm, T 47.5 mm. Unstratified, from spoil tip E of Trench 11.

\**SF262*: Rubbing stone. Intact flattened ovoid quartz-rich sandstone cobble, surfaces water-rounded and smooth. One extensive face is heavily abraded and smoothed as the result of wear with well-defined crisp edges to the grinding facet which covers the extent of the face. Grinding face has

regular shallow pits across the facet as the result of the loss of grits during use and perhaps some dressing of the face which has softened as the result of wear. Build-up of smooth abrasion and polish in a band (W 12 mm) is present around the circumference of the face. Abrasion extends onto the rounded tips of the short ends of the cobble adjacent to the grinding face where the stone has rubbed against the edges of the saddle quern during use but not as pronounced wear as *SF271*. The opposing smooth convex face has a small sub-circular concentration (34 × 41 mm) of peck marks, off-centre and towards the wide-rounded end from expedient use as a working surface. L 232 mm, W 183 mm, T 52.5 mm. Context [1702]. ST 3.

*SF271*: Rubbing stone. Intact rubbing stone produced from an ovoid water-rounded green-blue greywacke cobble, possibly split longitudinally before use to create plano-convex cross-section but thinning of cobble may simply be the result of extensive use. The grinding face is evenly worn, evidenced by even abrasion across the face with a light distribution of pitting across the surface due to loss of clasts during use and potentially some dressing to roughen the surface. A band (av. W 12 mm) of concentrated abrasion and light polish is present around the circumference of the face which is distinctly rounded across long axis. The tips of both short round ends display a narrow bevelled band of abrasion (min W 15 mm, max W 34 mm) where the ends have rubbed against the lip of the saddle quern during use. L 203 mm, W 148 mm, T 79 mm. Context [18027].

\**SF295*: Rubbing stone. Large flattened ovoid water-rounded cobble of granite, surfaces rounded but naturally pitted as the result of weathering. One extensive face is flattened, smoothed and polished across the face, and particularly towards the wider of the two ends of the cobble as the result of abrasion though use. This facet (L 210 mm, W 98 mm) covers much of the face but is asymmetric reflecting the orientation that the cobble was held at during use and the idiosyncrasy of the user. The wear extends onto two opposing long edges creating short bevelled facets (W 19 mm; W 23 mm) towards the rounded corners of the wider end of the cobble. L 240 mm, W 142 mm, T 58 mm. Context [1743]. ST3.

#### Unidentified upper or lower

*SF27*: Curving edge fragment of a worked mica/ quartz-rich sandstone, possibly a quern fragment. Plano-convex in section, angular fractures – deliberate breakage. Worked face abraded and convex. No pitting or polish. Surviving L 80 mm, W 60 mm, T 52.5 mm. Context [210]. ST2.

*SF51*: Substantially complete but damaged sub-rectangular greywacke cobble with smooth rounded surfaces and corners, plano-convex in section; one corner lost, probably in antiquity. The flat face has been smoothed though

abrasion from wear and has a narrow band of use-polish concentrating around the circumference of the face, particularly towards the blunt, wide, rounded ends. Small stone clasts have detached from the face during working, resulting in irregular pitting across the surface. The grinding face is only very slightly concave towards the centre, making it unclear whether this is a very small upper or lower stone. L 217 mm, W 127 mm, T 53 mm. Context [215]. ST2.

*SF165*: Saddle quern/ rubbing stone fragment. Heat-affected rounded corner fragment broken and detached from a larger water-rounded granite cobble. Only a small portion of one flat face survives which has been abraded and pitted from grinding. Surviving L 92 mm, W 77.5 mm, T 54 mm. Context: 'sump'. ST4.

#### Other

*SF255*: Quern or grinding surface fragment. Rounded corner from a thick sub-rectangular large cobble of quartz rich greywacke. Edges are naturally steep and angled, plano-convex in section but the tip of the rounded face has been lost and the cobble has broken diagonally across the natural 'grain' of the stone from the corner of one wide end of the cobble to the opposite long edge; the original length and form of the stone is unknown. Two small discrete patches (47 × 13 mm; 41 × 22 mm) of smoothed abrasion from rubbing are present on the surviving extensive face, towards the assumed centre of the face, perhaps from light or episodic use as a quern or grinding surface. Remaining L 200 mm, W 157 mm, T 90.5 mm. Context [1703]. Exterior of ST3, unphased.

### 15.1.7.2 Cobble tools

#### Grinders

*SF08*: Flattened asymmetric ovoid siltstone cobble with a wide angled end which tapers gently and evenly towards a blunt rounded narrow tip which has been worked, as evidenced by a bipartite abraded facet (19.5 × 34 mm). A small oval flattened facet (11.5 × 21.5 mm) is present at the tip of one opposite rounded corner. There is a light sheen across the surfaces which may be the result of handling. L 125 mm, W 83 mm, T 30 mm. L 125 mm, W 83 mm, T 30 mm. Context [203]. ST2.

*SF20*: Fragment of a sub-spherical granite cobble, fractured across the width resulting in the loss of 70% of the edges and one face, possibly as the result of heat damage. A wide band of faceted abrasion (W 63 mm) is present around the surviving circumference. Surviving L: 80 mm, W 74.5 mm, T 32.5 mm. Context [210]. ST2.

*SF32*: Sub-rectangular water-rounded quartzite cobble; one gently rounded wide end has a bevelled band of abrasion at the angled tip (15 × 47 mm). L 90 mm, W 67 mm, T 61 mm. Context [213]. ST2.

*\*SF90*: Flattened spherical water-rounded quartzite cobble with a wide, well-developed faceted band (D 56 mm) of abrasion encircling the circumference of the stone, implying extensive use. L 77 mm, W 67 mm, T 62.5 mm. Context [244]. ST2.

*SF92*: Broken fragment of elongated ovoid greywacke pebble, one surviving blunt rounded end has bevelled facet (27.5 mm × 7.5 mm) of abrasion at the wide rounded tip; the opposite end of the pebble is lost. Surviving L 88.5 mm, W 36 mm, T 15.5 mm. Context [244]. ST2.

*SF95 & SF97*: Sub-spherical quartzite cobble; fractured possibly due to heat damage resulting in the loss of approximately 50% of the stone. The surviving edges display a well-developed, faceted band (W 59 mm) of abrasion resulting from extensive use. A further two worked edge fragments were recovered as SF95 and found to rejoin. Surviving L 76.5 mm, W 86 mm, T 70 mm. Context [244]. ST2.

*\*SF102*: Flattened ovoid granite cobble with a bipartite band of abrasion (W 40 mm) around the circumference. The edges are damaged at opposing ends of each face. L 106.5 mm, W 101 mm, T 57 mm. Context [250]. ST2.

*SF115*: Ovoid water-rounded quartzite pebble with oval abraded facet at one end (28.5 × 36 mm). The opposite end has also been abraded through use but the wear is far less well-developed, covering all of the rounded end and extending onto rounded edges. L 55 mm, W 47 mm, T 38.5 mm. Context [226]. ST2.

*SF130a*: Ovoid water-rounded quartzite cobble, surfaces natural smooth and rounded. A small bipartite abraded facet (36.5 × 16 mm) is present at the tip of one rounded end. L 86 mm, W 62 mm, T 51 mm. Context [209/210]. Post-ST2.

*SF140*: Sub-spherical quartzite cobble, water-rounded, with a wide band (W 38 mm) of faceted abrasion around the circumference. L 80.5 mm, W 72.5 mm, T 69 mm. Context [219]. ST2.

*SF154*: Grinder. Elongated ovoid fine-sandstone/ siltstone cobble, water-rounded and naturally smooth surfaces. Tip (D 12 × 14 mm) of one narrow rounded end flattened though abrasion from use. L 128 mm, W 42 mm, T 41.5 mm. Context [1000]. ST4.

*\*SF156*: Grinder. Large, ovoid, pale grey quartzite-rich cobble, water-rounded and smoothed surfaces and ends. One wide blunt end covered by an oval bipartite abrasion facet (28 × 45 mm), wear concentrated towards

the one corner of the facet (?right-handed use). L 127 mm, W 77 mm, T 61.5 mm. Context [1002]. ST4.

*SF159*: Grinder. Flat ovoid water-rounded cobble with a narrow faceted bipartite area of abrasion (14.5 × 33 mm) at the tip of one wide rounded end. One face is covered in red-brown/ orange-brown linear rootlet stains. L 153 mm, W 84.5 mm, T 37.5 mm. Context [1005]. ST4.

\**SF161*: Grinder. Asymmetric ovoid water-rounded quartzite-rich cobble, dark brown staining covering all but one patch of convex smooth surface, ends extensively worn. Wide rounded end flattened from use with an irregular bipartite abraded facet (3.5 × 6 mm; 6 × 9 mm) covering the extent of the convex surface. Stone tapers in thickness but expands in width towards the opposite rounded end which is extensively modified by use as a grinder indicated by a wide faceted band of abrasion (27.5 × 66.5 mm); fine chipping around the periphery of facet suggests occasional pounding/ percussive use. L 101.5 mm, W 38.5–72.5 mm, T 28.5–56.5 mm. Context [1003]. ST4.

*SF179*: Grinder. Squat ovoid flattened sandstone cobble, water-rounded surfaces. Both ends extensively modified by oval faceted areas of abrasion: one end (54 × 80 mm) has round oval facet consisting of four merged and overlapping areas of wear resulting from use in a variety of direction/ angles; the opposite end has a bipartite oval facet (53.5 × 76.5 mm), the larger facet (W 33 mm) is rounded whilst the narrower facet (W 25 mm) is more steeply angled and chipped at the edges suggesting occasional percussive use in addition to grinding. L 99.5 mm, W 84.5 mm, T 60 mm. Unstratified.

*SF197*: Grinder. Irregular ovoid greywacke cobble, water-rounded smooth surfaces and wide rounded ends, plano-convex in cross-section. One end has been extensively modified though abrasion in the form of an asymmetric bipartite facet which covers the extent of the end (35.5 × 75.5 mm), extending on to one edge. The smaller of the two overlapping facets (L 37 mm) has been worn at an acute oblique angle; the larger facet (L 65 mm) is gently convex, sloping in the opposite direction. The tip of the opposite end has a very limited area of damage (13 × 18.5 mm) which may have resulted from a single episode of percussive use. L 123 mm, W 85 mm, T 42 mm. Context [1113]. ST3.

\**SF265*: Circumferential grinder. Flattened spherical quartzite cobble, surfaces naturally smooth water-rounded but with occasional deep pits and linear seams, natural to rock. A well-developed faceted band of abrasion encircles the circumference, ranging from 31–55 mm in width around *circa* 90% of the edges; the remaining 10% of the edge, at the thickest part of the cobble, has a much narrower (W 9 mm) and

less well-developed band of abrasion. At the centre of each extensive face is a dispersed group (D 20 mm and 30 mm, respectively) of small (D 1 mm) shallow peck marks indicating expedient use as a working surface. L 106.5 mm, W 100.5 mm, T 69 mm. Unstratified.

*SF266*: Grinder. Flattened ovoid dark brown sandstone cobble, surfaces naturally smoothed and water-rounded. One wide round end has oval (38.5 × 18.5 mm) rounded abraded facet. Cobble is otherwise unworked. L 117.8 mm, W 64 mm, T 29.8 mm. Context [1722]. ST3.

*SF272*: Grinder. Water-rounded ovoid quartzite cobble surfaces naturally smooth and even. One blunt rounded end has been used as an abrasive resulting in an asymmetric bipartite oval grinding facet (38.3 × 27.5 mm), comparing a steeply angled oval abrasion scar 18.5 mm in height at the tip of the cobble, directly adjacent to the flatter of the two extensive faces, and a smaller overlapping oval facet 11 mm in height, which extends onto the opposite more distinctly rounded extensive face. The opposite wide rounded end of the cobble is scuffed at the tip (27 × 7 mm) probably from light use. L 97.5 mm, W 82 mm, T 54 mm. Unstratified.

#### **Pounders (See also SF101)**

*SF30*: Circumferential pounder. Thin surface spall from a sub-spherical pale grey-brown sandstone cobble, surfaces fire-cracked, one face and much of the edges lost. Surviving rounded edges (*circa* 70% circumference) display a faceted band (W 13–19 mm) resulting from use as a pounder. L 80 mm, W 74.5 mm, T 32.5 mm. Context [210]. ST2.

*SF49*: Water-rounded ovoid quartzite pebble with naturally smooth surfaces. One rounded narrow tip has a very small (8.5 × 12.5 mm) but well-defined oval peck marked facet from use. L 50 mm, W 41 mm, T 36.5 mm. Context [209]. ST2.

\**SF83*: Small, ovoid, fine-sandstone water-rounded pebble, one end is flattened with a slightly bevelled oval pitted facet (16.5 × 31 mm). The edges of the facet are chipped and fractured indicating use with fairly vigorous physical force. L 89.5 mm, W 41 mm, T 38 mm. Context [244]. ST2.

*SF88*: Sub-oval quartzite cobble, water-rounded surfaces with use-wear confined to one narrow rounded tip in the form of two conjoining pitted facets (17 × 20 mm; 17.5 × 27.5 mm) suggesting fairly light use. Found with cache of water-rounded pebbles. L 85.5 mm, W 83.5 mm, T 55 mm. Context [241]. ST2.

*SF91*: Large spherical sandstone cobble, surfaces smooth and water-rounded with an irregular series of pits and gouges across the surfaces which appear quite weathered. It is possible that the markings on the surface are the

result of expedient, perhaps single, use as a pounder or hammerstone. D 103–111 mm. Context [244]. ST2.

SF93: Ovoid water-rounded cobble, severely heat damaged resulting in discolouration, pitting and spalling of the surfaces. Despite the heat damage, an oval facet (31 × 45 mm) of pitting from use as a pounder is observed at one rounded end which has been significantly flattened as the result of extensive use. L 90 mm, W 68 mm, T 52 mm. Context [250]. ST2.

SF176: Circumferential pounder. Quartzite-rich sub-spherical water-rounded cobble with a wide band (W 53 mm) of abrasion around 90% of circumference of cobble. Distinct dark brown 'tide-mark' covers one half of the stone. L 81 mm, W 73 mm, T 70.5 mm. Context [15001]. ST3.

SF198: Pounder. Flattened ovoid water-rounded cobble, smooth surfaces and naturally rounded ends, one of which is flattened at the tip by an oval pitted facet (16 × 25 mm) from use. A small chip has detached from one end of this facet indicating use with fairly vigorous force. L 101.5 mm, W 61.7 mm, T 33.8 mm. unstratified. Trench 11.

SF204: Pounder. Ovoid grey fine sandstone cobble, water-rounded smooth surfaces and naturally blunt rounded ends, one of which is damaged at the extreme tip by a small oval area (13.5 × 24.5 mm) of pitting produced from pounding. This facet is overlain by a few individual fresh peck marks. Light-use only. L 150 mm, W 90 mm, T 48 mm. Context [1120]. ST3.

### Smootherers

SF25: Wide-rounded end fragment of a flattened ovoid fine sandstone cobble, surfaces naturally smooth, the opposite end lost. One gently convex smooth face is stained with a light sheen suggesting limited use as a smoother. Surviving L 53.5 mm, W 44.5 mm, T 18.5 mm. Context [209]. ST2.

SF85: Flattened ovoid water rounded siltstone or fine sandstone cobble, with wide round end tapering towards a blunt rounded tip. Both faces and all edges have irregular patches of red-brown staining. One flat face has a light sheen that may be the result of limited use. L 115 mm, W 75 mm, T 26.5 mm. Context [244]. ST2.

\*SF297: Smoother. Triangular water-rounded quartz-rich silt/ sandstone cobble with rounded ends, naturally smooth and water-rounded surfaces and a lentoid cross-section. The less pronounced convex face has been smoothed from rubbing, particularly towards one narrow rounded end and the face is stained with a build-up of a dark brown residue concentrating as a narrow band (W 5.5 mm) on the opposite end. L 143 mm, W 30–71.5 mm, T 40 mm. Context [1743]. ST3.

### Strike-a-lights

SF120: Flat disc-shaped pebble of fine-grained lithology, surfaces naturally smooth and rounded with D-shaped edges. Both faces have seen use indicated by the presence of faint red-brown linear streaks and scores, concentrating towards the centre of each face. The markings of use are much more distinct on one face than the other. L 67 mm, W 64.5 mm, T 18.5 mm. Topsoil. ST2. Unphased.

SF187: Strike-a-light. Water-rounded sub-square cobble of quartzite, surfaces naturally smooth and rounded. Large spall has been lost to one face. Towards naturally squared end on opposite face are three light and ephemeral linear red-brown tracks resulting from striking the surface with a fragment of pyrite or iron; could represent single-use only. L 79 mm, W 73.5 mm, T 53.5 mm. Context [1113]. ST3.

### Whetstones

\*SF28: Elongated ovoid fine sandstone pebble, plano-convex in section with rounded ends. One flat face is smoothed with a slight sheen towards the wider round end through use as a whetstone. The choice of this stone appears to have been to take advantage of a thin horizontal band of quartzite that runs through the cobble – the overlying sandstone has been abraded away towards the middle of the face from use to the extent that the quartzite layer is partially exposed. The opposite end of the cobble, where a tangential quartzite vein cuts the face, is unmodified and convex. L 101 mm, W 37 mm, T 17 mm. Context [213]. ST2.

\*SF166: Whetstone/ sharpening stone. Tapering bar-shaped cobble of mica-flecked sandstone, tapering along length from irregular broken squared end towards narrower blunt wedge-sectioned tip which is lightly abraded with occasional pits suggesting light use as an abrasive/ pounder. One extensive flat face is smoothed with a light sheen from use as a whetstone; worn surface cut though by a series of linear sharpening grooves, orientated along long axis of cobble towards the centre of the face, surrounded by shorter, more haphazard striations from use. Pecked damage is also present at the centre of both long edges (*circa* W 12 mm). L 120 mm, W 30–44 mm, T 44 mm. 345.7g. Context [1301].

\*SF288: Whetstone. Wide, flat, sub-rectangular quartz-rich sandstone cobble (blue-grey) with naturally smooth and water-rounded surfaces, blunt rounded ends and a plano-convex cross-section. The flatter of the two faces is smoothed from abrasion, particularly from mid-length towards the wider of the two rounded ends associated with a few faint linear scuffmarks and a number of very fine and shallow pits. Wear is ephemeral and suggestive of light use. L 184.5 mm, W 22–50 mm, T 20 mm. Context [1092]. Trackway.

### Working surfaces (see also SF101 and SF116)

*SF59*: Broken tip from an elongated ovoid sandstone pebble, the extreme tip of which has been damaged. The form of the fracture is not consistent with use of the tip as a hammerstone but the fracture appears to radiate out from a small circular pecked indentation on the adjacent flat face which is flanked by a further two small peck marks. Surviving L 33 mm, W 30.5 mm, T 22.5 mm. Context [219]. ST2.

*SF80*: Blunt rounded end fragment of a plano-convex water-rounded greywacke/ fine sandstone cobble; the opposite end is lost and the original dimensions are unknown. The flat face that survives has irregular peck marks and gouges, probably from use as a working surface that saw only limited use. Surviving L 81 mm, W 124.5 mm, T 38 mm. Context [231]. Activity outside ST2.

*SF169*: Possible working surface. Small, flat, sub-square schist fragment, detached in antiquity from a larger slab. All surfaces are rounded from weathering. Most extensive square face has a series of diagonal gouges and scratches, possibly from expedient use as a working surface but surface damage lacks the regularity that would be anticipated from deliberate use as a sharpening stone. L 71.5 mm, W 66.5 mm, T 29.5 mm. Context [1301].

### Multifunction tools

*SF10*: Grinder/ ?rubbing stone. Ovoid quartz-rich cobble, surfaces water-rounded but naturally pitted where angular quartzite grains have become detached. A bipartite facet (23 × 35.5 mm) of abrasion is present at one rounded tip from light use as a grinder. The extent of one face, particularly towards one curving, rounded edge, is smoothed, possibly from light use as a rubbing stone. L 123.5 mm, W 81 mm, T 55 mm. Context [008]. ST1.

*\*SF101*: Rubbing stone/ working surface/ pounder. Flattened ovoid granite cobble, surfaces water-rounded with convex faces and edges. A wide band of peck marks are present around the circumference of the cobble from use as a pounder. One convex, smooth face is abraded and polished from use as a rubbing stone, the facet extending from the very edge of the face at both ends. Frequent pitting of this surface has been caused by individual clasts being detached and lost during use. The opposite face has an oval concentration of peck marks (47 × 55.5mm) towards the centre of the face and a further small cluster of peck marks (22 × 26 mm) on the same face towards one edge. L 193 mm, W 162 mm, T 53 mm. Context [250]. ST1.

*SF116*: Rubbing stone/ working surface. Flattened triangular water-rounded granite cobble, round but naturally pitted surfaces throughout. One convex face has been extensively worked with a well-developed oval area of abrasion and

polish (106 × 153 mm) at the centre of the face from use as a rubbing stone. Cutting through this polished surface at the centre of the face is an irregular series of deep peck marks (D 4–5 mm) suggesting expedient use as a working surface or anvil. L 178 mm, W 138 mm, T 58–70.5 mm. Context [265]. ST1.

*SF155*: Flattened ovoid water-rounded cobble of quartz-rich sandstone, tapering gently along its length from a wide rounded end to a narrower blunt tip (W 37 mm) which has been flattened as the result of heavy pounding. Detached flakes from the periphery of this facet indicates use with heavy physical force. Opposite end displays an oval peck marked facet (19 × 32.5 mm). Oval area (25 × 37 mm) of very shallow and ephemeral circular peck marks (D 2 mm) is present towards the round wide end of one face probably from expedient (single use?) as a working surface. Spots of iron rich residue, including small spheres, adhere to the surface of the stone, particularly at the narrow worked tip. L 181 mm, W 84 mm, T 36.5 mm. 959.1g. Context [1002]. ST4.

*SF175*: Multifunction tool. Wide flattened ovoid grey fine sandstone cobble, surfaces water-rounded and naturally smooth. One wide end extensively modified by bipartite abrasion facets which cover the extent of the end (29 × 77 mm): the smaller of the two facets (L 51 mm) has been worn at an acute angle whilst the larger facet (L 56 mm) is gently convex and chipped around the periphery. The opposite rounded end has a small oval area of pitting at the tip (10 × 18 mm) probably from single use. An area of abrasion with a high sheen particularly along one long edge on extensive convex face from rubbing whilst the opposite naturally concave face has a series of dispersed pits, peck marks and linear scratches from use as an expedient working surface. L 129 mm, W 95 mm, T 34 mm. Context [15001]. ST3.

*SF190*: Grinder/ pounder or working surface. Wide oval fine sandstone cobble, water-rounded and smooth, displays signs of extensive use as abrasive tool, particularly at one end. Blunt wide end is bevelled towards one long edge by a wide oval bipartite abrasion facet (32.5 × 71.5 mm), the wider of the two facets (W 22.5 mm) covers the width of the end but is more extensively worn towards one edge. The narrower facet (W 9 mm) is less well-developed and worked an opposing angle with some chipping around periphery of facet. The opposite rounded end also has a small bipartite facet (20 × 47.5 mm) consisting of two diametrically opposed areas of wear. Towards the centre of one long rounded edge is a concentration of deep peck marks and an oval chip has detached from the edge implying use either as a pounder or as a working surface whilst set on edge. L 139 mm, W 97 mm, T 40.5 mm. Context [1114]. ST3.

*SF194*: Pounder/ ?rubber. Wide flattened ovoid cobble, water-rounded and naturally smoothed surfaces, narrow rounded end flattened at tip by oval pitted facet (24.5 × 37.5 mm) resulting from use as a pounder. One naturally flat and smooth extensive face has a poorly defined band of polish from rubbing across the centre of the face. L 143 mm, W 110 mm, T 48.5 mm. Context [1113]. ST3.

*SF200*: Multifunction tool (grinder/ working surface/ pounder). Blunt rounded end fragment detached from an elongated ovoid fine sandstone cobble, surfaces water-rounded and naturally smooth; opposite end of cobble lost, broken across width resulting in a long narrow shard detaching from one long edge. Surviving end is extensively modified by a well-developed bipartite oval grinding facet (35 × 43 mm), facets worn from steeply angled opposing directions (W 18.5 mm; W 22 mm). Towards centre of surviving convex face is a sub-oval area of pitting (17.5 × 32.5 mm) from use as a working surface. Surviving long edge has band of dispersed shallow peck marks either from pounding or from use as a working surface when set on edge. Surviving L 139.5 mm, RW 65.5 mm, T 41.5 mm. Context [1113]. ST3.

*SF256*: Grinder/ pounder. Flattened elongated ovoid water-rounded siltstone cobble (blue-grey in colour) with naturally smooth and rounded surfaces. Both rounded ends have been flattened as the result of use: the widest end has an oval bipartite pitted facet (45.5 mm x 28 mm) covering and flattening the extent of formerly rounded end, the opposite narrower end has also been flattened by an oval bipartite facet (34 mm x 23.5 mm), ground by abrasion which is overlain by pitting and chips on one edge though use as a pounder. There are a series of very shallow small peck marks towards the wider end on one smooth rounded face and towards the centre of the adjacent rounded edge possibly the result of expedient use as a working surface. L 154.5 mm, W 81 mm, T 38 mm. Context [1704]. ST3.

\**SF257*: Pounder/ hammerstone. Flattened ovoid quartz-rich sandstone cobble, surfaces naturally smooth and water-rounded. One end of the cobble has been lost as the result of heavy pounding or hammering resulting in an angular bifacial fracture scar. The opposite blunt rounded end has a small oval (24.5 mm x 16.5 mm) pitted facet from pounding, located just off-centre. Remaining L 132.5 mm, W 80 mm, 35 mm. Context [1704]. ST3.

*SF259*: Grinder /pounder. Flattened ovoid water-rounded cobble of mousey-brown quartz-rich siltstone/ sandstone, rounded ends and plano-convex cross-section have naturally smooth surfaces. One round end has been modified through wear in the form of an oval (51 mm x 29 mm) bipartite abraded and pitted facet which is chipped around *circa* 40% of the circumference suggesting use with fairly vigorous force.

Towards the apex of the curving, rounded, long edge of the cobble are a few dispersed peck marks indicating expedient use. L 141 mm, W 81 mm, T 33 mm. Context [1704]. ST3.

\**SF276*: Sharpening stone/ working surface. Angular sub-rectangular block of pale grey quartz-rich sandstone or whinstone with irregular but steeply sloping edges and faces, perhaps broken from a larger glacial erratic boulder. One original extensive rectangular face survives and displays extensive evidence of use. At the centre of the face are two opposing pairs of diagonal linear score marks, both lines of each pair sit parallel to one another but the pairs are diametrically opposed and appear to radiate out from the centre of one long curving edge to the opposite long edge, the longest being 190 mm in length and the shortest 150 mm in length, max 4.5 mm in width and av. 3 mm deep. Towards both short-squared ends of the face are a further pair of shallow and more ephemeral sharpening grooves visible under raking light (L 8–13 mm). Pits and small concentrations of peck marks are present across the surface including two distinct circular pits (D 11–16 mm) and a series of small peck marks (D 2 mm) in between the widest angle of the two central pairs of sharpening grooves. Radiating upwards from one corner of the face towards the opposite edge is a deeper score (L 90 mm, W 17 mm, Depth 1.5 mm). L 252 mm; W 230 mm; T 220 mm. Context [1706]. ST3.

\**SF287*: Pounder/ hammerstone. Narrow, elongated ovoid cobble of a blue-grey fine sandstone, roughly tadpole in shape with a wide blunt rounded end tapering along length and thickness to a narrow rounded tip. The tip of the blunt wide end has been flattened by pounding evidenced by an oval pitted facet (25 mm x 14 mm), chipped around 55% of circumference; opposite narrow tip has small bifacial fractures, also from use. At the apex of the curving and rounded long edge of the cobble is a concentration (26 mm x 15 mm) of deep angular pecks and gouges implying use as a pounder/ hammerstone, used with fairly vigorous physical force. L 142 mm, W 18–42 mm, T 22 mm. Context [1902]. Trackway.

*SF303*: Circumferential grinder/ pounder. Sub-spherical granite cobble (black, white and grey), water-rounded surfaces heavily modified as the result of abrasion from use. A wide, uneven, faceted band (W 60 mm) of abrasion and pitting is present around the circumference, concentrating particular in a band (W 42 mm) around the middle of the rounded edge. Only a small patch of original surface survives on two opposing faces. L 81 mm, W 77.5 mm, T 73.5 mm. Context [1745]. ST3.

### 15.1.7.3 Textile production

\**SF132*: Decorated spindle whorl. Thick, disc-shaped whorl made from sandstone with a bored (conical) central

perforation (D 7.5 mm). Both faces are decorated with a series of closely spaced incised radial lines which extend from the exterior curving edge to converge at the edge of the central perforation: on one face they terminate at the edge of the hole, on the other they stop a little short of the hole itself. The decoration extends onto the vertical edges, comprising closely-set vertical lines which are cut through by a crude wavering groove incised at mid-height around the edge of the whorl. The edges are abraded unevenly, creating a faceted surface and removing and/ or softening the incised decoration; this may be due to expedient use as an abrasive. D 32 mm, T 14–16.5 mm; 21.6g. Context [209/210]. ST2.

\**SF160*: Spindle whorl. Disc-shaped whorl of fine red sandstone with flat abraded faces and faceted bipartite/ near-vertical edges, slightly off-centre conical bored perforation (max D 9.5 mm x 10 mm; min D (interior) 6 mm). Modern scratches on both faces. D 35–37.5 mm; T 9.2 mm; 17g. Context [1103]. ST3.

\**SF254*: Spindle whorl, possibly unfinished. Small disc-shaped whorl of quartz-rich ?sandstone with distinct faceted abrasion from shaping present on both faces and edges, and bored biconical perforation which is slightly lopsided and off-centre on one face (max D at surface 13.8 mm, narrowing to min D 7 mm x 8 mm, mid-thickness). Edges are roughly faceted from abrasion to shape, vertical around approximately three quarters of the circumference but more rounded and uneven at one edge, corresponding with an area on both faces that is rough, uneven and damaged. Like the edges, one face has a series of small, regular abrasion facets remaining from manufacture, covering approximately two thirds of the surface; the rest is uneven but abrasion overlies this rough area around the external edge. D 47.6 mm, T 10–11 mm. Context [1700]. ST3.

#### 15.1.7.4 Miscellaneous

\**SF11*: Smoother? Grindingstone? Small flat ovoid fine sandstone or siltstone pebble. Both surfaces and one rounded edge are covered in a series of very fine striations which cluster as blocks of parallel scratches which overlap in places and vary widely in orientation. Associated with these striations is a light sheen to the surface of the stone. L 77.5 mm, W 44 mm, T 15 mm. Context [202]. ST2.

*SF15*: Possible polisher. Plano-convex sub-square white quartzite pebble with water-rounded surfaces and rounded corners. Flat surface is naturally smooth but short curving bands of polish are present at the tips of two opposing ends, suggesting light use. Amorphous light staining is present on rounded face but it is unclear whether this is related to use or post-depositional processes. L 71.5 mm, W 61 mm, T 21.5 mm. Context [035]. ST1.

*SF170*: ?worked. Flattened sub-rectangular greywacke cobble with wide blunt end tapering along the length a narrow naturally squared tip. All original surfaces have been lost due to post-depositional erosion except for one elongated narrow patch of water-smoothed surface along one bevelled edge. Due to the loss of the surfaces, no evidence of use or modification survives. L 137 mm, W 77 mm, T 32 mm. Context [1301].

*SF180*: Worked haematite. Irregular pink-red haematite pebble, sub-square in plan and rectangular in section; both ends, one long edge and both faces irregular and coated in residual mud but surfaces powdery and friable. Angular straight edge between one extensive face and near-vertical edge has formed as the result of deliberate abrasion. L 43 mm, W 41 mm, T 27.5 mm. Context [723]. Rampart 2.

*SF184*: Stained stone. Flattened ovoid ?granite cobble, surfaces water-rounded and naturally smooth. Hairline cracks on one face towards wide rounded end suggestive of heat damage. Both faces are covered in irregular and poorly defined areas of dark staining. No surface damage to confirm that staining is related to use. L 107 mm, W 88 mm, T 43.5 mm. Context [15013]. ST3.

*SF201*: ?worked. Flat elongated ovoid dark grey-brown fine sandstone cobble, fracture damage at two opposing ends of one flat face of the stone. Not consistent with use as pounder/ hammerstone but unlikely to be natural. L 125 mm, W 42 mm, T 19 mm. Context [15018]. ST3.

\**SF301*: Perforated stone. Fragment of a thin disc-shaped piece of slate, broken across width to one side of a small biconical circular perforation (D 4 mm) resulting in the loss of *circa* 40% of the stone, and for a spall to laminate from one face. The original thickness of the disc is unknown. The edges of the disc have been abraded to shape and bifacial facets are observed under magnification. Surviving L 30.6 mm, W 19.5 mm, T 1.6 mm. Context [1743]. ST3.

*SF311*: Hollowed stone. Sub-square cobble of ?granite broken into three re-joining wedge-shaped fragments from the centre of one face, the surfaces heavily degraded as the result of weathering resulting in the loss of most of the original surface of both short ends and one face of the stone. The opposite face is damaged from breakage but at the very centre of the face is a small shallow round-based hollow (D 35.5 mm). L 165 mm, W 205 mm, T 221 mm. Context [19005]. Trackway.

*RT*: Flattened sub-rectangular water-rounded quartzite pebble, surfaces uneven and covered with natural cracks and fractures. One extensive convex face is stained dark brown with well-defined margins but the pebble otherwise lacks any evidence of modification or wear. L 80 mm, W 47.2 mm, T 26.6 mm. Context [1731]. ST3.

## 15.2 The ceramic and heat-affected clay

Dawn McLaren

### 15.2.1 Introduction

In total, one substantially intact thumb pot, two heavily weathered sherds of pottery, and over 6.1 kg of fractured and amorphous pieces of heat-affected clay were recovered during the excavation and the subsequent soil sampling process, the latter typically representing fragments of degraded hearth lining from the various structures targeted for excavation.

### 15.2.2 Pottery

The most significant object recovered amongst this group is a small, substantially intact thumb pot (SF79; Figure 15.8) which has been produced by working a ball of raw clay by hand and impressing the thumbs into the centre to draw out a round-bodied, semi-spherical vessel.

This small pot is notable considering the general paucity of evidence for pottery vessel use in Iron Age contexts in Wigtownshire (Hunter et al 2018: 198). The only other fragments of pottery recovered consist of the external face of a body sherd (SF13) which came from an organic-rich deposit [018] in ST1 and a single, heavily weathered, body sherd deriving from a thin-walled low-fired pot recovered during soil sample processing from [1119], a minerogenic surface in the Phase 8 occupation in ST3. Not enough of the sherds survive to allow further comment on the original form of the vessels but they are distinct enough in composition and cross-section from the rest of the heat-affected clay assemblage to allow them to be identified as fragmentary pot sherds rather than a piece of daub or hearth lining.

The thumb pot is round in plan and has a semi-circular vertical cross-section with a plain but damaged rim. Although well-shaped, little care has been taken to mask finger-marks left during production. The fabric is lightly fired with yellow-brown oxidised surfaces and the rim of the pot has broken across crude angular rock fragments which may have been added to the clay as temper. Similar thumb pots, also sometimes referred to as pinch pots, are fairly common on Iron Age sites throughout Scotland, and yet their function remains somewhat elusive. The Black Loch pot has no traces of any staining or residue in the interior to help shed light on this question of function. Its mode of production is similar to other Iron Age thumb pots such as that from the Howe, Orkney (Ross 1994: 237).

Many similar small Iron Age thumb pots, such as those from Dunagoil, Bute (Mann 1916: 65, pl 4:2; 1925, 59, pl 39), Dun Beag, Skye (Callander 1921: 126–127, fig 8: 4 & 5) and Foshigarry, North Uist (Beveridge & Callander 1931: 342, 349) were originally postulated

on discovery to be crucibles for use in non-ferrous metalworking. Yet a study of these as part of a wider programme of analysis of Scottish Iron Age crucibles argues against this on the basis of shape, fabric and the typical lack of vitrification or metallurgical residues (Heald 2005). This study determined that ‘crucibles’ of this form (*ibid*: Type 10) are typically made with thick walls and bases using gritty coarse fabrics with large inclusions up to 5 mm and are orange-brown in colour with no signs of vitrification or general extensive heating. The thickness of the walls and the inclusion of coarse grits would limit the effectiveness of trying to heat any contents from the exterior and this factor alone mitigates against their use as a crucible. The thumb pots also have no functional attributes (pouring spout, shape) characteristic of a crucible. All are impractical for heating, pouring and preventing oxidation of the alloy and there are typically no visible metallic residues, nor any shown by x-radiography. This suggests that these objects played no part in the metalworking process and should be discounted as crucibles.

Like the Black Loch example, the thumb pots from Balloch Hill, Argyll (Yarrington 1982: 175–176, fig 12:303), Dornoch, Sutherland (McLaren 2021b), Dun Ardtreck, Skye (MacKie 2000: 381, illus 22: 47), Dun Cuier, Barra (Young 1956: 299, fig 13:22), Garry Iochdrach, North Uist (Beveridge & Callander 1932: 37, 42) and Gillies Hill, Stirlingshire (Barlow 1992: 131, fig 5.7) *inter alia*, do not appear to have been heavily fired and display no traces of metal products. Grey staining on the inside of examples from Dunagoil and Ghegan Rock near Seacliff, East Lothian (Laidlaw 1870: 376) suggests reducing conditions of some material, perhaps wax or oil for use in a lamp.

The thumb pot came from [241], a charcoal-rich spread which signals the beginning of the Episode 2 hearth-building activity over the footprint of ST2. This activity began almost immediately after the abandonment of ST2 in or by 415–390 cal BCE (95% probability). The intact condition of the thumb pot is noteworthy and its deliberate placement within the charcoal-rich spread prior to the construction of hearth [207] might suggest some form of foundation deposit. Its placement is reminiscent of the probable deliberate placement of the triangular crucible (SF210) amongst the sub-floor timbers of ST3.

### 15.2.3 Catalogue

*SF13*: Body sherd. Single body sherd from a coarse handmade ceramic vessel, only the external surface of the sherd survives; the opposing internal face has been lost, exposing the dark grey organic rich core of the sherd. Surviving surface is light buff in colour, hand smoothed when wet. The fabric is fairly fine silty clay with frequent natural quartzite flecks and frequent (+ 50%) fine organic inclusions



SF79



Figure 15.8. Thumb pot SF79.

which has been poorly fired. No diagnostic features of the sherd survive to allow comment on form or date. Remaining L 35.5 mm, W 31.5 mm, T 9 mm; 6.6g. Context 018.

*SF79*: Thumb pot. Substantially complete small handmade hemispherical ceramic bowl with rounded base, upright upper body and plain rim. Approximately 1/3 of the rim has been lost; spalls have detached from areas where angular grits protrude. The exterior of the pot is gently faceted from finger-shaping during production but the surface has been smoothed when wet to finish. The interior hollow has been produced by inserting the thumbs into the middle of the ball of raw clay creating a steep sided but round-based hollow 28 mm in diameter and 21 mm deep. The fabric is a fine clay with occasional (15%) angular mixed grits (approximately 10 mm diameter) which has fired moderately hard and is oxidised. No residues or

sooting are visible on the exterior or interior of the pot. D 43.5–47.5 mm, H 32 mm, T 8.5 mm; 51.5g. Context [241]. *RT*: Body sherd. Single, heavily weathered body sherd, possibly deriving from a thin-walled low-fired pot. The fabric is a fine clay with no obvious inclusions or temper, soft fired, and incompletely oxidised (orange-beige exterior surface, mid-grey/ brown core and internal surface). Remaining L 12 mm, W 11.5 mm, T 6.5 mm; 1.1 g. Context [1119].

#### 15.2.4 Heat-affected clay

A total of 6.1 kg of heat-affected clay fragments were recovered from 33 contexts across the excavated area (Table 15.9). The vast majority consists of amorphous fractured fragments, displaying various levels of weathering and abrasion. Usually, no original surfaces survive. On the basis of macroscopic examination (no thin-section analysis was conducted) the fabric appears

quite consistent across the assemblage, comprising a fairly fine to moderately coarse clay, either untempered or with small quantities of added crushed angular grits. The inclusion of organics within the clay is rare but was noted on a number of pieces, comprising mostly grasses or rush stem fragments. In addition, organic impressions were noted on a small number of individual pieces, including two pieces from [1156] which have clear impressions of bracken leaves on one face.

The heat-affected clay predominantly derives from contexts associated with the basal surfaces of hearths or deposits of hearth debris and are probably broken up fragments of baked hearth lining, although fragments of fired clay used to construct the superstructure of domed oven structures is also noted. A more detailed breakdown by episode, structure and phase, is available in the site archive.

### 15.3 The worked antler and bone

*Dawn McLaren*

Despite the extensive excavations at BLoM, fragments of only two worked bone objects were recovered. These consist of two re-joining fragments of an incomplete long-handled antler comb (SF188) and three non-joining fragments of an incomplete notched rib implement (SF230 and SF231) (Figure 15.9)

The three fragments of the notched rib implement (SF230 and SF231) were all recovered from the Phase 2 active floor surface [1153] within ST3. Although the object is substantially complete the fragments no longer join. This is due in part to post-depositional distortion but also because of a ragged tear mid-length which probably occurred prior to deposition, resulting in the loss of the middle portion of the object. The original length of the object is unknown but it must have been at least 143 mm in length.

The object has been made from a section of a large mammal rib bone (zones 2 and 3; Dobney & Riley 1988) which has been trimmed at both ends to create squared terminals; the curvature of the bone is largely natural but may have been exacerbated by its use. A small U-shaped notch has been cut into both long edges, about 10 mm from the squared ends. Examination using a low-powered binocular microscope has shown that three out of four are fairly fresh in condition. In contrast, one notch is asymmetrically worn in the interior as the result of repeated rubbing which has caused the notch to expand into a wider V-shaped facet. The abrasion is angled toward the inner concave face of the bone. Immediately below the notches at both ends on the concave face are patches of smoothing and polish caused by the bone rubbing against another material. The edges of the wear are not well defined but it has caused a dished facet to be worn into the bone surface at one end only.

Structure	Episode	Weight (g)	Summary
ST1	Episode 1	3698	Mostly amorphous or angular fractured fragments deriving from possible flooring material (Phase 1, context 018) and packing around Hearths 2 and 3 (Phase 2 & 3, contexts 004, 005, 019, 037)
ST2	Episode 1	1053.8	Hearth lining or clay packing around Hearths 2 (contexts 218, 242, 255) and 3 (context 256). Fragments from Phase 2, context 256 display evidence of smoothing when wet
ST3	Episode 2	534.82	Small, fractured and weathered fragments of fired clay, mostly deriving from hearths or deposits of hearth debris (Phase 3, context 1762; Phase 4, context 1751; Phase 5, contexts 1156, 1174, 1735, 1736; Phase 7, context 1731; Phase 8, context 1120)
ST4	Episode 2	31.4	Fractured fragments, including slightly vitrified pieces from (context 19005); small degraded fragment, probably trample, within final floor layer (context 1003)
ST6	Episode 2	27.3	Poorly preserved and friable pieces, all probably deriving from the degraded superstructures of Ovens 1 and 2 (contexts 628, 657, 658)
Trackway	Episode 3	5.9	Possible trampled fragments of heat-affected clay incorporating plant matter and charcoal amongst metallating over trackway (context 18002)
Rampart 2	Episode 3	1.2	Residual weathered fragments (contexts 621 and 723)
Palisade 3	Episode 3	3.6	Residual weathered fragments incorporated within post-hole (context 624)
Post-ST2	Episode 2-3	2	Residual weathered fragments within occupation debris (219)
Post-ST2	Episode 2-3	785.4	Weathered and amorphous fragments including fragments associated with hearths (contexts 210 and 237), a flat stone feature (context 216) and the B-horizon covering the site (context 202)
Trench 6	Episode 2-3	0.61	Residual weathered fragments (contexts 611 and 631)

Table 15.9. Summary of heat-affected clay fragments.

The use of this object is rather enigmatic but a few parallels can be found amongst the Scottish Iron Age/ Early Historic corpus. A similar item, made of antler, and with arrow-shaped rather than squared ends, was found at Dùn An Fheurian, Gallanach, Argyll (Ritchie 1971:103, fig 4:3). This example was identified by Dr D V Clarke as a possible scraping implement; a taut thong might be tied to the notches at both ends, bowing the antler and allowing the edge to be used as a blade (*ibid*). It too had broken

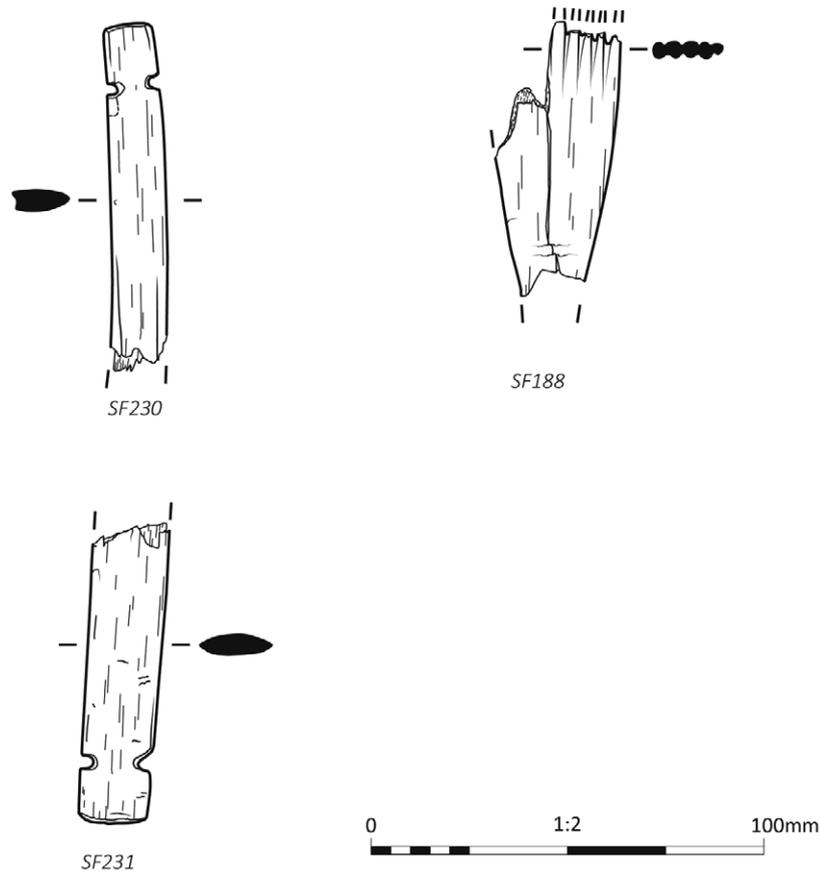


Figure 15.9. Fragments of notched implement SF230 & SF231; comb SF188.

across the middle, presumably during use. A miniature bone item of the same form was found at Freswick Sands Broch, Caithness (*ibid*: 103; NMS: X.GA 755). It is difficult to see how the BLoM implement could have functioned in a similar way to the Dùn an Fheurain example due to its size and proportions. A further item, similar in appearance but not in interpretation due to the inflexibility of the bone used, comes from Scalloway Broch, Shetland (Smith 1998: 164–165, fig 106:2). This consists of a flat thin rectangular plate or strip of whalebone, curving along its length, with a worn rounded end cut into at opposing sides of the long edge with semi-circular notches; the opposite end appears broken. The notches on the Scalloway example have been interpreted as partial perforations for use with bone or wooden pegs and is thought to be a fitting of some kind rather than an implement.

Interpretation as a scraper is certainly possible for the BLoM example and would explain the wear in at least one of the notches as well as the shearing of the bone across the area of maximum strain. Yet, it bears no obvious evidence of smoothing, rubbing or abrasion on the long edges of the bone as would be expected if this was used as a blade for scraping. Instead, wear is confined to the ends and specifically to one notch and an area of rubbing below the notches on the concave face. This suggests an

alternative use. One possibility is as a bow for a bow drill. A circular-sectioned wooden shaft or spindle bearing a drill tip (presumably of metal) at the base could be rotated rapidly in a vertical position by looping a thong or sinew around the middle of the shaft, the thong held taut at either side by stretching it between two ends of a pliable long strip, which would bend through the tension exerted. The bow, typically made from wood, would be used as a handle set perpendicular to the shaft and moved back and forth to rotate the shaft and with pressure applied from above. A pad of some kind, often stone (Ilan 2016) could be placed between the top of the shaft and the user's hand to enable the shaft to rotate freely whilst protecting the user's palm. This same type of bow drill could also be used as a fire-starter with a simple wooden shaft and a notched base board. Here the rotating tip would cause friction between the two wooden surfaces, charring the wood and creating dust and embers which could be nurtured into a flame. Although the use of bone as opposed to wood to make the bow is unusual it remains a possibility, a hypothesis that is strengthened by the evidence of craft activities taking place within ST3 and, specifically, its recovery alongside a number of well-preserved puffballs which have historically been used as tinder for fire-lighting (Chapter 11.5.7.1). Other possible interpretations for this object include use

as a net gauge for making nets (MacGregor 1985, 157-8). Dendrochronological analysis of the ST3 timbers suggests that use of this structure and the deposition of this object could span only about 16 years, sometime between *circa* 400 BCE and around *circa* 360 BCE.

The second worked item is an incomplete antler long-handled comb (SF188) surviving in two re-joining fragments. This was recovered from [709] in the core of Rampart 2 into which deposits of hearth debris appear to have been incorporated during its construction. It is probable that the comb was burnt on the hearth, perhaps after breakage during use and incidentally incorporated in the rampart bank within one of these dumps of waste.

The comb has been made from a flat plate of antler, probably removed from the surface of the branch of the antler rather than a tine based on the lack of curvature across the short axis of the comb (MacGregor 1985). Only the head of the comb survives, and all teeth have been lost. Stumps of five remain with probably a further five or six from the lost portion. Looking at the stubs of the teeth in cross-section, it appears as though the teeth were cut from both sides but were slightly off-set, so rather than being square or circular in cross-section they appear almost figure-of-eight. The reasons for this are unclear. It does not appear to be a result of atypical wear but rather that the teeth were produced by cutting with a knife from each face rather than the more typical use of a saw. Areas of wear between the two outermost remaining teeth stubs indicate that the comb had seen use before it was damaged and burnt. Unfortunately, the loss of both the teeth and the butt makes it very difficult to fit the comb into established typologies (eg Tuohy 1999).

The comb fragments that do survive suggest it was originally a fairly slender and delicate example, the head contracting strongly towards the butt but with slightly convex long edges. The width of the handle at the point of breakage, just forward of the butt is only 17 mm and the comb may only have been around 140 mm in length in its intact condition. The thinness of the antler (max 5 mm) adds to the impression that this was a delicate implement not designed for heavy use. This is significant if we consider the possible functions of these implements. The function of long-handled bone combs has been much debated and is still contested (eg Coughtrey 1871; Henshall 1950; Hodder & Hedges 1977: 17; Coles 1987: 105–106; Tuohy 1999; Hunter et al 2013: 274; Stirling & Milek 2015). They were traditionally accepted as being used primarily for beating down the horizontal weft threads on a warp-weighted loom (Henshall 1950: 146). Claims that they will not have been effective in this process led to suggestions that they were used as hair ornaments (Hodder & Hedges 1977: 99), with alternative theories including uses in de-fleshing hides and preparing fibres for fabric production. Following experimental work and use-wear analysis (Tuohy 1999),

it has been suggested instead that they may have been used in braiding or in the weaving of decorative borders, or potentially other forms of craft, such as wool combing, forming multi-functional textile production tools (*ibid*: 97). The delicate design and the small and thin form of the BLoM comb surely rules out the more heavy-duty tasks just described. An association with braiding or weaving of fine textiles appears more plausible in this instance, particularly in light of the recovery of the wooden baton from the site which may be part of a tapestry or embroidery frame.

The discovery of the comb fragments from BLoM is significant, not only due to their well-stratified and dated context, but also to the rarity of long-handled combs from Iron Age sites in southern Scotland of which only a few examples are known (eg Borness Cave, Kirkcudbrightshire, Broxmouth, East Lothian and The Dod, Roxburghshire (Corrie et al 1874: pl XIX; Smith 1982: 133; Hunter et al 2013: 273–276).

Despite the relatively high representation of artefacts of organic materials (wood and leather) from Iron Age contexts in Wigtownshire, bone and antler artefacts are exceptionally rare owing to the acidic conditions (Hunter et al 2018: 198, table 20), the finds from BLoM more than doubling the existing corpus for the region.

#### 15.3.1 Catalogue

*SF188*: Head and shaft of a long-handled comb fragment. Two joining fragments (refitted during conservation) of a thin, undecorated long-handled antler comb, burnt and split into two halves down the remaining length of the implement, suffering the loss of the handle and probably five teeth, assuming a symmetric form. The comb appears to be fairly small and elegant in shape, produced from a thin plate of antler probably cut from the beam, being widest at the head, the shaft tapering along its surviving length towards the terminal, now lost. The shanks of only five teeth survive (av. D 2.5 mm; longest surviving L 2.5 mm), each of which taper towards narrow points, broken and now lost. In cross-section the teeth appear to be slightly offset and have been made from opposing faces by cutting with a knife rather than sawn and are over-cut in places. Burnt and incomplete. Remaining L 67.7 mm, RW 29.5 mm, T 4.8 mm. Mass 6.3g. Context [709].

*SF230*: Possible bow drill bow fragment. Wide, squared, notched head cut into one end of a large mammal rib bone (zone 3; Dobney & Riley 1988), broken towards mid-length but probably originally re-joined with SF231. The natural rounded end of the body of the rib has been cut off, squared and smoothed, creating rounded corners; a rectangular flake has pared off from the tip on the exterior convex face. Approximately 12 mm from the squared head, two U-shaped notches (W 3 mm) have been cut into opposing sides of the long edge of the bone. One is distinctly U-shaped and narrow and appears fresh with no signs of wear. The

opposite notch is worn asymmetrically and the lower edge has expanded in width to 6 mm. Like SF231, the curvature and shape of the fragment is natural. The smooth concave face is natural but a distinct patch of polish (11.5 × 24.5 mm) is present immediately below the U-shaped (unworn) notch parallel to long edge of the bone. Surfaces are stained dark brown from the depositional context. Surviving L 76 mm, W 17.6–19.5 mm, T 4.2–7 mm. Context [1153].

*SF231*: Possible bow drill bow fragment. Narrow, thick, rectangular-sectioned notched head cut into the body of a large mammal rib bone (zone 2; Dobney & Riley 1988). Natural head, neck and tubercle of the rib has been removed and bone has torn (post-deposition) at opposite end but would originally have joined with SF230. Approx. 11 mm from squared head, a V-shaped notch (W 3.5 mm) has been cut into opposing long edges, the interior of each appears rough and uneven. The curvature and shape of the bone are natural but the interior concave face has a discrete area of polish and smoothing from rubbing, particularly concentrated 19 mm from the notches towards the centre of the bone where the surface has become dished through wear. Under magnification, fine linear and diagonal striations are visible in conjunction with this polish, concentrating parallel and adjacent to one long edge. The bone is stained a dark brown from depositional context. A second detached and ragged piece of bone is also present (L 31.5, W 15 mm) which undoubtedly once joined the broken end of this fragment but is now distorted. Surviving L 87 mm, W 11.9–15 mm, T 6–7.2 mm. Context [1153].

## 15.4 The wooden artefacts

Anne Crone

A remarkably small assemblage of wooden artefacts was retrieved from BLoM mostly from only two contexts, the midden [800] and flooring deposits [1144] and [1153/1743] in ST3 (Table 15.10). A worked timber, SF310, found re-used in a surface post-dating ST4 and a large structural peg found along the trackway, is also included here. The artefacts are presented below by episode and context.

### 15.4.1 Episode 1; the midden

Four wooden artefacts were retrieved from the midden, the most significant of which is the bowl.

#### 15.4.1.1 SF219; the bowl

The bowl was found in the ditch terminal and was probably substantially intact when deposited. It may have been thrown away because it was broken, but no evidence for pre-depositional breaks or damage has been observed, suggesting that it had been deliberately deposited in the ditch. It had been almost completely flattened (Figure 15.10) so that the two ‘sides’ were separated by only *circa* 20 mm

Context	SF no.	Description	Species
<i>Episode 1 midden</i>			
800	215	withy rope	Hazel
800	218C	square peg	Ash
800	219	decorated bowl	Maloideae cf pirus/malus
800	227	roll of birch bark	Birch
<i>Episode 1 Trackway</i>			
18023	280	large structural peg	Oak
<i>Episode 2 ST3</i>			
1144	221	adze haft?	Alder
1153	237	baton-like object	Yew
1743	293	platter/tray fragments	Ash
1743	298	turning waster	Maloideae cf pirus/malus
1743	299	roll of birch bark	Birch
1743	302	dowel/peg	Oak
1743	308	woven withy circlet	Hazel
<i>Episode 3 Trackway?</i>			
19004	310	timber with slotted face	Willow

Table 15.10. The wooden artefacts.

of the peaty matrix, and this has resulted in substantial distortion to the profile. Nonetheless, at least 90% of the bowl survives as a single intact fragment retaining both rim and base, and photogrammetry has enabled the profile and size to be reconstructed (Figure 15.11). A handful of smaller fragments were also retrieved, the largest three of which fit together and clearly adjoin one edge of the main fragment.

The bowl has been fashioned from a log of Maloideae, a sub-family which in Scotland could include apple (*Pirus sylvestris*), hawthorn (*Crataegus* sp.) and rowan (*Sorbus aucuparia*) (Hather 2000: 88–89). It is not possible to microscopically distinguish which of these species has been used but their use in modern lathe-turning might identify the likeliest candidate. All three species have been used; anecdotal references suggest that apple is well-favoured whereas hawthorn splits easily and rowan is described as hard and heavy to turn.

The grain pattern on the outer surface of the vessel gives the best indication of how it was converted from the log. The circular ring-pattern on opposite sides of the bowl indicates that the vessel has been converted from a full trunk, with the pith running parallel with the rim, entering and leaving the bowl through the central decorative band (Figure 15.11). This is unusual for face turning as typically a log will be halved and the pith removed to prevent



10 cm

Figure 15.10. Top: the bowl SF219 as it was found; the rim is at the top and the very deformed base at the bottom. The burnished surface is very clear. Middle: the single round hole. Bottom: the paired holes seen just under the rim on the fragment to the right in the top image.

differential drying of the green wood which can cause irregular shrinkage and splits. It may have been converted in this manner because the girth of the trunk available from the species selected was too small to allow a half-log to be used. As the pith passes through the bowl at approximately 75 mm from the base the original log would have had to be at least 150 mm in diameter. All the species mentioned above could produce boles of this diameter.

The vessel takes the form of an open rimmed bowl *circa* 180 mm in diameter at the rim and 130 mm high. Below the slightly lipped rim the bowl swells out slightly before curving gracefully down to a narrow pedestal, 6 mm high and *circa* 90 mm in diameter at the top, widening out to *circa* 100 mm diameter at the base. The walls of the bowl are only 5.7 mm thick at the rim but they are thicker around the belly; 7.8 mm at the upper decorative band, 10.3 mm at the second band, before narrowing down to 6 mm as the bowl curves inwards. This variance of only 4.3 mm demonstrates the exceptional skill of the turner, to be able to maintain such a minimal variance in thickness while the bowl sides taper and narrow. The base is also finely turned, being 7 mm thick at the exterior and tapering to only 4.6 mm at the centre.

The vessel was lathe-turned but there are few turning marks visible on the exterior. They are only just visible beneath the rim where they occur as very fine grooves, created with either a chisel or turning hook, running parallel with the rim. Judder marks where the chisel has skipped over the surface were visible just under the rim too, as well as in one spot just above the base. The interior surface is lined with fine grooves which become deeper and wider around the belly of the bowl, presumably from the difficulties of angling the tools into the space. The base is very fragmentary and distorted. A shallow chisel or gouge mark 7 mm wide lies some 15 mm in from and concentric with the perimeter of the base but otherwise the base of the bowl is smooth. There is no evidence, in the form of toolmarks, for the removal of the cores of wood which would have kept the bowl roughout in place between the mandrels during the production of the bowl.

The surface of the bowl is remarkably smooth and shiny (Figure 15.10), an effect that could have been achieved by burnishing with fine sand or shavings before it was taken off the lathe, and probably prior to decoration. This would explain the lack of turning marks on the exterior surface.

A belt of decoration encircles the vessel (Figure 15.11). The belt is 68 mm wide and begins some 29 mm below the rim. The patterning is contained within two bands, an upper one consisting of two incised lines within which are a row of dots, while the lower band consists of a single incised line, with traces of a second just below it. Within these bands are two decorative blocks which are repeated twice round the bowl. All the decoration has been executed as a row of dots contained within a pair of incised lines. The first block consists of a tip-to-tip lozenge pattern which runs parallel to the rim and is contained within two bands of paired lines. The lozenges consist of single outer lines within which there are multiple rows of dots; in one panel the lozenges are smaller and contain three rows of dots, while in the other panel they are wider and contain five rows of dots. An oval dot marks the top and bottom of each lozenge. The second block consists of stepped zig-zag lines which run perpendicular/ parallel/

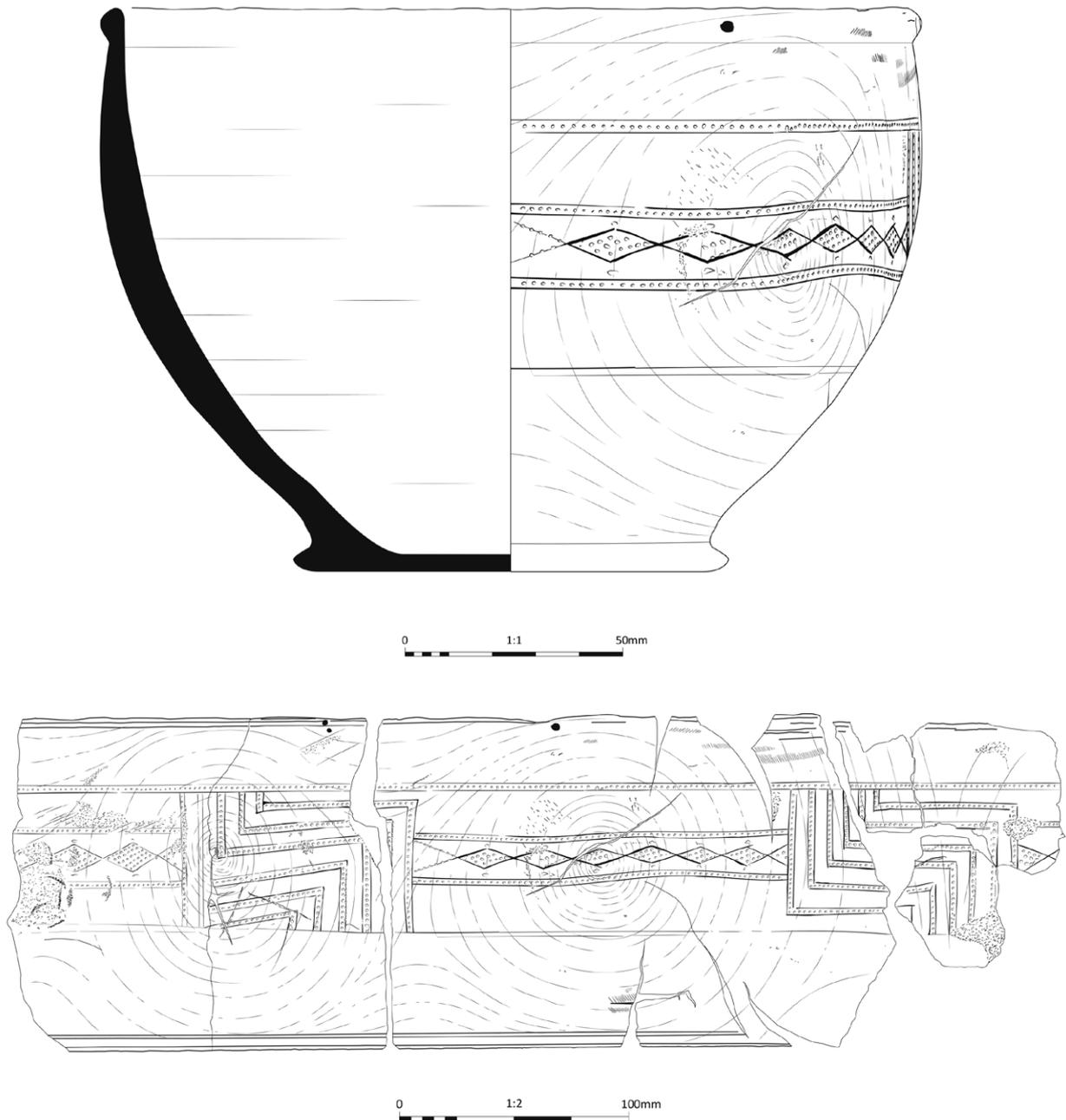


Figure 15.11. The bowl SF219; reconstruction and unrolled elevation showing full extent of decoration.

perpendicular to the rim, a pattern which brings to mind a Greek key design. In one panel the horizontal lines are consistently parallel with the rim but in the other block they slope down towards the base, although they remain parallel with each other.

The lines were created with a knife or blade, while the holes were created with a fine pointed tool, such as an awl. As with the turning of the vessel, the decoration has been executed with great skill and consistency. A slip of the blade while creating a vertical line of a zig zag can be

observed below the bottom band; the bowl tapers to the narrower pedestal here which can make blade slips easier as the surface falls away beneath the blade. In two areas what should be incised lines appear as a row of dots; this perhaps shows how the pattern was initially marked out.

The rim of the bowl is perforated by some small holes. These consist of a single round hole 3.5 mm in diameter which penetrates the wall of the bowl at a downward angle, and approximately 80 mm further along the rim is a pair of rectilinear holes, 1 mm and 1.5 mm wide and lying

some 3.5 mm apart. These could have been made by a metal staple, of the type used to repair wooden bowls (Crone forthcoming b) but the bowl was not cracked at this point.

## Discussion

There are currently no parallels for the Black Loch bowl in the British Isles, in terms of its morphology, decoration and the species used. Given its unique characteristics it was initially thought that it might have been manufactured elsewhere but the discovery of a turning waster from the Episode 2 ST3 (see below) confirms that lathe-turning was taking place on the settlement. A small alder disc of end-waste from Oakbank crannog (Sands 1997: 58; *British Archaeology* 1997: 4) also testifies to the manufacture of face-turned vessels elsewhere in Scotland in the mid-1st millennium BCE.

In Scotland there is now a corpus of 15 wooden bowls of later prehistoric date. The Black Loch bowl is the earliest in this corpus, the majority of the dated examples dating to the 1st to 4th centuries CE (Crone forthcoming b). Where there is enough of the vessel surviving to be able to determine profile the Scottish bowls are mostly shallow and round-bottomed, with either distinctive vertical looped handles, pierced horizontal handles and/ or lugs. Of nine examples where the wood species has been identified, six are alder and two are birch.

In Ireland round-bottomed vessels also appear to be the preferred style during the Iron Age. Large cauldron-like containers are known from the 2nd half of the 1st millennium BCE from Ireland, with handles and profiles that suggest they were modelled on metal cauldrons (Earwood 1993: 45–49). There is also a corpus of round-bottomed bowls which are virtually identical to those in the Scottish corpus, displaying the same vertical looped and pierced horizontal handles; several of these bowls have produced radiocarbon dates spanning the 2nd century BCE to the 2nd century CE (*ibid*: 62–67). The wood used to make most of these bowls is unknown but a more recent discovery, of a round-bottomed bowl from Killow, Co. Clare was identified as ash (Taylor 2006: 7–8); this yielded a radiocarbon date of 777–407 cal BCE (2461±32; UB-6287). The Altartate cauldron (see below) was made of poplar with yew handles (Earwood 1993: 265).

In England the corpus of Iron Age bowls is limited and consists of an assemblage of four examples from Glastonbury Lake Village, the construction and occupation of which probably starts between 210–150 BCE and ends between 80–20 BCE (Hill et al 2019: 14), and two vessels from the cistern on the Breiddin hillfort in Powys, Wales, which has produced a basal date of 507–114 cal BCE (HAR-1291, Britnell & Earwood 1991: 170). Only two of the vessels from Glastonbury survive but they were described in detail by one of the excavators (Bulleid 1911) who observed fine striae on the interiors of all the vessels and concluded that

they were all lathe-turned. Pugsley (2003) has queried this description, arguing that the size (300 mm & 385 mm) and profile (tub-like with straight sides and flat bases) of two of the vessels makes them unlikely to have been turned. However, of the two surviving vessels one is a much smaller version of the tub-like profile and displays turning marks on the interior (Earwood 1988, 85). The fourth bowl in this assemblage is quite different in profile, being a small, round-bodied bowl with everted rim, with an estimated diameter of 125 mm. Only fragments survive so the profile of the base is unknown. However, it is very similar to one of the bowls from the Breiddin which is globular with a flat base and has an estimated rim diameter of 135 mm (Britnell & Earwood 1991: 170). The other bowl from the Breiddin is a large open bowl with a flat base and projecting rim, 470 mm in diameter (Britnell & Earwood 1991: 166). This open bowl had clearly been carved but it was impossible to determine whether the globular bowl was carved or turned. Thus, although small the English corpus of wooden bowls displays a remarkable diversity of profile. The species of only one of the vessels is known; the open bowl from the Breiddin was made of alder.

Very few of the vessels mentioned above were decorated. Earwood (1993: 60) maintains that in the British Isles ‘...decoration of wooden artefacts is unusual until the late 1st millennium AD’. Almost all the known examples of decorated wooden vessels come from one site, Glastonbury Lake Village. The decoration consists of incised linear patterns with areas of hatching but the designs vary with type of container; the bowls display the curvilinear styles of La Tene design while the bentwood boxes and the carved composite tubs display a very geometric design (Earwood 1988). The designs are all replicated on pottery from the site (*ibid*). Only one other wooden vessel from the British Isles displays decoration: that on the wooden cauldron from Altartate, Co Monaghan consists of a curvilinear design executed in parallel lines, which are picked out by dots a little like the Black Loch decoration (Mahr 1934). This design is also thought to be a native translation of La Tene art, while the dots are thought to be skeuomorphs of the rivets used in the metal cauldrons of which the wooden version is a copy (*ibid*). The design on the BLoM bowl is geometric and has been executed as a series of parallel lines but the comparison ends there. The closest parallels for the BLoM design have been found at Danebury, Hampshire. Here the decoration of the *Ceramic Phase 7* pottery was executed using lines and dots in a combination of geometric motifs in horizontal bands around the pots (Cunliffe 1984b: 310–313). Some of the most comparable designs were those which employed diagonal and zig-zag lines creating triangles which were infilled with dots (Figure 15.12). *Ceramic Phase 7* has since been equated with Period 5–6 which is dated to 270–50 BCE (Cunliffe 2013a), so the ceramics

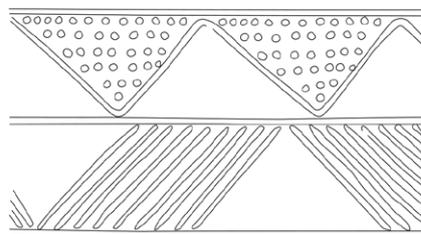
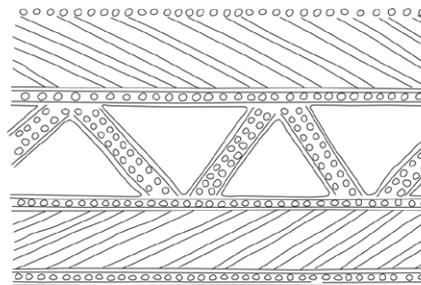
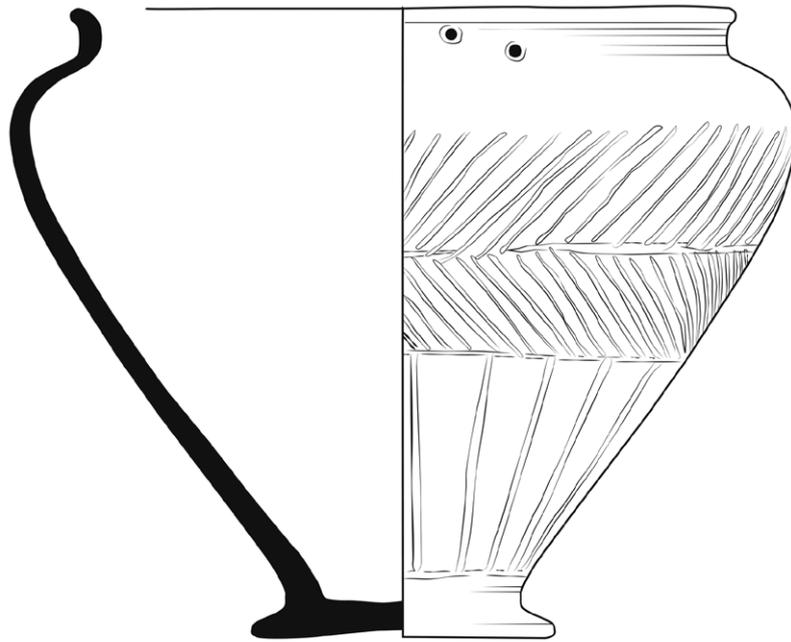


Figure 15.12. Top: ceramic jar 722 from Danebury. Bottom: *Ceramic Phase 7* designs from Danebury (after Cunliffe 1984b).

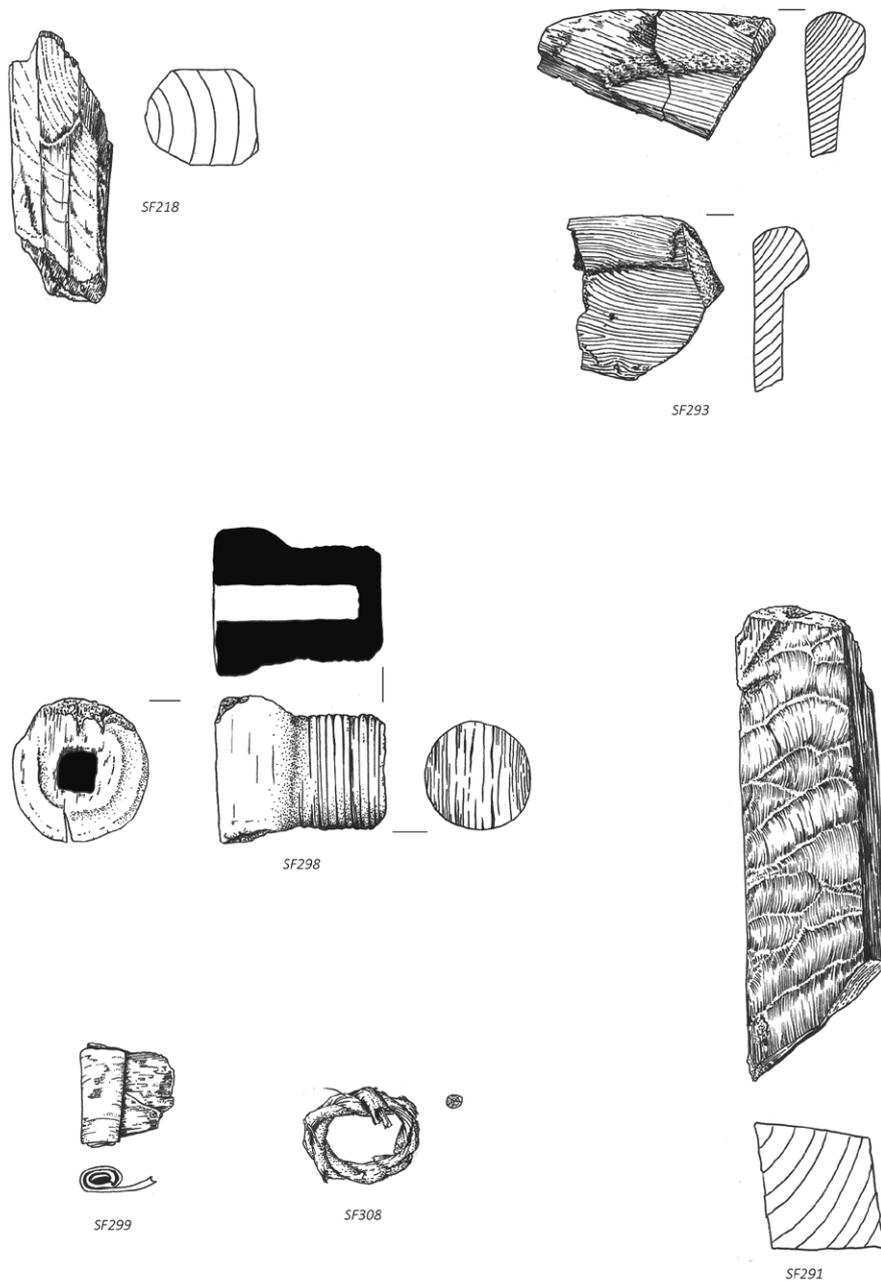


Figure 15.13. Wooden artefacts: peg SF218/C, platter fragments SF293, waste core SF298, birch bark roll SF299, with circllet SF308 & offcut SF291.

were manufactured a few centuries after the BLoM bowl. A pattern also reminiscent of a Greek key design has been noted on a tub-footed ceramic urn (of roughly mid-1st millennium BCE date) from Denmark which has been executed as a series of parallel lines within which lies a line of dots (Liversage 1980: 40, 193).

The small circular hole just below the rim is intriguing. Similarly placed holes have been found on other late prehistoric vessels. The Castle Law, Abernethy vessel, NMS X.GP41 and the Loch Laggan vessel, NMS HY276.1 both have a single hole, 3 mm in diameter which penetrates the thickness of the vessel just below the rim (Crone forthcoming b). A slightly larger hole, 6 mm in diameter is also visible in the same position on the flat-bottomed bowl from the Breidden hillfort, Wales (Britnell & Earwood 1991: 166). It is presumed that the bowls were suspended by string loops threaded through the holes. Interestingly, 722, one of the wheel-made ceramic jars from Danebury, which perhaps coincidentally displays a profile very similar to that of SF219 in terms of the narrow pedestal base, also has two holes just below the rim (Cunliffe 1984b: 328 & see Figure 15.12).

The taphonomy of the bowl is worthy of note. As described above it was found virtually intact but completely flattened in a midden-like deposit within the ditch terminal. A large quantity of willow leaves was found in the bowl and in the sediments around it (Chapter 11.5.7.2) and as willow was not commonly used on the settlement, either for structural purposes or for fuel (Chapter 14.2) it seems likely that the willow leaves were purposefully collected and deposited with the bowl. The bowl may therefore have been deliberately deposited rather than discarded in the ditch terminal (see Chapter 15.10.6 for further discussion).

Comparisons with the corpus of later prehistoric wooden bowls in the British Isles has not revealed any parallels for the Black Loch bowl in terms of morphology, decoration and the species used. Some types of wooden vessel appear to have been copies of ceramic and metal containers (Earwood 1993: 46, 61, 64; Bamforth 2024: 560) but there are no obvious parallels for the Black Loch bowl amongst contemporary ceramic or metal assemblages. However, the corpus of wooden bowls is remarkably small so the lack of comparanda is probably an issue of survival.

## 15.4.2 Other wooden objects from the midden

### 15.4.2.1 SF215; withy rope

This object consists of three hazel withies up to 10 mm in diameter which have been twisted along their lengths and then coiled around each other to form a loop. The object survives to a length of 185 mm and is 60 mm across at the widest point of the loop. One of the withies is tucked

through the loop and under it, and its end has been pared down to a roughly rectangular cross-section only 4 mm in thickness.

### 15.4.2.2 SF218/C; peg (Figure 15.13)

SF218/C has been fashioned like a dowel (ie the growth rings run across its width) from a piece of ash. It survives to a length of 100 mm and is roughly rectangular, 37 × 40 mm. It has been pared to shape and thin facets run down its length on all surfaces.

### 15.4.2.3 SF227; birch bark roll

This find contained four fragments of birch bark, three of which were curled up at the edges, as though they had formerly been rolled up. The largest piece was 34 mm wide with an extended length of 80 mm.

## 15.4.3 Episode 1; the trackway

### 15.4.3.1 SF280 [18023] – fenceline along track; structural peg

This is a very large peg in comparison to SF218 and SF302 and may have served as part of the locking mechanism of the gate structure over the threshold timber. It is 195 mm long but the tip is missing. It tapers from 82 × 64 mm at its widest just below the top to 70 × 57 mm at the broken end and if the trajectory of the taper were extended the peg could originally have been over 300 mm long. It has been fashioned from a quarter-log of oak and is roughly hexagonal in cross-section with wide facets forming the sides. The top of the peg is shaped by a series of facets some 35 mm deep which reduces it to a flat central surface roughly 33 mm in diameter. This surface is rough and dented, as though it has been hammered.

## 15.4.4 Episode 2: ST3 floor deposits

All but one of the artefacts came from the Phase 2–3 flooring deposits [1743/1153]. The adze haft SF221 was found in the Phase 6 flooring deposit [1144].

The three most significant artefacts from the flooring deposit [1743/1153] are SF237, a baton-like object; SF293, fragments of a possible plate or tray; and SF298, a lathe-turning waste core.

### 15.4.4.1 SF237 [1153]; the baton (Figure 15.14)

This object is long and cylindrical in form, so in the absence of an obvious function, it is referred to here as a baton. It has been fashioned from a quarter billet of yew (*Taxus baccata*) and has been very finely crafted by spindle-turning, with some knife finishing. A small facet is visible on the side of the distal terminal (see below) which probably came from the cleaving of the original log into quarter billets. The baton was damaged during its discovery but must have

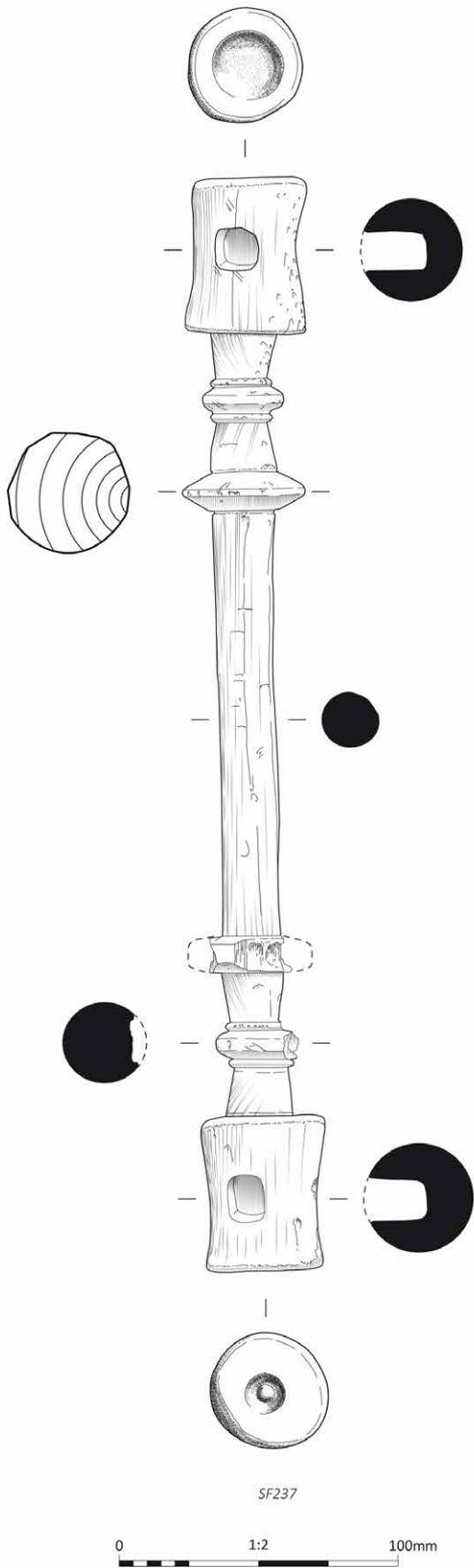


Figure 15.14. The baton SF237. The pre-conservation photograph shows the highly burnished surfaces of the baton.

been intact when it was initially deposited. It was slightly warped along its length, possibly from seasoning after manufacture.

The baton is 395 mm long. There are differences in design at each end of the baton so for clarity they will be referred to as the distal and proximal ends, although this does not signify a top or a bottom to the object. The main shaft is 20 mm in diameter and at either end are larger drum-like terminals with slightly concave sides; both are 56 mm in length but they vary slightly in diameter, the distal end expanding from 42 mm to 44 mm and at the proximal end from 42 mm to 45 mm. Just inside the terminals are a paired set of collars leaving a central shaft 152 mm long. This central shaft is very regular in diameter along its length, but the sections of shaft between the terminals and collars taper in diameter towards the outer collar.

The outermost of the paired collars at either end are similar in profile and size. They are 29 mm in diameter and 10 mm thick, with a rounded profile and defined on either side by smaller adjoining collars. The inner collars are relatively similar in size, 43 mm in diameter and 13 mm thick at the distal end, and 48 mm in diameter and 13 mm at the proximal end, but they are markedly different in profile. The distal collar has a convex profile tapering to a sharp but rounded edge, whereas the proximal collar is quite rectangular in profile with flat sides perpendicular to the shaft and a squared edge lying parallel with the shaft. The difference in the design of the collars is clearly deliberate and may have had a functional purpose, as the other symmetrical components demonstrate that the maker was certainly capable of achieving symmetry.

A roughly square hole with rounded corners had been carved into the same side of each terminal, midway along their lengths. The holes were roughly 13 mm by 16 mm across and penetrated the terminal to a depth of approximately 22 mm. They had probably been hollowed out with a chisel/ gouge with a knife used to round the tops. Although aligned on the same side, they are now very slightly offset probably due to the warping described above. These holes must have been intended to house secondary components and as such are key in identifying the function of the baton.

The overall morphology of the baton indicates that it has been spindle-turned but there is little evidence of the turning process. The only place where turning marks are evident are the flat surfaces of the larger collars, where very fine spiralling grooves can be seen. The spiralling demonstrates the maker engaging into the wood with a tool, possibly a chisel, as the object spins on the lathe. There are also some small knife marks on the inner faces of the terminals, where knife finishing may have been necessary to create the sharp right angle between terminal and shaft. The surface of the baton is remarkably smooth and shiny (Figure 15.14) which suggests that it has been sanded and burnished, and this

probably explains the lack of turning marks. The end faces of the terminals also seem to be charred or burnished, possibly for decorative purposes.

Two circular hollows in the end of either terminal also suggest spindle lathe manufacture, as these are where the wood would be suspended between two metal mandrels. However, the forms of these hollows differ; the hollow in the distal terminal is concave in profile, 22.45 mm in diameter and displays evidence of having been widened by a knife; the proximal indentation is concave but with a small convex protrusion in the centre and is only 14 mm in diameter. These differences could relate either to different styles of mandrel attachment during manufacture or to the function of the baton. Certainly, the knife shaping of the hollow in the distal terminal suggests post-manufacture modifications.

## Discussion

No parallels for this object have been found in the literature but many suggestions about its probable function have been forthcoming and some of these are worth considering. The key to the function of this object lies in the holes carved into the terminals which indicate that it must have been part of a composite object. It seems most probable that these housed rods or dowels which were aligned at right angles to the baton and were in turn housed at the other end in another component. Among the suggestions are that the baton was a component of a folding stool or a weaving frame, or even of a musical instrument such as lyre. None of these are testable but some can be more readily dismissed.

Folding stools of Bronze Age date have been found across Northern Europe, mainly in Denmark but with a few from Germany. The baton would have to be either the top or bottom horizontal bar because there is no central fixture present where the legs of the stool would have crossed and pivoted. The rods that fitted into the holes would thus have formed the legs; they would not have formed very strong legs as they would have been only 13 × 16 mm in cross-section but it is possible that the hole housed only the dowel of a thicker leg. However, there are no compression marks around the hole to suggest that this was the case. The seat could have been a fabric or leather strip slung from the central portion of the shaft where it was wrapped around and stitched onto itself, thus leaving no marks on the baton. However, this does not explain the asymmetry of the inner two collars, nor why one would restrict the width of the seat to the narrow central portion of the shaft which is only 152 mm. On balance, this suggestion does not seem practical.

The difference in design of the inner collars does suggest that the baton had a top and a bottom when in use. One possibility is that it was one of the side bars of a small handheld weaving frame, the missing rods forming the upper and lower sides, around which the warp was

bound. The central portion of the shaft is a suitable width to be easily gripped while the outer portions could have been where thread ends were secured. Morphologically, the baton closely resembles the shaft of a niddy-noddy, a tool for winding skeins of wool, which is often embellished with collars and/ or grooves defining the central holding position. Although it does not display any of the other vital features of a niddy-noddy and therefore cannot have operated as such, it may have functioned as some type of a two-part skein winder.

The key characteristics of the baton are that it has been skilfully fashioned, that it has been embellished, and that it has been made from a relatively rare species of wood, one that is favoured for decorative wood. This all suggests that the baton was a prized personal possession, although, as with the adze haft (see below) it is possible that the baton is a skeuomorph, made exclusively for deposition under the floors and embellished accordingly.

#### 15.4.4.2 SF293 [1743]; platter/ tray/ lid? (Figure 15.13)

This consists of three fragments, two of which conjoin, which come from the same object. This object is flat, circular with a raised rim around the edge. It has been fashioned from ash and converted from the log in such a way that the grain lies parallel with the rim; the alignment of the growth rings suggests that it could have been fashioned from a radially or tangentially cleft plank. The curvature of the fragments suggests that the original object would have been 360 mm in diameter. The fragments thus represent a small proportion of the original; the conjoined fragment is 85 mm at its widest and 45 mm deep, while the other is 50 mm wide and 57 mm deep. The underside of the base is completely flat but the upper side expands from 9–10 mm thick at the broken edge to 12 mm where it joins the rim. Apart from its flat base the rim is almost circular in cross-section; it stands 18 mm high and is 20 mm wide, broadening to 25 mm at the end of one fragment. There are no toolmarks visible on the fragments but the change in width along the rim makes it more likely that the object had been carved and not lathe-turned.

The flat circular nature of the object invites interpretation as a tray or platter. Fragments of an ash platter were found alongside the Iron Age trackway of Corlea 1, Ireland (dated to 148 BCE) (Raftery 1996: 242) and several other platters are known from Irish bogs (*ibid*: 266). The Corlea platter was similar in thickness to SF293 but it was oval in shape, concave in cross-section and without a distinct rim. The handled ash platter or scoop from Over Rig is similar to the profile of the Corlea platter and much smaller than the projected size of SF293 (Crone 2018a: 179–180).

SF293 could be a lid for a vessel, although these are generally flat, without the raised rim. A lathe-turned lid from Glastonbury (Bulleid 1911: 322) also displays a

globular rim but it differs from the BLoM object in that it also displays a projecting ridge which would have sat inside the neck of the vessel to provide a tight fit, and at 220 mm in diameter it was also significantly smaller. It remains feasible that the SF293 fragments are from a complex, non-circular object, the nature of which we can only speculate about.

#### 15.4.4.3 SF298 [1743]; lathe-turning waste core (Figure 15.13)

SF298 is a waste core produced during the manufacture of a vessel by lathe-turning. The parent vessel had been face-turned from a half-log of *Maloideae*, the same sub-family as that used to make the bowl (see above). The core is complete and is 60 mm high. It has been squashed by compression so at the top it is slightly oval in cross-section, 52 × 47 mm across; originally it was probably about 50 mm in diameter. The core is straight-sided but some 25 mm below the top it steps down in diameter to 40 mm. The upper section is relatively smooth but the lower section is encircled by deep grooves some 2–3 mm wide. The mandrel hole penetrates the core from the top to a depth of 45 mm. It is a roughly square hole, 14 × 16 mm and lies within a central depression, the surface of which appears to be scored with small cutmarks. A concave indentation 7 mm wide runs around the edges of the upper face; this is probably the mark of a small gouge. In contrast there are no toolmarks on the base of the core. The grain is clearly visible, suggesting that the core may have been simply levered or broken off the base of the vessel.

Most waste cores are generally conical or turnip-shaped (ie Barber 1981: figs 31–33; Morris 2000: 2153). As Morris (*ibid*) explains these shapes are produced when turning wide-mouthed bowls and cups with rounded profiles, where there is little constriction at the mouth for inserting tools to undercut the core as much as possible. It was easier to remove a core with a small attachment to the base of the bowl but it also increased the risk of the core breaking off before the turning was completed. The deep grooves around the bottom of SF298 were probably made because the angle of the cutting tool was restricted by the vessel rim and the turner was engaging the tool harder into the core in order to reduce its size. In Medieval York there were some cores with a similar profile to that of SF298 (*ibid*: 2152) and Morris suggests that those cores, with wider bases, represent efforts by the turner to reduce that risk (*ibid*: 2146). However, it would then have needed extra skill to remove them cleanly from the base of the bowl. Usually a single blow from a chisel would remove the core, leaving a flat scar on the base of the core (*ibid*: 2133); SF298 does not display any toolmarks on the base so it may have broken off by accident. We therefore cannot be certain that the height of the core reflects the final height of the parent vessel. At a minimum, allowing for the thickness of the base, the parent

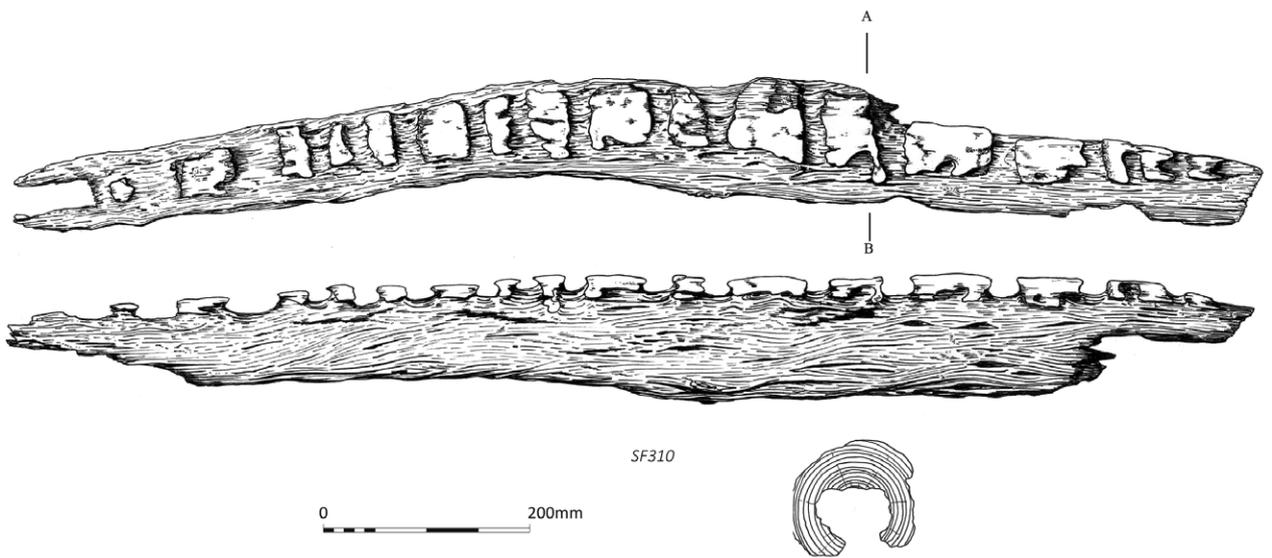
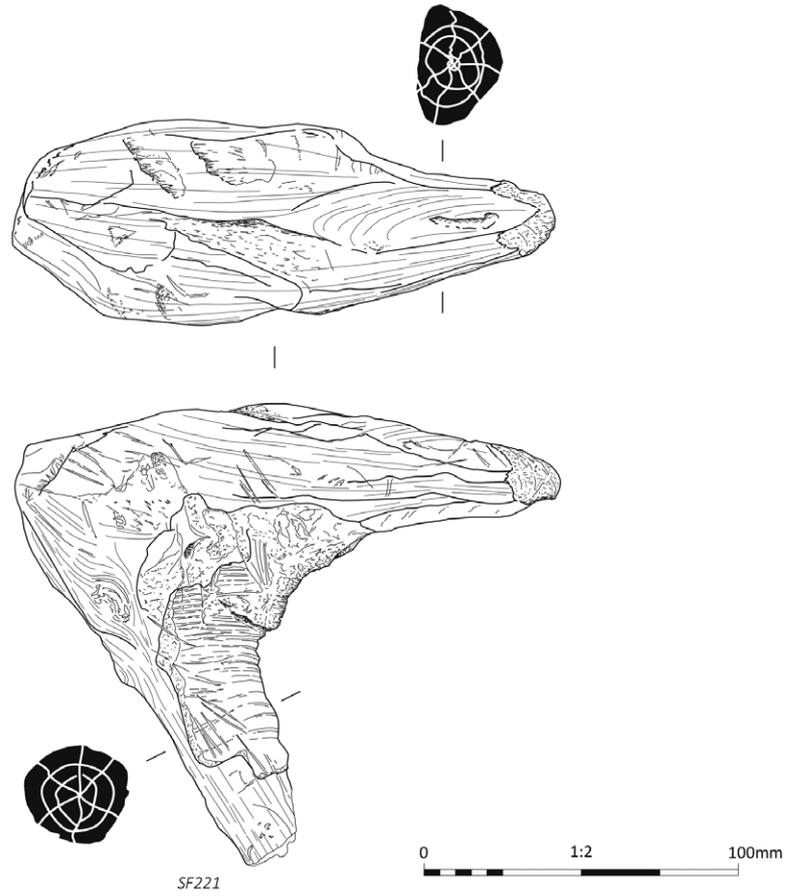


Figure 15.15. Wooden artefacts; adze haft/ foreshare SF221, slotted timber SF310.

vessel would probably have stood between 65 and 70 mm high but its profile cannot be determined by the core alone.

#### 15.4.5 Other wooden objects from [1743/1153]

##### 15.4.5.1 SF299 [1743]; birch bark roll (Figure 15.13)

This find consists of a single tightly coiled roll of birch bark 34 mm wide. The coil itself was 8 mm by 12 mm with an uncoiled extension making the whole fragment 29 mm long.

##### 15.4.5.2 SF302 [1743]; dowel

SF302 has been fashioned like a dowel from a cleft length of oak. It is complete and is 135 mm long. It is 24 mm in diameter and maintains the same dimension along its length. It has been finely finished so that all the surfaces are smooth and polished, except for the traces of some narrow longitudinal facets near the tip. The edges around the top of the peg have been neatly rounded off while the tip has been fashioned to a blunt end by small facets, cut in from the edges towards the centre, leaving a rough central stub where it has been broken off. There is no evidence of damage or compression on any of the surfaces to suggest that it had been used as a peg or trenail.

##### 15.4.5.3 SF308 [1743]; woven withy circlet (Figure 15.13)

This is a small circlet of thin twisted withies. The bark-covered withies are 4 mm in diameter and three of them have been twisted together to form a slightly compressed circlet 33 × 40 mm. The withies form a band 7 mm wide and 5 mm thick and the ends have been tucked one under the other.

##### 15.4.5.4 SF221; [1144S]; adze haft/ard foreshare? (Figure 15.15)

This object has been fashioned from a branch junction of alder (*Alnus glutinosa*). The parent branch, which has been cloven in half and would have been over 60 mm in diameter, forms the head of this adze haft while a smaller offshoot branch, some 30 mm in diameter forms the handle. The head is 174 mm long from poll to tip and tapers from 62 mm at its widest to 18 mm across at the rounded tip. Two large axe facets shape the large poll at the point where the parent branch intersects with the smaller branch. The tip of the haft has been shaped by small 'stepped' facets on one side of the cloven surface suggesting careful shaping with an axe, with a larger single facet taken out of the underside of the tip. The other side of the cloven surface is too degraded to see any toolmarks, but this shaping has produced a distinct flattened 'nose' some 68 mm long and 32 mm deep, around which the socketed or flanged adze would presumably have been fitted. Some bark survives on the

lower junction between the two branches, demonstrating that no working was required in this area. No tool marks were observed on the handle itself, although this had been broken prior to deposition, and only *circa* 70 mm of its original length survives.

#### Discussion

Despite the evidence for its manufacture there is no evidence that the haft was ever fitted with an adze and used; there are no indentations or wear patterns around the head. Hafts are more commonly made from ash which is elastic and shock-absorbing, so the choice of alder, which does not have those properties, is unusual (although an alder haft of Bronze Age date was found at Perry Oaks, Heathrow; Lewis & Batt 2006: 142–143). Morphologically, the BLoM haft resembles the Bronze Age axe hafts from Must Farm, except that it has been converted very differently, the side branch forming the handle not the foreshaft (Bamforth 2024: 593–601). The angle between handle and foreshaft is *circa* 65°, so it could have functioned as either axe or adze haft (*ibid*: 593) but the distinct shaping of the flattened 'nose' is more suggestive of an adze, with the blade at right angles to the handle. The haft may have been more symbolic than functional, ie it was perhaps made specifically for deposition under the floor and never intended for use (see below).

It is therefore interesting that the only adzes known from Scotland come from what might be termed votive environments. There are three from hoards deposited in bodies of water (Piggott 1952); adze-hammers of Roman type from Eckford, Roxburghshire (*ibid*: 27) and Carlingwark Loch, Kirkcudbrightshire (*ibid*: 37), and an adze-blade of native design from Blackburn Mill, Berwickshire (*ibid*: 48). However, these all have vertical sockets whereas the Black Loch haft was intended for a socketed or flanged adze. An adze with a horizontal socket was found in High Pasture Cave, Skye (Gemma Cruikshanks, pers comm), again a site with strong ritual connotations. The wooden handle was still *in situ* within the socket. No flanged adzes are known from Scottish contexts but many other types of Iron Age tool were flanged.

Throughout the description and discussion above it has been assumed that the object is a haft but there is one other possibility that should be considered. Morphologically SF221 also resembles the foreshare of a crook ard, the handle thus forming the remains of the beam. As part of a crook ard it would be considerably smaller than known examples; for instance on the two crook ards from the Early Historic crannog at Buiston, Ayrshire, the foreshares were 340 mm and 400 mm long (Crone 2000: 118–120), while that of the crook ard found on Oakbank crannog, Loch Tay is about 420 mm long (Dixon 2004: 152). However, SF221 could have been a skeuomorph of a crook ard, made solely to be placed under the floor. Ardshares from composite bow-ards

have been found in similar positions, ie under the floor surfaces, at Cults Loch 3 crannog (Cavers & Crone 2018) and Milton Loch crannog (Piggott 1953), and the crook ard from Oakbank was also recovered from the lower 'floor-foundations' (Dixon 2004: 152), so the practice of propitiatory deposition of ploughing equipment in the 1st millennium BCE was clearly widespread.

### 15.4.6 Episode 3; trackway?

#### 15.4.6.1 SF310 [19004] slotted timber (Figure 15.15)

SF310 consists of a length of willow roundwood, 1.25 m long and 110 mm at its maximum diameter, which lies about two-thirds along its length. Apart from the slotted face, which survived because it was laid this face down in the wooden surface in which it was re-used (Chapter 4.3.6) the timber is heavily decayed; none of the other original surfaces have survived and decay has also hollowed it out. It is gently curved along its length, in the same plane as the slotted face. At one end there is what appears to be the remains of a mortise, some 25 mm wide and 75 mm deep; it is open-ended but this could be the result of decay. At this end the timber is only 65 mm in diameter but again, this could be the result of decay. It is very decayed at the other end and was probably originally longer because the slots that are its defining feature continue on to the very end.

The face which lies on the same plane as the mortise-hole is cut across by slots. There are 16 in all and they are rounded in cross-section, as though they have been cut through with something like the curve-bladed gouges surmised for other toolmarks on the site (Chapter 14.5). There is what might be an incomplete slot at the decayed end where the slot does not completely cross the timber leaving the rounded imprint of the blade. They are mostly quite regular in width, varying from 17 mm to 20 mm across, although at the mortised end there are two very wide slots, 32 mm and 37 mm across. They also vary in depth from 7 mm to 15 mm but this could be partially due to compression in the wooden surface in which it was re-used. The spaces between the slots are very irregular in width; from the mortised end they are 72: 25: 18: 29: 45: 24: 40: 57: 37: 71: 56: 85: 65: 62 (mm).

#### Discussion

No obvious parallels for the function of this intriguing object have been found. An ash timber, similar in overall dimensions to SF310 and with a series of recesses cut into one face was found at Edercloon, Ireland and it was suggested that it might be part of a cart frame, with laths fixed into the recesses (Moore 2021: 136–137). However, the similarities are superficial, the recesses being equidistant, regularly cut, wide and square in cross-section with dowel-

holes in each recess, in contrast with the rounded cross-section and pronounced irregularity of both the spacing and size of the notches on SF310.

The mortised end implies that it was designed to fit around another component, while the rounded cross-section of the notches could have been designed to hold withies. One possible interpretation is that it could have formed part of a vertical framework of horizontal withies for drying out meats, fish or other foodstuffs, although its design seems overly complex for such a function.

The notches invite comparison with a group of wooden anthropomorphic figures which have been found in a small area of bog in County Offaly, Ireland, often associated with prehistoric trackways or platforms (Stanley 2007: 189). These figures have all been fashioned out of a small roundwood trunk and are characterised by a series of roughly-cut notches on one or both sides, interpreted as representing ribs. The number of notches present varies from six to 11, although the majority displayed 11 notches (Corcoran 2003; Stanley 2007). They also display bulbous 'heads' at one end and a stake-like tip at the other, and decay patterns suggest that they were set upright in the ground for a short period of time (Stanley 2007: 186). SF310 does not display either of these features, although if the open-ended mortise was interpreted as a pair of legs then the head would have been at the other very decayed end and may have broken off. The County Offaly group have all been dated to the Bronze Age (Stanley 2012) although a recent find from Gortnacranagh, County Roscommon which also displays rib-like notches is Iron Age in date (Cathy Moore, pers comm).

The interpretation of SF310 as the remains of an anthropomorphic figure is very speculative and it clearly differs from the Irish corpus in its absence of a head and the larger number of notches present. However, its position in a possible trackway (Chapter 4.3.6) also mirrors the association of many of the Irish and European figures with trackways where it is suggested they might have acted as protective deities (Stanley 2007: 189). One other aspect suggests that SF310 might have been special in some sense and not just a domestic appurtenance. All the Irish figures were made of alder, a species with negative connotations in Irish folklore (Stanley 2012: 37) but SF310 was made of willow. As discussed above, willow was a rarely used species at BLoM, so its use to carve the notched log, together with the deliberate placement of willow leaves in and around the bowl, hints at some other significance.

#### 15.4.7 Discussion

For a waterlogged site with excellent preservation the assemblage of wooden artefacts from BLoM is remarkably small. For comparison Bulleid (1924: 48) recorded the following inventory from his excavations at Glastonbury Lake Village; '*Portions of fourteen tubs and cups, either*

*cut from the solid or stave-made. ...Sixty-three pieces of frame-work, parts of looms or apparatus for making textile fabrics. Five ladles, parts of three lathe-turned wheel-hubs, several wheel-spokes, a ladder with four steps, a small door, handles [...from various tools...], fragments of baskets, two small wood pins... the tops of two spade-handles, three pieces of finely ornamented wood bands, two wooden mallets, three stoppers, an oak dish or trough, beams and planks with mortise holes, and several wicker-made hurdles.*' This is the varied assemblage that one might expect in the debris of a domestic settlement. Given the catastrophic circumstances in which the settlement at Must Farm was destroyed, it seems reasonable to assume that the volume of wooden artefacts found during the recent excavations there more closely represents the normal accoutrements of a domestic household, be it Late Bronze Age or Iron Age (Bamforth 2024: 716).

The size and nature of the BLoM assemblage is almost certainly related to the cleanliness of the inhabitants during occupation and their strategies upon abandonment (Chapter 18.5). The assemblage divides into several complete and highly significant objects (in terms of their rarity and craftsmanship), some of which may have been deliberately deposited, and small, fragmented utilitarian objects which were probably accidentally discarded.

#### 15.4.7.1 Wood species

Most of the artefacts are prosaic in their function and the species used in their manufacture are those commonly found on the site, ie oak and ash for pegs, hazel for small braided objects. The two rolls of birch bark are interesting because birch is a relatively small component of both the structural wood and wood fuel assemblages (Figures 14.1 & 14.7), although it was a greater component of the wooded landscape (Chapter 17.1.5). It is possible that birch trees may have been reserved for the harvesting of their bark.

Maloideae wood was used to manufacture both the bowl and the vessel represented by the waster core so it would seem that it was favoured for woodturning. The only other occurrence of Maloideae on the settlement was a few fragments of charcoal so it was either not commonly found in the local landscape or was set aside for specific purposes such as vessel manufacture.

The baton is the only item of yew wood found on the settlement. Yew was not recorded in the local palynological record (Chapter 17.1.5) so the baton was either manufactured elsewhere or the wood was sought out for its specific qualities. The wood is close-grained and an attractive reddish colour so it has often been used in the production of finely carved and turned objects, such as the baton. It appears to have been favoured for specific purposes; from the Neolithic to the medieval period it was extensively used in the manufacture of bows (Bevan-Jones 2002: 151–154). Iron Age examples include several

stave-built tankards (Earwood 1993: 266) but perhaps the most famous Early Iron Age object of yew is the Roos Carr carving of five figures in a boat, thought to be a votive offering (Coles 1990). Artefacts of yew wood are relatively rare finds on archaeological sites of all periods in Scotland (Crone & Dimova 2024). In folklore yew has often been invested with mythological associations and magical properties so the choice of yew for the baton might reflect its 'special' status, to the owner or the community.

#### 15.4.7.2 Taphonomy

Most of the wooden objects found in the ST3 floor deposits could represent accidental discard. They are all small and/or broken and could readily have become incorporated into the thick deposit of plant litter floor covering [1743/1153] which was one of the richest on the settlement in terms of artefacts (Chapter 15.7.4). The waste core is important because it testifies to lathe-turning on the settlement (see below) but it is nevertheless debris that was probably discarded; it may have been dropped on the floor during manufacture or it could have been brought into the house to be used as fuel.

It is more difficult to see the baton SF237 and the adze haft/ foreshare SF221 as accidental discard. They are large objects and it seems more likely that they were deliberately incorporated into the floor coverings. One of the crucibles (Chapter 15.5.2.5) also appears to have been deliberately positioned in the floor coverings at the end of one of the Phase 7 radial sub-floor timbers in ST3. These might reflect the cultural practice of burying symbolic objects during the construction of a building, to bring good fortune to the house and its occupants. The deliberate placement of wooden objects under the floors of two of the houses was also noted at Cults Loch 3 (Cavers & Crone 2018). These included a rectangular box, an ardshare and several stave-like boards, and it was suggested that the choice of these objects perhaps reflected the identity of the occupants (Crone 2018b: 102). The similarity between SF221, as a possible foreshare which had not been used, and the ardshare at Cults Loch 3 has already been noted. If these were propitiatory offerings it would suggest that, on several occasions during the lifetime of ST3 it was necessary to 're-consecrate' the building, and that possibly, the function of the building changed during its occupancy, the baton in Phase 3, the adze haft/ foreshare in Phase 6 and the crucible in Phase 7 all reflecting the changing identities of the occupants.

There were no wooden artefacts recovered from any of the Episode 1 houses but the bowl, perhaps the most significant find from the settlement, was found in midden-like deposits in the ditch terminal. As the bowl had been flattened after deposition it is difficult to tell whether it was already broken when discarded. Given the care and craftsmanship involved in its manufacture, it seems

unlikely that it would have been thrown away without some attempt at repairing cracks in the bowl but there is no evidence for repairs. Several of the later prehistoric Scottish bowls display evidence for repair in the form of staples across cracks and copper alloy plate mounts pinned over the rims (Crone forthcoming b), so it would not have been uncommon to repair a prized possession. The location of a beautifully decorated, apparently unbroken bowl in the midden is puzzling and raises the question of the very nature of the midden.

#### 15.4.7.3 Bowl manufacture

It is notable that Maloideae wood had been selected for the manufacture of both the bowl and the vessel represented by the waste core. Wood from this sub-family was very rarely used at BLoM as either building material or for fuel (Figures 14.1 & 14.7). A single stake and six pieces of charcoal is all that has been recorded, so its selection for the manufacture of lathe-turned vessels appears to be a very specific choice. It therefore seems even more notable that species which belong in this sub-family were also used in the manufacture of spindle-turned objects found at two later prehistoric sites in Dumfriesshire, Picts Knowe and Over Rig (Crone et al 2007; Crone 2018a). In spindle-turning the grain of the wood lies parallel with the lathe rather than perpendicular as in face-turning and is usually employed to make smaller diameter items. The only evidence for spindle-turning in later prehistoric Scotland comes from these two sites and consists of waste cores, four from Picts Knowe and two from Over Rig. Both the Over Rig cores were identified as rowan (*Sorbus aucuparia*) while one of the Picts Knowe cores was identified as Pomoideae (cf *Pirus/Malus/Crateagus*), the sub-family now known as Maloideae. Small carbonised fragments of a turned bowl also made of Maloideae were found recently in the posthole of an Iron Age roundhouse in Dornoch, Sutherland (Jackson 2021). It is a small dataset but nevertheless, when six of the nine items (two of which have never been identified as to species) which provide evidence for lathe-turning in later prehistoric SW Scotland have been made from Maloideae, it does suggest a specific preference for this wood.

#### 15.4.7.4 The character of the assemblage

Most of the items in the assemblage are very prosaic. The rope of twisted withies could have been used for a multitude of purposes and are common components of waterlogged wood assemblages, as at Picts Knowe (Crone et al 2007: 114) and Oakbank crannog (Dixon 2004: 154). At Glastonbury woven withies were found in association with loom frame components (Bulleid 1911: 341). Similarly, the small rolls of birch bark could have been harvested for a variety of purposes. Birch bark rolls have been more commonly found on Mesolithic sites (Fletcher et al 2018) and Norse sites throughout the North Atlantic (Mooney 2013).

Large sheets of birch bark have been used to waterproof buildings, as roofing and matting, and to make bags and containers. The smaller rolls might have been collected for tanning, or to produce a resinous glue or tar (Morris 2000: 2348–2349) which could be used for caulking. The small rolls could have been produced to make small floats for fishing nets (Fletcher et al 2018).

The two peg-like objects SF218/C and SF302 are very different in character. SF218/C is less finished and could well have been used as a peg or trenail in a structural framework. The only *in situ* pegs found on the settlement were the large oak pegs in the primary entrance framework in ST2 (Chapter 14.4) so there is little with which to compare SF218/C. Although it has been labelled a dowel, SF302 has been too carefully crafted and finished for that purpose, and furthermore it displays no evidence to suggest that it has been used in that way. It may have had a very different purpose all together.

The most significant aspect of the assemblage is perhaps what it reflects in terms of the high quality of craftsmanship on the settlement. There is an aesthetic sensibility in the design and production of the bowl, the baton and the dowel SF302. Even if they were simply functional items (and the function of the latter two items is moot) a lot of care has gone into their finishing, their surfaces smoothed and burnished so that toolmarks do not show. An offcut from the midden, SF291, also reflects this craftsmanship (Figure 15.3 & see Chapter 14.3). It has been cut from a thin, finely dressed oak plank and is of a quality designed to be seen; it is better suited to interior finishings than the thick crudely dressed planks of the house walls and palisades. These objects allow us to imagine a roundhouse interior furnished with finely made furniture and partitions, with decorative surfaces.

#### 15.4.7.5 Comparable assemblages

There are few later prehistoric domestic assemblages of wooden artefacts with which to compare the BLoM assemblage. Oakbank crannog has yielded some 50+ wooden artefacts (Sands 1997: 48–49; Dixon 2004: 146–155) which include a range of vessels including a trough, a bowl, a plate, a stave from a composite vessel and a rectangular butter dish, as well as a spindle whorl, paddles, an ard, a whistle, the bridge of a musical instrument and basketwork. This does indeed appear to represent the equipment of a domestic settlement which has been discarded or lost in the course of occupation, but it has yet to be fully analysed. With regards to all the other later prehistoric wood assemblages from Scotland there is some query over the ‘domesticity’ of their content. For instance, the assemblage from Cults Loch 3 contains only objects which had probably been made specifically for deposition under the floors of the buildings (Crone 2018b). The enclosures at Picts Knowe

and Over Rig both have assemblages of wooden objects (Crone et al 2007; Crone 2018a) found in the waterlogged deposits in the ditches but neither of the sites can be definitively classed as a domestic settlement. Mercer (2018: 234) has suggested that the Over Rig enclosure was an ‘auditorium’ used for ceremonial activity while Thomas (2007: 153) has hypothesised that Picts Knowe might also be a ceremonial centre or shrine. The Picts Knowe assemblage does contain a keg and spatula, domestic appurtenances, but it is dominated by a group of peg-like objects which appear to be more votive or ritual in character (Crone et al 2007: 115), while the most significant items in the Over Rig assemblage are a toy sword, a possible toy boat and the ash platter noted above, with nothing that is unambiguously domestic in nature. Nonetheless, taken as a whole, these disparate assemblages reflect the craftsmanship and ingenuity of the later prehistoric woodworker.

## 15.5 Metalworking evidence

*Dawn McLaren*

### 15.5.1 Ferrous metalworking waste and associated vitrified materials

#### 15.5.1.1 Introduction

A total of 3,773.77 g of vitrified material and possible ferrous metalworking waste was recovered during the 2018 and 2019 seasons of excavation, all relating to either activity in the vicinity of the Episode 1 palisade and entranceway or the Episode 2 ST3 (Table 15.11). The material in this group comprises both hand-retrieved debris (recorded by SF number) and material recovered as the result of sample processing (recorded under RT, an abbreviation for retents). The waste consists of very limited quantities of ironworking debris in the form of two fragments of possible smithing hearth bottoms and pieces of unclassified iron slag, as well as a range of other vitrified materials which are undiagnostic of particular pyrotechnic processes. This latter group includes fragments of fuel ash slag and vitrified ceramic. Although there is inevitably some overlap in the vitrified and heat-affected materials associated with ferrous and non-ferrous metalworking, the evidence for these two distinct forms of metalworking has been described and discussed separately.

#### 15.5.1.2 Classifications

The vitrified material was visually examined with the aid of a low-powered binocular microscope, enabling categorisation based on morphology, density, colour, vesicularity and response when scanned with a magnet. The vitrified material has been described throughout using

Type	Weight (g)
<i>Indicative of ironworking</i>	
Plano-convex cake fragments (PCC frags)	241.8
Unclassified iron slag (UIS)	516.97
Slag amalgam (SA)	206.4
<i>Undiagnostic vitrified material</i>	
Vitrified ceramics (VC)	430.19
Non-magnetic vitrified material (NMVR)	136.1
Fuel ash slag (FAS)	23.81
<i>Other</i>	
Bog ore	2218.5
<b>Total</b>	<b>3,773.77</b>

Table 15.11 Summary of the vitrified material assemblage by type and weight.

common terminology (eg McDonnell 1994; Starley 2000; Bayley et al 2001; Dungworth & McLaren 2021).

Assemblages of vitrified materials or slags can typically be divided into two broad categories. The first group includes material which can be attributed to a particular industrial process such as ironworking; these comprise ores and smelting and smithing slags. Only a few, for example tapped slag and hammerscale, are truly diagnostic (of smelting and smithing respectively). The second category of vitrified material includes a range of non-diagnostic slags which could have been produced by a number of different pyrotechnic activities but display no diagnostic characteristics to allow them to be identified to a specific process. There is often a significant amount of material within this non-diagnostic category which is unclassifiable, making the allocation of individual pieces – particularly small samples – to specific types and processes difficult (Crew & Rehren 2002).

#### 15.5.1.3 Ironworking waste

##### Plano-convex cake fragments (PCC fragments)

These dense plano-convex accumulations of slag are referred to variously as ‘plano-convex bottoms’ and ‘plano-convex slag cakes’ (eg Heald 2008: 207). They can be found in a range of sizes, making it sometimes difficult to differentiate those produced during smelting (furnace bottoms) or smithing (hearth bottoms) although the dimensions and weight of the examples discussed here compare closer to slag cakes associated with smithing (eg McDonnell 1994: 230, 2000: 219; Starley 2000: 338). Hearth bottoms form as the result of high-temperature reactions between the iron, hammerscale and silica from the hearth lining or flux to form plano-convex accumulations at the base of the hearth. They are recognisable by their

characteristic plano-convex form, often displaying smooth dished upper surfaces which have become hollowed as a result of the downward pressure of the air from the bellows (McDonnell 1994: 230).

A single small and intact sub-circular cake and a fragment of a second cake came from [1119] in ST3. The small size of the intact cake, being only 81 mm in diameter and 21 mm thick, its compact and dense structure and its response to a magnet are all consistent characteristics of a plano-convex hearth bottom resulting from blacksmithing or welding. Adhering to the edge on one side of the cake is a skim of vitrified ceramic which may be the remnants of the clay lining of the hearth. The second fragmentary cake is almost identical in thickness to the first, similar in texture, inclusions and magnetic response. No distinctive micro-debris in the form of hammerscale flakes or spheres was observed on the surfaces of either piece.

#### **Unclassified iron slag (UIS)**

Small fractured amorphous pieces of iron silicate slag are a common component of slag assemblages (Crew & Rehren 2002: 84) and are typically interpreted as rakeout material from a smelting furnace or smithing hearth. Differentiating between smelting and smithing through visual examination alone is difficult and for this reason such slags are often referred to as undiagnostic ironworking slags. A total of 13 such amorphous fractured fragments (516.97 g) came from three contexts ([723], [1113] and [1119]). Most of this material is magnetic but displays no diagnostic characteristics. Three fragments of slag recovered from a dump of hearth debris [723] used in the construction of Rampart 2 have a distinctive soft and powdery surface appearance due to corrosion in a waterlogged environment as observed amongst other assemblages such as that at Culduthel, Inverness (*cf* Dungworth & McLaren 2021).

#### **Slag amalgam (SA)**

Fractured and angular fragments of unclassified iron slag adhering to a layer of vitrified ceramic (206.4 g) were also recovered from [723]. Although they have no diagnostic characteristics to allow closer classification, adhering vitrified ceramic represents the remains of the original clay hearth or furnace lining.

### **15.5.1.4 Undiagnostic vitrified material**

#### **Vitrified ceramics (VC)**

Many pyrotechnic processes take place in association with clay-lined features such as hearths or kilns and the recovery of vitrified ceramic lining is not necessarily indicative of metalworking. Sixteen fragments of vitrified ceramic (430.19 g) were recovered from five contexts ([772], [1113], [1119], [1120] & [1800]). Most of this material probably represents fragments of the heat affected and partially

vitrified hearth lining, displaying a gradient in colour and vitrification from red-brown fired clay through to dark brown/ black glassy vitrified material, but in most instances (unlike the slag amalgam just described) none of the surfaces were slag-attacked

#### **Non-magnetic vitrified material (NMVR)**

A single amorphous fragment of a dark red-brown, low-density, silicate-rich vitrified material (136.1 g) was recovered from topsoil in Trench 18. Some patches of fuel ash slag were embedded in the surfaces but no surface details allow closer identification, and it is undiagnostic of a particular pyrotechnic process.

#### **Fuel ash slag (FAS)**

Fuel ash slags are formed when material such as sand, earth, clay, stones or ceramics are subjected to high temperatures, for example in a hearth. During heating these materials react, melt or fuse with alkali in ash, producing glassy (vitreous) and porous materials (Bayley 1985: 41). These slags can be formed during any high-temperature pyrotechnic process and are not necessarily indicative of industrial activity (McDonnell 1994: 230). This material was recovered in small quantities from five contexts ([709], [1150], [1709], [1720] & [1757]), in each case associated with deposits of ash (peat and wood) and charcoal from to hearth debris.

#### **Bog ore**

Two sub-rounded, ovoid accumulations of bog ore (2,218.5 g) were recovered from ST3, associated with contexts [1109] and [1119]. Bog ore is a naturally occurring substance, typically dark brown, red-brown or orange, brown in colour. It can vary in texture and density but often includes frequent rootlet voids, rootlet inclusions and impressions of decayed organic matter on the surfaces alongside natural grits and nodules of peat. The fragments amongst the Black Loch assemblage are pitted and uneven with a range of natural inclusions and rootlet clasts with eroded and weathered surfaces. Extensive patches of bright yellow/ orange-brown powdery iron oxide on the surfaces indicate areas of oxidisation but there is no evidence of any vitrification or fusing as the result of exposure to intense heat.

### **15.5.1.5 Distribution**

The vitrified material assemblage was recovered from two discrete areas, the Episode 2 ST3 and the Episode 3 entrance. The distribution is summarised in Table 15.12 by structure and context. Vitrified material from these areas was limited in quantity. A distinct concentration of waste was recovered in ST3; over 3 kg of waste, including both ferrous metalworking waste and undiagnostic slags, came from this structure, representing 79% by weight of the vitrified material assemblage.

Area	Episode	Phase	Context	Indicative of Ironworking			Non-diagnostic vitrified material			Other	Total Wgt
				PCC frag	UIS	SA	VC	FAS	NMVR	Bog ore	
Rampart 2	3	2	709					0.87			0.87
Rampart 2	3	2	723		85.2	206.4					291.6
Entrance	3	2	772				211.12				211.12
ST3	2	8	1109							692.9	692.9
ST3	2	8	1113	241.8	430.4		66.93				739.13
ST3	2	8	1119		1.37		13.52			1525.6	1540.49
ST3	2	8	1120				0.72				0.72
ST3	2	6	1150					0.22			0.22
ST3	2	7	1709					21.9			21.9
ST3	2	6	1720					0.54			0.54
ST3	2	3	1757					0.28			0.28
		n/a	18000				137.9		136.1		274
<b>Total Wgt</b>	<b>241.8</b>	<b>516.97</b>	<b>206.4</b>	<b>430.19</b>	<b>23.81</b>	<b>136.1</b>	<b>2218.5</b>	<b>3773.77</b>			

Table 15.12. Summary distribution of vitrified material by structure, episode and phase and classification.

### Episode 2: ST3

In ST3 most of the material comes from Phase 8, the final phase in the structure, in spreads of hearth debris associated with the use of the final hearth, Hearth 7. All the other deposits with vitrified material also appear to be hearth debris.

*Phase 3:* A total of 0.28 g of fragments of fuel ash slag came from a spread of limpet-rich charcoal [1757] associated with Hearth 8.

*Phase 6:* A further 0.76 g of fuel ash slag was associated with the use of Hearth 5. A total of 0.22 g came from [1150], a mixed ashy deposit and 0.54 g was recovered from [1720], a charcoal-rich deposit of domestic debris.

*Phase 7:* A very limited quantity (21.9 g) of fuel ash slag was recovered from a deposit of white ash [1709] which lies within the inner and outer wall of the structure and is thought to be associated with the burning event in Phase 7.

*Phase 8:* The greatest quantity of vitrified material (2,996.18 g) came from Phase 8 deposits within the SW quadrant of roundhouse ST3, from four distinct contexts ([1109], [1113], [1119] & [1120]). It consists of both metalworking debris and undiagnostic waste.

A total of 789.56 g of waste consisting of fragments of plano-convex slag cake (241.8 g) and unclassified iron slag (430.4 g) both indicative of ironworking, as well as fragments of vitrified ceramic (66.93 g) came from hearth debris [1113] around Hearth 7, the final hearth in this structure. A fragment of bog ore (692.9 g) was recovered from [1109], a surface associated with the construction of Hearth 7. A total of 1,540.49 g of vitrified material, dominated by fragments of bog ore (1,525.6 g) alongside

fragments of unclassified iron slag (1.37 g) and vitrified ceramic (13.52 g) came from a minerogenic surface [1119] associated with the use of Hearth 7. A small quantity (0.72 g) of vitrified ceramic was recovered from [1120], the active floor surface associated with Hearth 7 into which hearth debris had become mixed.

*W edge of structure (Trench 18):* A total of 274 g of vitrified material came from this area, consisting of 137.9 g of vitrified ceramic and 136.1 g of non-magnetic vitrified residues; neither can be related directly to metalworking activities. Both came from topsoil.

### 15.5.1.6 Episode 3: palisade and entrance structure

A total of 503.59 g of vitrified material was recovered from three contexts in this [709] used in the construction of Rampart 2. Fragments of unclassified iron slag (85.2 g) and a slag amalgam (206.4 g) consisting of a single fused lump of unclassified iron slag and vitrified ceramic were also found in another dump of hearth debris [723] used in the construction of the rampart. A fragment of vitrified ceramic (211.12 g) was recovered from hearth debris [772] thought to have washed into the entranceway over cobbles [728] by water movement. All of this material appears to be residual hearth waste deposited alongside peat ash and fuel residues. It is significant that small quantities of ironworking waste (291.6 g) come from context [723], their presence attesting to metalworking activities taking place in the area. In particular, the slag amalgam – a fragment of iron slag fused to a fragment of clay hearth lining – implies the presence of metalworking hearths or furnaces in the vicinity, probably situated beyond the excavation area.

### 15.5.1.7 Discussion

Categorising the extent and scale of ironworking activity at BLoM is problematic. The quantity and range of diagnostic ironworking waste recovered is very limited (less than 1 kg) but the presence of a small intact plano-convex hearth bottom and fragment of a second cake suggests that blacksmithing occurred as slag rarely moved far. This evidence of ironworking is supported by the fragments of unclassified iron slag and slag amalgam. The presence of fragments of bog ore, the typical ferrous-rich ore form used in Scotland in the Iron Age (Dungworth & McLaren 2021), demonstrates that the raw material was available in the area for smelting, but the lack of furnace bases, smelting slags or furnace structures means that there is no direct evidence of smelting. With no obvious evidence of modification to the ore, one cannot prove the fragments were present in ST3 as the result of deliberate harvesting and collection for use in metalworking; the bog ore could have been incidentally introduced within blocks of peat used as fuel (Chapter 11.5.6).

Although the majority of the ironworking waste is securely stratified in contexts associated with the Episode 3.2 defences ([723]) and Hearth 7 in ST3 ([1113] [1119]), there is little evidence of *in situ* ironworking. The complete absence of diagnostic micro-debris in the form of hammerscale flakes or spheres which are produced during the refining of blooms, welding and forging of iron in the smith's hearth (Dungworth & Wilkes 2009) is puzzling in this respect as significant quantities of ironworking micro-debris (whether diagnostic or not) would be anticipated in the immediate vicinity of metalworking activity areas. This simply is not present at BLoM. How then to explain the ironworking slags, particularly micro-debris, within ST3? Could blacksmithing have been undertaken in conjunction with Hearth 7 and then later the surrounding floors levels were stripped out and replenished, taking any bulk slags and micro-debris along with it? This scenario can be argued from the soil micromorphology evidence (Chapter 9) where flecks of slag and fuel residues are present amongst the trampled floor surfaces. This is a significant finding as well-stratified, secure and well-dated examples of Iron Age ironworking in the region is rare.

Defining the chronology of the ironworking activity at BLoM is also not without its challenges, being hampered by the re-deposited contexts of discovery. The ironworking waste recovered from ST3 (Episode 2) is thought to have been deposited sometime between 425–420 cal BCE and 375–310 cal BCE based on the modelled radiocarbon dataset for construction and abandonment of this structure (Chapter 2.4). The majority of the vitrified material from the palisade and entrance area derive from contexts that relate to Episode 3.2. Dendro-dating of the defensive structures relating to this episode indicate construction in 243 BCE, providing a *terminus ante quem*

for the deposition of the vitrified material, although it is possible that this material is residual and relates to the earlier Episode 2 activity.

### 15.5.2 The non-ferrous metalworking evidence from BLoM

*Dawn McLaren (with X-ray fluorescence analysis by Gemma Cruickshanks, NMS)*

#### 15.5.2.1 Summary

Evidence of non-ferrous metalworking at BLoM consists of ceramic crucible fragments and, two tuyère fragments. Fragments from a minimum of three crucibles were recovered from ST3 and the surrounding area. One crucible is intact, another is substantially complete, whilst only small fragments remain amongst the rest of the assemblage. All display evidence of use. The crucible fragments came from contexts relating to both Episode 1 and 2; this activity is likely to span a few generations from around *circa* 435 BCE to *circa* 360 BCE, suggesting a series of short-lived episodes of metalworking.

#### 15.5.2.2 Crucibles

The assemblage consists of 16 crucible fragments which represent a minimum of three examples, but more may be represented by the smaller featureless body sherds. Two examples were substantially intact whilst the others are represented only by fragments. Three diagnostic examples fall into two broad groups: a simple three-sided conical crucible (SF210) and two example of a more unusual globular handled variety (SF220 and SF248).

The first crucible is a thick-walled, robust, three-sided crucible (SF210) with a plain rim which has been pinched to shape at all three corners (Figure 15.16). One of the corners is notably narrower than the others and may have functioned as a spout. No obvious metallic residues were observed in the interior, but its exterior walls are vitrified and glassy in patches and the upper body below the rim is sooted as the result of contact with fire. It was discovered intact, in an upright position on the sub-floor [1127/1128] within the Phase 7 active floor surface of ST3.

The second form of crucible from BLoM is defined by a substantially complete, large, robust, handled example (SF248) comprising five re-fitting fragments, missing only the very centre of the base (Figure 15.17). It has a slightly flattened globular body, elongated in plan along one axis where a narrow, rounded, pouring spout has been pinched out from the rim. Distinctly rounded walls lead to a slightly flattened, thick base, the centre sherd of which is lost. The thick tapering squat rectangular handle projects from the centre of one long rounded edge.

A second example of such a crucible is represented by a thick projecting handle (SF220) of almost identical form



SF210



Figure 15.16. Crucible SF210.

(Figure 15.18). This is an unusual form both in size and shape but parallels from early Iron Age contexts are known including examples from Danebury hillfort, Hampshire, from contexts dating to between 550 and 300 BCE (Poole 1991: 381, fig 7.5, 7.140–142) and from Dunknock hillfort, Perth and Kinross (Cruickshanks & Hunter forthcoming) and potentially Dowalton Loch, Wigtownshire (Hunter et al 2018: 208). The Dunknock example is slightly taller and narrower than the BLoM examples but in all other respects is remarkably similar. A heavily vitrified and incomplete pear-shaped crucible from Dowalton Loch (NMS: X.HA 36; Hunter et al 2018: 208, illus 159b) has broken across the rim and rear of the body, resulting in the loss of the upper surface of a thick sub-rectangular protrusion to one side. This lost feature may have been a projecting handle, similar to those from BLoM.

The other nine crucible fragments are all small and fractured undiagnostic body sherds which were recovered during soil sample processing from [1150], hearth debris from the Phase 6 Hearth 5 and from [1113] hearth debris from the Phase 8 Hearth 7, both in ST3.

A series of well-preserved tong-marks on both the BLoM handles provide a rare glimpse of Early Iron Age tongs with straight, blunt-ended tips. These marks are present in the form of narrow but fairly deep linear impressions which crimp four sides of SF220 and the upper and lower surfaces of the handle of SF248. The impressions present on SF220 are between 8 mm and 10 mm in width; a much narrower (W 3 mm) and better-defined impression at the tip of the rounded terminal of the handle may be from contact with the pivoting inner surface of the teeth of the tongs. Their positioning demonstrates that this handle form allowed tongs to be used horizontally and vertically, which would

have allowed the smith a variety of positions for placing and pouring during use. Tong marks are also present on SF210 of a different form. The exterior surface is pitted, making it difficult to distinguish tool marks but a series of short linear impressions (max L 12 mm, W 2 mm) and crescentic marks (W 6.5 mm) are present at either side of its pinched corners which may be impressions from the tips of tongs.

The fabric of the crucibles is remarkably gritty, a characteristic which is quite unusual on later, more thin-bodied examples. All display evidence of use in the form of vitrified surfaces or metallurgic residues. The three-sided crucible (SF210) is reduced to a dark grey colour. There were signs of vitrification in the form of glassy patches on the exterior and sooting, but no substantial heat damage or distortion. No obvious metallurgical deposits were observable but analysis (detailed below) detected copper-based residues. In contrast, the two globular handled crucibles (SF220 and SF248) were heavily heat-affected with vitrified surfaces and abundant residues. Although all that survives of SF220 is the handle fragment, its form, fabric, colour, level of vitrification and coating of metallic residues is almost identical to SF248. Similar crucibles found at Dunknock hillfort, Perth and Kinross, are argued to have been thrown together into an intensely hot fire in order to destroy them as the level of vitrification and distortion observed was so pronounced (Cruickshanks & Hunter forthcoming). Although SF220 and SF248 do not display the same severe distortion as those from Dunknock, their friable and fractured condition may indicate either catastrophic failure of the crucibles during use or deliberate intense burning to destroy or destabilise them prior to discard.

### 15.5.2.3 Tuyères

Amongst the vitrified materials, two fragments of tuyères (SF192 from [1113] and SF251 (unstratified from the SW quadrant of ST3) were recognised (Figure 15.18). Tuyères are pierced discs, cylinders or cones of clay which would have protected the organic nozzle of the bellows from the heat of the fire (Tylecote 1986: 141–142, illus 86–87). The surface in direct contact with the heat of the fire is typically highly vitrified, and sometimes slag can be found adhering to this innermost face. It is likely that the fragments amongst the BLoM assemblage derive from two separate tuyères, though very little survives. No original edges remain on either example so their original form also is unclear. Tuyères could have been used in association with a range of high-temperature pyrotechnic crafts but X-ray fluorescence analysis of the BLoM examples has confirmed their association with non-ferrous metalworking.

### 15.5.2.4 Scientific analysis

Qualitative x-ray fluorescence (XRF) analysis of a selection of crucibles and both tuyère fragments was conducted in an attempt to identify any metal traces present on

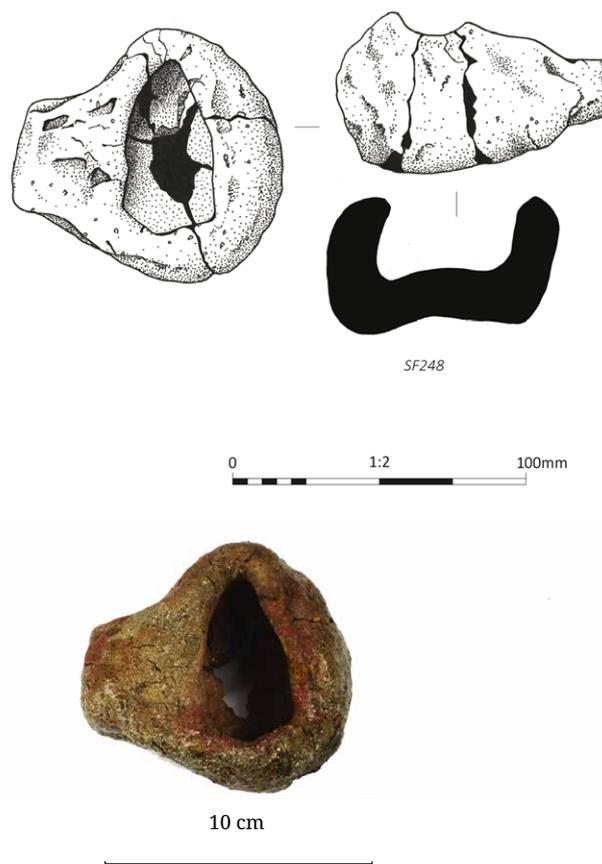


Figure 15.17. Crucible SF248.

the vitrified faces and to confirm the composition of the alloy present.

Two analyses were undertaken of the intact crucible (SF210) and no metal traces were detected which could not be present in the clay. Such a result is usually only obtained on unused crucibles. The high degree of vitrification over the surface of SF210 suggests it was used during a high-temperature process but the XRF results suggest this is unlikely to be non-ferrous metalworking.

The fragment of handled crucible (SF220) showed moderate amounts of copper (Cu), with minor/ trace levels of tin (Sn), lead (Pb) and zinc (Zn). The fragmentary handled crucible (SF220) produced varying levels of copper, with trace tin and lead in places. Particularly high levels of copper were present in a patch of dull green-grey residues near the rim on the crucible's exterior.

Both tuyère fragments (SF192 and SF251) revealed minor levels of copper, lead and zinc, indicating they were utilised during copper-alloy-working. It cannot be confirmed if the tuyères were also used during ferrous metalworking as iron (Fe) is naturally present in the clay.

The results indicate copper alloys were being cast on site, but the minor elements are not present in sufficient

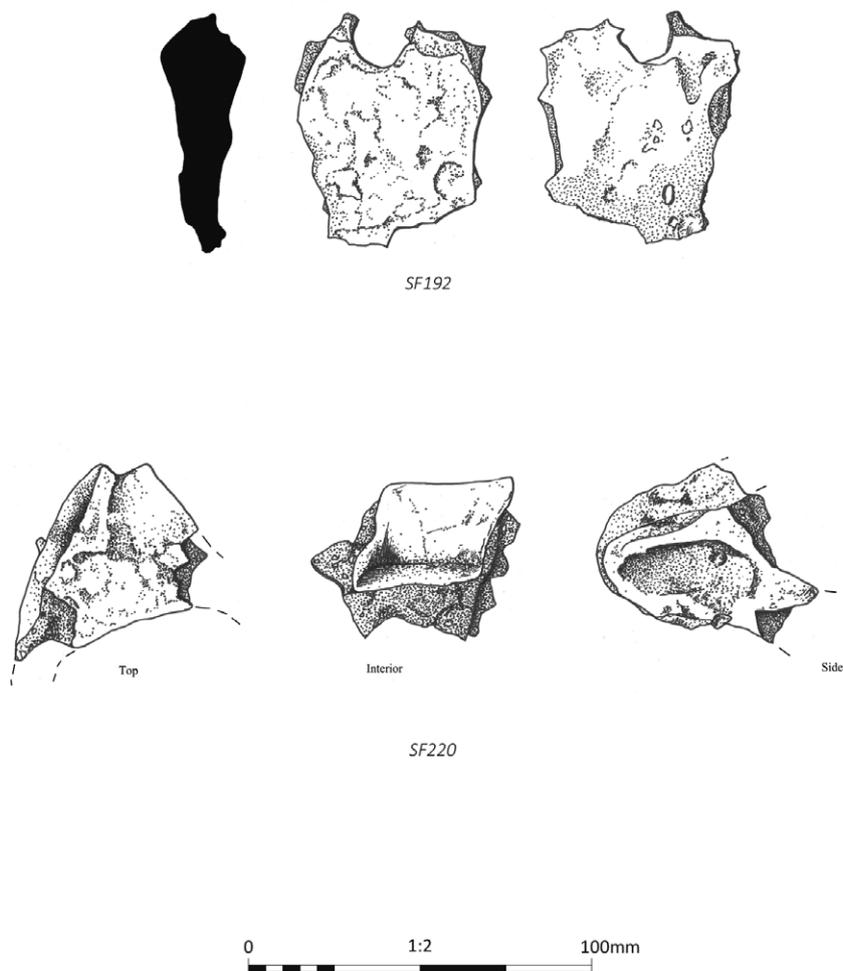


Figure 15.18. Crucible SF220 & tuyère SF192.

quantities to suggest which type of alloy. While the presence of zinc usually suggests a Roman period or later date, the levels are so minor here that it could simply be an impurity and cannot be used as a chronological indicator.

#### 15.5.2.5 Distribution

##### Episode 1

The handle fragment (SF220) from a globular crucible was recovered from the midden-rich fill [800] of the Episode 1 ditch terminal alongside puffballs [SF224] and woodworking debris (SF218). It is thought that the puffballs may have been used as kindling (Chapter 11.5.7.1) but whether these might be related to fire-lighting in a domestic hearth or share an association with pyrotechnic crafts is unknown. Deposition of this midden material probably took place sometime between *circa* 435 BCE to *circa* 400 BCE, prior to the construction of ST3.

##### Episode 2

The remaining crucible fragments were all recovered from the later phases of use of ST3 (Phases 6–8), which fell out of use between 375–310 cal BCE, and these phases can be placed in the early 4th century BCE. From the SW quadrant of the house came a possible small, fractured body fragment of a crucible from hearth debris [1150] around Hearth 5 (Phase 6). The three-sided crucible (SF210) was found intact and upright on the sub-floor [1127/1128] of the structure, also in the SW quadrant, surrounded by and overlain by the active floor surface [1116]. It appears to have been deliberately placed at the terminal of one of the radials of the sub-floor when the structure was re-floored after the fire (Phase 7). Eight small and fractured fragments of possible crucible wall were recovered from [1113], hearth debris from the Phase 8 Hearth 7 alongside tuyère fragment (SF192). The substantially complete handled crucible (SF248) came from the northern half of the structure but it has not been possible to assign a phase to the activity it represents.

### 15.5.2.6 Discussion

Despite the limited evidence of non-ferrous metalworking at BLoM, several significant points can be teased out of this small group of crucibles and tuyère fragments regarding the crucible forms, their chronology, their use and also wider depositional practices on site.

Firstly, the large, globular handled crucibles (SF220 and SF248) are unusual and rare forms, not just in Scotland but across Britain as a whole (Webley et al 2020: 25–31). Where they have been recognised, they are found alongside other crucible types, implying that we are seeing a variety of casting methods, volumes and perhaps preferences of individual smiths.

Secondly, the chronology of the use of these handled crucibles ranges from the Early Iron Age to the early-Middle Iron Age, which is entirely in keeping with the Episode 1 midden and ST3 deposits. The close dating of ST3 (Chapter 2.4) will undoubtedly assist with refining the chronology of this crucible type on other Iron Age sites.

Thirdly, it is valuable to note that the size of these crucibles is substantially larger than the more typical three-sided or baggy crucibles used throughout the middle and late Iron Age in Scotland. This is undoubtedly a reflection of the volume of metal being cast which suggests the production of moderately large or robust objects. SF210 had the internal capacity to hold a volume of 33.02 ml and SF248 is larger still at 46.06 ml. The lack of any mould fragments means one cannot speculate further on what objects were being produced. Bronze was clearly a commodity of value at BLoM as no casting debris, droplets or spills of copper alloy were found, suggesting it was carefully managed and any such debris was likely collected up for re-use and limited working.

Finally, the distribution of the crucible and tuyères helps us to tease out some significant spatial patterning. The evidence of copper-alloy working is present in two episodes, Episode 1 and Episode 2. During Episode 1, crucible fragments are confined to the midden ditch fill, so the locale of metalworking during this early episode remains unidentified. Within ST3, metalworking is in evidence particularly around the hearths of the refurbished roundhouse (Phases 6–8). As the quantities of crucible fragments are so small, it is likely that metalworking was undertaken as a series of short-lived bursts of activity rather than a single episode. However, their confinement to ST3 in Episode 2 suggests that this building was used very differently from the other roundhouses investigated. Further, the three-sided crucible (SF210) appears to have been deliberately positioned in an upright position at the end of one of the sub-floor radials in the SW quadrant of the structure. Its intact condition, upright position and placement within the sub-floor structure all points towards deliberate and purposeful placement, perhaps as a foundation offering during the refurbishment of the

structure after the fire. This is made all the more significant by the evidence of its use on the fire, indicated by patches of vitrification and sooting on the exterior surfaces, but the absence of any metal traces on its interior or exterior surfaces, suggesting that it had not been used for casting metals. This absence of metallic residues may simply be a lack of survival rather than a genuine absence but this is not certain. Could this be a votive crucible, not intended for actual use in metalworking but held in the fire to scorch and burn its surfaces as a symbol of its intended function? Could its placement have been offered to invite good fortune to the new building or even to act as a symbolic offering to welcome success in the craft that was intended to be undertaken in the building? This picture resonates strongly with potential foundation deposits recognised at Cults Loch crannog, Castle Kennedy, where an unused wooden ardshare deposited amongst the sub-floor timbers of the structure (Cavers & Crone 2018: 101–102) was thought to have been placed in this position as an offering to encourage a bountiful harvest.

### 15.5.2.7 Catalogue

*SF210*: Triangular (pyramidal) crucible. Complete and intact, large thick-walled crucible, triangular in shape, tapering to narrow rounded base. All three corners at mouth have been pinched to shape, one of which is much narrower and more rounded than the others and probably functioned as a spout for pouring molten metal. The exterior surfaces are vitrified with a glassy and pitted surface with some flecks of vivianite whilst the upper body below the mouth is sooted from contact with fire. The walls range from 9–13 mm in thickness. The fabric is very sandy with frequent small angular feldspar/quartzite grits. The interior has no visible residues but some patches of ephemeral staining. D 24.6–68 mm, H 58 mm, internal depth 44 mm. Context [1116], wood-rich flooring above [1127/1128]. ST3.

*SF220*: Handle fragment from side-handled crucible. Tapering rectangular handle detached from the side of a thick-walled ceramic crucible. The crucible interior shape is unknown but the base is flat and would have been at least 27 mm in depth. The walls are thick (W 13 mm) and have been produced from extremely coarse ceramic with abundant small feldspar/quartzite grits which give the vessel a pale to mid-grey appearance. The handle, which would have projected horizontally from the side of the crucible rather than one end, which is more typical, tapers in width and thickness along the length and has clear sub-rectangular pinch marks (av. L 31 mm, H 10 mm) on all four sides from being held in tongs during use. The surfaces are coated in a rich bright red glassy residue and areas of iridescent corrosion product. Max surviving W 40 mm; handle: min W 17 mm, min T 20 mm; T of base 12–15 mm. Context [800], midden-rich fill of ditch.

SF248: Side-handled crucible. Globular crucible in five re-joining fragments forming substantially complete example, missing only a small portion from the flattened base. It has been fashioned from extremely coarse ceramic walls with abundant small feldspar/ quartzite grits which give the pot a pale to mid-grey appearance. The mouth of the crucible tapers at one side to form a narrow spout, creating a closed mouth. Crescentic impressions around the circumference may be from production or tool marks made during use. From one side, a thick, tapering rectangular handle has been pinched out and bears distinct linear impressions on the upper surface (W 2.8–3 mm) and edges (L 14 mm, W 8 mm) from the tips of tongs. The base is gently convex (missing a central spall); it and all exterior surfaces are heavily vitrified with a translucent glassy coating, speckled with yellow-coloured metalliferous deposits and bright red residues, particularly on the surfaces adjacent to and encircling the spout and handle. Possible broken during use. L 85 mm, W (including handle) 93.6 mm, H 52 mm. Rim T 12–46 mm. Interior 54.5 × 28 × dpt 39 mm. Handle W 36 mm, H 20 mm. Mass 212g. Unstratified, Trench 15.

RT: Fractured angular sub-rectangular fragment of mid-grey to pale-grey highly vesicular vitrified ceramic or fuel ash slag. Low density. Based on the consistency and appearance of the crucibles from the site, it is possible that this is a fragment of a thick walled, heavily vitrified crucible wall. Remaining L 27 mm, W 17 mm, T 15 mm. Wgt 5.92g. Context [1150], mixed ashy deposit overlying Hearth 5 (Phase 6/7).

RT: Eight fractured and angular fragments of mid to dark-grey low-density, porous vitrified ceramic; very little heat-affected clay surviving on the surfaces, which appear to have completely weathered away leaving only the vitrified skin. Probably fragments of heavily vitrified crucible but too fragmentary to confirm. Wgt 7.12g. Context [1113], hearth debris rich tumble from Hearth 7 (Phase 8).

## 15.6 The non-ferrous metalwork

*Dawn McLaren & Natalie Mitchell*

Despite the presence of multiple crucible fragments amongst the assemblage from BLoM no copper-alloy casting debris was recovered and only a single small copper-based item was present. This takes the form of a tiny, narrow, annular bead (SF314) (Figure 15.19) which was recovered during soil sample processing from hearth debris [1018] from the primary hearth in ST4. Careful cleaning during conservation, accompanied by x-radiography, enabled details of the bead's form and production method to be understood. It has been made by rolling a very fine, flattened sliver or wire of copper-alloy around on itself then skilfully flattening the faces around the central circular perforation by light hammering. No

verdigris corrosion product is present, presumably halted by the anaerobic conditions of the deposit.

The recovery of the bead in ST4 relates to Episode 2 activity. ST4 was built no earlier than *circa* 420–415 BCE and more likely around the turn of the century *circa* 400 BCE. The extent of surface alteration post-deposition and the minute size of the bead make it difficult to establish if the absence of distinctive evidence of wear means that it was unfinished but its recovery from the ash of Hearth 1 certainly lends weight to the suggestion that it may have been lost amongst the hearth debris during the final stages of its production.

No ready parallels for a copper-alloy bead of this size are known amongst the current corpus of Iron Age ornaments from Scotland.

### 15.6.1 Catalogue

SF314: Minute annular bead, perhaps a spacer, produced from a thin sliver or flattened wire of copper or copper alloy, rich dark brown in colour with flecks of a rich surface sheen visible under magnification. x-radiography suggests the bead was produced by wrapping and rolling a thin, flat, sliver of metal around a fine cylindrical form, producing a wedge-shaped profile with vertical sides and narrow circular perforation (Diam 1.3 mm). Both faces around the perforation are reasonably flat; slight lipping of the exterior edges on both faces, particularly where the bead is thinnest, create a concave channel around the middle of the bead and suggest the flattening of the faces was achieved by careful hammering. There is also a small dent on one of the flat faces, toward the outer rim. Diam 2.7 mm, T 0.3–0.7 mm. Wgt 0.01g. Context [1018]. ST4.

## 15.7 The ironwork

*Dawn McLaren*

### 15.7.1 Introduction

Only one iron object was recovered during excavations at BLoM; other candidates proved to be natural iron-rich concretions. SF003 is a substantially intact but damaged ploughshare tip, found in ST1, in [002] a deposit consisting of multiple active floor surfaces immediately under the topsoil. This single item contributes significantly to our understanding the site's function and helps to illustrate the agricultural activities that took place in its vicinity during the Iron Age, as evidenced by the substantial macroplant assemblage. What makes this find even more important is the general rarity of iron objects from secure Iron Age contexts in SW Scotland (Hunter et al 2018: 208).

### 15.7.2 Discussion

During his early investigation of possible prehistoric features at BLoM, Munro noted the presence of 'masses of



Figure 15.19. Copper alloy bead SF314.

corroded iron and vitreous slag' (1885, 83). This provides a tantalising suggestion of the former presence of metal artefacts and possible metalworking debris in the vicinity of the settlement but, as none of this material was retained, no further comment is possible. The general paucity of iron objects from the current excavations at BLoM fits a pattern that is widely reflected across Iron Age lowland settlement sites in Scotland. This is particularly apparent in SW Scotland and Wigtownshire more specifically, where only a handful of sites have produced iron objects or ironworking debris, implying most of the iron in use at this time was either recycled in prehistory or has corroded over time (Hunter et al 2018: 208). Where iron objects do survive on SW Scottish sites, they are often recovered from special contexts, suggesting purposeful deposition rather than casual loss.

Iron object SF003 (Figure 15.20) is consistent in form and size with a ploughshare tip of a type categorised by Manning as a 'flanged share' (1964), though he later re-categorised them as share tips as they are not shares complete in themselves, but the iron tips intended to cover and reinforce the wooden shares (1985: 43). In use they would have been fitted over the front of the wooden foreshare of a bow ard; the shorter examples, like that from BLoM, fitting onto the very tip (*ibid*: 43).

Bow ards consist of five main components (Figure 15.21): the main curving beam, the foreshare, mainshare, ard-head and stilt (Glob 1951; Fenton 1968: fig 2).

The mainshare and the foreshare would have been inserted through an aperture at one end of a curving beam, with a separate stilt extending out behind the beam (Crone 2018b: 94). The draught animals were yoked at the other end, pulling the share which would have cut through the soil at an angle and the direction of the ard could be controlled by using the stilt (*ibid*). Long linear

channels on the upper surface of wooden mainshare heads, such as that from Milton Loch, Kirkcudbrightshire (C M Piggott 1953; Fenton 1968: 150–151, fig 3a), appear to have been created purposefully to allow the shorter and narrower wooden foreshare to fit closely on top of the mainshare (Raftery 1996: 270, fig 393, 1). In this configuration the foreshare helps to protect the main share from excessive wear (*ibid*: 150). Interestingly, no channel to neatly accommodate the base of the foreshare was noted on the arrow-shaped head of the wooden mainshare found at Cults Loch, Wigtownshire but this may be a reflection of its unused condition (Crone 2018b: 96, illus 74).

Although reinforcement of the foreshare by addition of an iron shoe or tip is not essential, the addition of an iron component would reduce wear to the tip of the shaft and potentially enhance the effectiveness of the share by increasing its ability to withstand stony or hard soils. Asymmetric wear and damage noted on the BLoM implement is mirrored by the pattern of wear observed on earlier prehistoric stone ard points as well as later prehistoric iron bar shares, share shoes and share tips (Rees 1979).

Flanged ploughshares and ploughshare tips are well attested in the Iron Age, and more rarely from the Roman period (Manning 1985: 43) but they continue in use into the medieval period (Goodall 2011: 77, 84, fig 7.2, nos. F3–5). Although similar in form to Iron Age and Roman examples, the medieval share tips noted by Goodall (2011) are substantially larger in size than prehistoric and Roman examples and are not directly comparable to the share tip discussed here, ruling out a later date for use and loss of the example from BLoM.

An almost identical iron share tip to the Black Loch example comes from Hod Hill, Dorset (Manning 1985: 43, no. F2). Both examples are similar in size: the Black Loch share tip measures 145 mm in length compared to the Hod Hill example at 142 mm in length (*ibid*: 43) and both comprise a short tip of almost oval cross-section with a long, open but asymmetrically damaged socket. A similar but slightly larger share tip comes from Frilford, Oxford, deriving from early Iron Age levels (Payne 1947: 89, fig 1:1). One significant difference between the Hod Hill, Frilford and Black Loch examples is a possible nail hole on the latter object, revealed during investigative cleaning. The BLoM implement would have gripped the beam of the foreshare using the flanged edges and was then additionally secured with a nail. Manning notes that the use of nails to fasten iron share tips in place is very rare and casts doubt on their identification but offers no alternative interpretation of their possible function (1985: 43). The addition of a nail fixture on the Black Loch example could be evidence of a repair.

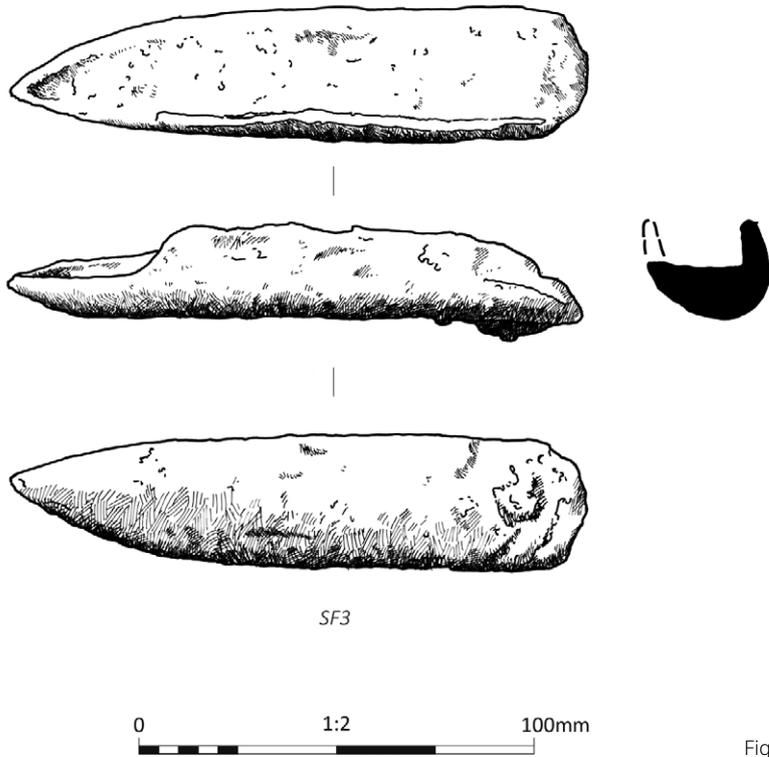


Figure 15.20. The iron foreshare tip SF003.



Figure 15.21. 3D reconstruction of a bow-ard based on the Donnerupland ard (Reynolds 1982). The mainshare is modelled on that from Cults Loch 3 (Cavers & Crone 2018: illus 74 & 75).

### 15.7.2.1 Scottish cultivation implements

In a review of early and traditional cultivation implements in Scotland, Fenton usefully summarised later prehistoric and later Scottish examples of iron share components, including wedge-shaped shoes and flanged share tips (1963). These were mostly Roman Iron Age examples, including those from a hoard at Blackburn Mill, Berwickshire (S Piggott 1953: 47, fig 12: B3; Fenton 1963: 271–272, fig 4:1), Traprain Law (Burley 1956: 212, fig 7: 479–480; Fenton 1963: 272, fig 4: 2 & 3), Eckford hoard (S Piggott 1953: 27, fig 5: E10; Fenton 1963: 272, fig 14:5), and from A Cheardach Bheag wheelhouse, South Uist (Fairhurst 1971: 102, pl 12). The Blackburn Mill share tip is most similar in form to that from BLoM but is much stouter and the flanges that flank both tapering edges continue to envelope the rounded tip of the blade, unlike the Black Loch example. The Blackburn Mill share was discovered as part of a metalwork hoard of Roman Iron Age date which comprised multiple iron tools, household fittings and items of horse equipment alongside agricultural tools such as a peat-spade and a possible second spade shoe (S Piggott 1953: 47; Fenton 1963: 271–272, fig 4:1).

The discovery of an unused arrow-headed wooden mainshare from the crannog at Cults Loch, Wigtownshire (Crone 2018b: SF22) prompted a review of wooden ard components in Scotland (Crone *ibid*: 94–98). This example and the BLoM iron foreshare tip belong to a European-wide group of long-shafted ard shares with arrow-shaped heads (*ibid*: 94), most of which date to the 1st millennium BCE (Raftery 1996: 270–272). Including the example from Cults Loch crannog, there are five ard shares from Scotland: one from Milton Loch crannog (C M Piggott 1953) already mentioned, two from Virdifield, Shetland (Rees 1979: 44; Murray 2011) and one from Dundarg, Aberdeenshire (Rees 1983). Two beams from bow ards are also known, from Virdifield, Shetland and Lochmaben, Dumfries and Galloway, both of which have also provided 1st millennium BCE dates (Rees 1979: 44; Murray 2011: 40). Although the corpus of both wooden ard share components and unambiguous iron ard shares or shoes from early and middle Iron Age contexts in Scotland is limited, these examples outlined above demonstrates how valuable the BLoM iron foreshare tip is in augmenting the existing picture.

### 15.7.2.2 Context of the find

The share tip was recovered from a layer of decayed occupation material [002] that overlies ST1. It is difficult to pin-point the chronology of its use and abandonment with certainty but stratigraphically, it post-dates the occupation of ST1 (Episode 1) and could, therefore, be related to later activity on the settlement (Episodes 2 or 3), any time between *circa* 400 BCE to the late 3rd century BCE. It is difficult to know whether the tip was deliberately deposited or represents a

casual discard of a broken object on abandonment of the site. The loss of the flange from one edge certainly suggests that it was no longer functional. It is assumed, due to the asymmetrical wear, that the damage occurred as the result of use.

### 15.7.2.3 Conclusion

The iron foreshare tip from BLoM is a significant addition to the known corpus of 1st millennium BCE agricultural implements from Scotland and its context suggests a broad date range for production, use and deposition occurring sometime between the 4th and late 3rd centuries BCE. This tool would have been fixed to the tip of the wooden foreshare of a bow ard, used to break up soils to prepare the land for cultivation, an activity for which there is abundant evidence within the macroplant record from the site (Chapter 11.5.2). It is a rare survival of an Iron Age agricultural tool as well as a material type which is rarely represented within Iron Age assemblages from south-west Scotland.

### 15.7.3 Catalogue

*SF003*: Iron ploughshare tip, substantially intact but damaged. Elongated oval blade with wide rounded end perforated by a small square nail hole (W 5.5 mm) to enable fixture to the wooden shaft of the foreshare. The blade gently tapers along its length to a rounded tip, oval in cross-section. Investigative cleaning of the surfaces has shown that one long edge has been flattened and thinned along much of its length (L 105 mm) to create a thin open flange but the curving edge of this feature has been damaged. It survives to a height of 23.5 mm. This gives the widest end of the blade an L-shaped profile. No corresponding flange survives on the opposing edge; x-radiography shows damage but this is not immediately apparent on the surviving object due to the extent of remaining corrosion products, and it is likely that a symmetrical flange once existed on this damaged edge. L 145 mm, W 34.5 mm at rounded end, T 10.5 mm. Context [002].

## 15.8 The glass

### *Dawn McLaren*

Although too small a fragment to allow precise identification of form, size or date, a small fleck of translucent dark blue glass, probably detached from the rounded surface of a cobalt-blue glass bead, was recovered during soil sample processing from the soil matrix of a spread of stones [203] lying in the area between ST1 and ST2. This stone spread is likely to be part of the Episode 2 activity which immediately post-dates ST2 and began in or by 415–390 cal BCE and ended in 400–330 cal BCE.

Blue annular and globular beads classified by Guido (1978) as her groups 6iv and 7iv, are long lived types ranging

Type	Number
Pebble	9
Split nodule	1
Flake	6
Bipolar flake	1
Split flake	2
Spall	1
Amorphous core	1
Chunk/ shatter	4
Chips	4
Triangle microlith	1
<b>Total</b>	<b>29</b>

Table 15.13. Flint: the assemblage by type.

in use from the early Iron Age (*circa* 6th century BCE) into the early medieval period (*ibid*: 67-68). Examples from Wigtownshire include those from Luce Sands (*ibid*: 161) and Castle Loch (Stevenson 1976: fig 1 no 5; Guido 1978: 161), while fragments of blue glass or enamel were noted at Rispain (Haggarty & Haggarty 1983: 45). More recently, an annular blue glass bead with white wave-trail decoration of Guido's Group 5a was found within a decayed floor horizon at Cults Loch crannog (Hunter 2018). Although the Cults Loch bead came from a decay horizon, it was argued to be contemporary with activity on the crannog and is likely to be around 5th century BCE in date, providing valuable early dating evidence of this bead type in Scotland (*ibid*: 106).

#### 15.8.1 Catalogue

SF02: Small fleck of translucent dark blue glass, possibly detached from the surface of an annular or globular glass bead, retains gently rounded original surface and small bevelled facet which may be the edge of a conical perforation. The glass is vesicular with an inclusion of a white vitrified material. L 5 mm, W 4 mm, T 2 mm. 0.01g. Context [203].

## 15.9 The lithics

*Rob Engl*

### 15.9.1 Introduction

A small assemblage of only 29 lithic artefacts was recovered during the 2013 to 2019 excavations (Table 15.13). All of the material was retrieved from stratified contexts.

The entire collection was macroscopically examined and a general characterisation was undertaken. General classifications and descriptions of the artefacts were based on those proposed by Ballin (2000). A complete catalogue of all the lithic material is deposited with the archive.

The assemblage is composed of honey brown and pale grey flint, with many of the artefacts displaying a thick, smooth water-rolled cortex. It is likely that the material is derived from nearby secondary coastal deposits and includes a high proportion of Antrim-type material.

The majority of the artefacts show some patination in the form of cream 'blooms', with eight showing signs of heat treatment in the form of slight crazing and colour change.

### 15.9.2 The assemblage (Table 15.14)

With the exception of the microlith (SF151) the assemblage is composed entirely of debitage including flakes, chunks/shatter, chips and pebbles. A single amorphous flake core (SF162) and a bipolar flake (SF289) were also identified.

The retrieval of such a small assemblage makes the discussion of technological aspects such as manufacture relatively difficult. Nevertheless, all of the flakes display crushed platforms and pronounced bulbs of percussion, suggesting that they were produced using a simple hard hammer technique.

The presence of the amorphous core (SF162; Figure 15.22) and bipolar flake (SF289) coupled with a lack of secondarily modified material suggests a utilitarian and expediently produced assemblage for use in localised tasks.

### 15.9.3 Distribution

The majority of the assemblage was retrieved from hearth, surface or floor deposits in the Episode 1 and 2 roundhouses, and therefore can be closely associated with activity occurring within the settlement. The material located within the hearth debris and associated deposits suggests that activities were being undertaken in close proximity to the hearth. These activities required the production of simple flakes. The heat-affected pebbles (SF199), chunk/shatter (SF17) and flake (SF02) may be associated with the remains of a discarded foundation or cooking surface. However, it is equally likely that they may have been used in cooking activities such as water heating. The material recovered from the floor and surface deposits are likely to have become incorporated in the deposit either through accidental loss or intentional disposal.

The identification of a triangular microlith (SF151; Figure 15.22) initially appears problematic for the attribution of a firm Iron Age date to the lithic assemblage. However, this artefact was recovered from a deposit under a cobbled surface associated with the Episode 2 palisade and as such is residual.

The pattern of deposition at BLoM is very similar to the nearby crannog site of Cults Loch 3 where the majority of the lithic material was thought to relate to dumps of household detritus and floor deposits located within the settlement (Engl 2018: 115).

Episode	Structure	Context	SF No.	Type	Quantity		
1	ST1	2	14	Primary flake	1		
		6	2	Secondary flake	1		
		8	4	Secondary flake	1		
		36	17	Chunk	1		
1	ST2	204	16	Split flake	1		
		210	56	Split nodule	1		
		210	58	Burnt chip	1		
		231	37	Spall	1		
		241	112	Tertiary flake	1		
		244	111	Secondary flake	1		
		250	84	Chunk	1		
2	ST3	1109		Pebble	1		
		1113	199	Burnt pebbles	5		
		1116	214.1	Pebble	2		
			214.2				
		1116	214.3	Chips	3		
		1743	304.1	Chunk	1		
		1743	304.2	Split flake	1		
		1743	289	Bipolar flake	1		
		2	ST4	1003	162	Amorphous core *	1
		3.2	Rampart 2	723	186	Pebble	1
616	151			Triangular microlith*	1		
3		612	133	Burnt shatter	1		
		713	164	Chunk	1		
u/s		topsoil	126	Secondary flake	1		

Table 15.14. Flint: the assemblage by feature.

#### 15.9.4 Discussion

BLoM is a securely dated Iron Age wetland site, and its small lithic assemblage can be directly compared with those occurring on similar excavated sites in SW Scotland.

The lithic assemblage appears to link crannog sites such as Cults Loch 3 (Engl 2018) and Dorman's Island (Engl 2011) with more terrestrial locations. Archaeological evidence for flint working during the Iron Age is most often explained in terms of residuality. However, the work of Humphrey & Young (1999) has sought to clarify just how and what the lithic material is residual from. This has been achieved using a firm contextual base in which a recurring range of attributes can identify later prehistoric lithic assemblages. Their work, together with Humphrey (2004, 2007) and McLaren (2009) is showing that a consistent range of expediently produced and

utilitarian lithic material is being produced within Iron Age contexts across Southern Britain and recorded on Iron Age wetland sites within SW Scotland.

Similar small locally procured assemblages of lithic material all displaying a restricted range of artefact types have been recorded at the crannog sites of Buiston (Finlayson 2000: 143) and Lochlee (Munro 1885: 108–109) in Ayrshire and Dorman's Island (Engl 2011: 93), and Cults Loch 3 (Engl 2018: 114–116) in Dumfries & Galloway. Though associated stratigraphic information on these sites is often scarce or absent, recent excavations such as at Cults Loch 3 have shown that firmly contexted lithic material is present on such sites. The excavations at Black Loch show that lithic material is a common if unglamorous and utilitarian component of Iron Age material culture in wider contexts.

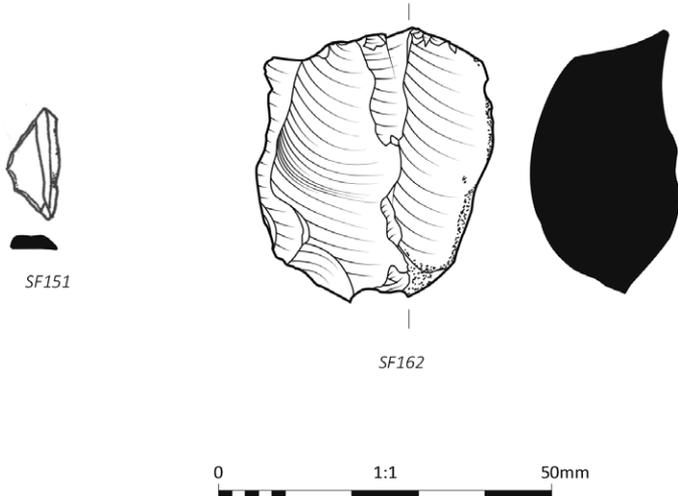


Figure 15.22. Lithics; microlith SF151 & core SF162.

## 15.10 Synthesis of the material culture from BLoM

*Dawn McLaren*

### 15.10.1 Introduction

From the outset of the BLoM project, the remarkable preservation of structural elements of the timber buildings was recognised as immensely significant for the information they present about roundhouse construction and longevity during the Iron Age that is generally not observable on most contemporary terrestrial sites in mainland Scotland. A similar promise was held for the artefact assemblage; it was hoped that the BLoM site might allow avenues to a better understanding of gaps and biases in artefact assemblages from Scottish roundhouse settlements, as well as enabling closer interrogation of the distribution of objects in association with them, allowing the relationship between the objects and the structural elements of the roundhouses to be observed and interrogated in a way that is simply not possible where the organic elements of the structure have degraded.

The objects from BLoM have provided valuable insights into aspects of Iron Age material culture that are so far unique to the site and have enabled the presentation of broad conclusions about artefact use and resource procurement as well as providing a platform from which to delve into the murky waters of aspects of Iron Age cosmology, symbolism and ritual practice in the domestic sphere. But many questions remain to be answered, particularly due to the general paucity of midden-rich material within the excavated area, which suggests that the day-to-day disposal of waste was undertaken either in areas of the settlement not investigated in the trenches, dumped into the waters of the loch, or spread across the fields that provided the settlement with its abundance of grain.

In this section, the finds from the site will be considered in relation to several key themes: raw materials and resources; biases in the archaeological record and the identification of genuine gaps; agriculture, its evidence and importance to the community; craftworking and activities across the settlement; decoration and personal objects; and the use of artefacts in symbolic practices within the domestic sphere.

A study of the material culture of Iron Age Wigtownshire (Hunter et al 2018), the county in which BLoM is situated, forms a valuable benchmark for consideration of the BLoM assemblage in its wider context.

### 15.10.2 Raw materials: biases in the record or genuine absence?

The majority of items are directly related to everyday subsistence tasks and activities undertaken within or around the roundhouses during their use, namely the processing of grain into flour for cooking and other tasks centred around the hearths, as indicated by the distribution of cobble tools and worked flint. Like all archaeological assemblages, the BLoM finds are distorted by patterns of survival. Durable and almost indestructible, stone dominates the assemblage in every episode and phase of the settlement whilst other once-abundant Iron Age materials are conspicuously absent.

The relative lack of metal objects, especially iron, is a pattern at BLoM that echoes across the region (Hunter et al 2018: 208) where strongly acidic or peat-rich soils do little to promote the preservation of this vulnerable material type. In addition, the value of copper-based alloys and iron as a raw material during the middle Iron Age would have encouraged routine recycling of the metals that could not be repaired, making many commonplace metal tools almost invisible in the archaeological record. The proxy record of tool marks on items of worked bone, antler and wood are invaluable in filling the gaps in the surviving record, attesting to the use of metal knives, gouges, drill bits, adzes

and axes (Chapter 14.5). The presence of whetstones at BLoM also attests to the sharpening and maintenance of metal blades where none survive.

This rarity makes the two metal objects from BLoM particularly significant. The small annular copper alloy bead is remarkable due to its diminutive size and the care taken in its production, but its size would have made it vulnerable to accidental loss. The iron foreshare tip or shoe presents a different story; this object appears to have been damaged and was then repaired. The repair may have subsequently failed leading to the loss of the iron shoe during use but purposeful deposition is possible.

Unsurprisingly, the waterlogged conditions at BLoM have promoted the preservation of organic materials but, despite the large area of the settlement excavated, the number of wooden artefacts remains small and no textile finds were encountered. A portion of a withy rope (SF215) and a birch bark roll (SF227) attest to the commonplace use of further natural resources that would have been abundant in the vicinity of the settlement.

Preservation of unburnt bone was generally poor on site. Worked bone and antler artefacts were also limited to only two items: a fragmentary and burnt long-handled antler comb and an object made from a large mammal rib that may be a drill or fire-starter handle or a net gauge. This general paucity in the worked bone record from the site reflects regional patterns of survival where artefacts of bone or antler are all but unknown (Hunter et al 2018: 198, table 20) and yet are likely to have been in routine use during the life of the settlement. This is in direct contrast to the waterlogged sites of Ayrshire where unburnt faunal remains and items of worked bone or antler are more abundant, albeit from contexts where the relative pH levels were raised in a way that encouraged their preservation (*ibid*; O'Sullivan 2000: 155).

The presence of a few pottery sherds, heat-affected clay and other items made from clay such as the thumb pot and crucibles is significant. Pottery in the region is virtually unknown after the late Bronze Age (Maxwell 1889: 226–267; Hunter et al 2018: 198) with only a handful of exceptions including some small sherds of pottery from the Iron Age palisaded enclosure at Cults Loch, tiny abraded fragments of fired clay from Cults Loch promontory crannog, and a small number of sherds from the enclosure at Whitecrook (*ibid*: 198); the latter may be late Bronze Age and those from the Cults Loch sites could also be residual earlier material. A similar explanation for the two small and abraded pot sherds at BLoM should not be ruled out but the abundant use of clay to line the hearths associated with the Iron Age houses, the intact thumb pot from below post-ST2 hearth belonging to Episode 2/3 and the crucibles found in and around ST3 are undoubtedly contemporary with the settlement. The use of clay at BLoM demonstrates that the general absence of pottery cannot be explained away as a lack of access to raw

material nor a lack of skill in forming objects from it. Rather, this must represent a cultural choice, with a preference for vessels made of other materials such as those of wood, bronze or leather; only the former survive. The general lack of pottery at BLoM and the region more broadly during the Iron Age suggests that local diet and cooking methods may have been quite different to other areas of the Scottish mainland where pottery is more routinely recovered (Hunter et al 2018: 217).

### 15.10.3 Agriculture

The ecofact record at BLoM amply demonstrates the importance of arable farming to the site economy (Chapter 11) and this is bolstered by the artefact assemblage, specifically the iron foreshare tip and the numerous quern stone fragments recovered. The recognition and recovery of saddle querns from Iron Age sites in the Wigtownshire region is unexpectedly rare (Hunter et al 2018: 199–200). The earlier survey of quern recovery from the region (*ibid*) concluded that querns are under-represented in the area in comparison to other regions of mainland Scotland. Issues of recognition, particularly of incomplete examples, is undoubtedly a factor in this pattern, as are retention policies in earlier excavations, but the general paucity of quern stones from this area appears to be real (*ibid*: 217). This has led to the suggestion that bread, using flour ground from grain on quern stones, was a less significant component of the local diet during the later prehistoric period than other regions and that cereal grains may have been incorporated into the local cuisine in porridges and stews rather than as flour-based products (*ibid*: 217).

The assemblages from both Cults Loch promontory crannog and BLoM stand out in contrast to this wider pattern. A total of six rubbing stones and five saddle querns (mostly fragments) were recovered from Cults Loch crannog (McLaren 2018) whilst at BLoM, five saddle querns and nine rubbing stones, one possible quern fragment and two multifunction tools incorporating possible use as rubbing stones were recognised, doubling the existing dataset for Wigtownshire. Are these sites unusual, or is the sparsity from other sites due to the antiquarian nature of most excavations?

At BLoM, there is a notable concentration of querns, rubbing stones and indeterminate fragments that could represent portions of either querns or rubbing stones from ST2, Episode 1. This could suggest that this structure had particularly close links to grain processing and raises the question of whether this structure was used differently to others on the site, where the association with quern stones was less numerous or entirely lacking.

Clearly the processing of grain at BLoM, as at Cults Loch crannog, was a key activity, perhaps undertaken at a larger scale and/ or for longer duration than on any other Iron Age excavated site in the region. Was the community at BLoM producing a surplus of grain and flour for trade and

distribution in the locale rather than just to service the needs of the settlement's population? Does the number of querns and rubbing stones simply reflect the longevity of the settlement's occupation? Or does the pattern of deposition of quern stones here at BLoM give querns a prominence not visible on sites with alternative traditions of depositional practice? These are questions raised by the data that remain to be answered.

It is well established that on some sites Iron Age rotary querns and fragments are regularly recovered in association with hearths, thresholds and built into structures in a purposeful and meaningful pattern, even if the reasons for this practice remain under debate. A similar practice involving saddle querns and rubbers has seen less consideration (but see Brück 1999, 2001; Pope 2003: 267 and Watts 2014 as notable exceptions) but is undoubtedly present during the Late Bronze Age and Iron Age. Some examples can be demonstrated at BLoM, including SF5 and SF11. Here we have multiple fragments of a robust saddle quern of some size and thickness, made from dense igneous rock, which although worn, was very far from being exhausted. The robust quality of the stone makes it unlikely to have been the victim of accidental breakage during use (see Heslop 2008 for discussion regarding Iron Age beehive querns) and yet it survives fragmentary and incomplete. Analysis of the breakage pattern suggests that the edges were first removed and then the stone shattered across the centre by a heavy percussive force. Some of the pieces of this smashed quern stone were then incorporated around Hearth 2 in ST1, forging a link between an implement of cereal processing with the central hearth of the home, itself an important symbol of the household. Indeed, it has often been argued that the agricultural cycle was pivotal to Iron Age cosmology and such a concept may have been mirrored not only by the life cycle of humans, but also of tools associated with grain processing (Hingley 1997: 23–26; Williams 2003; Bradley & Yates 2007).

Household implements in the form of quern stones associated with processing the products of harvest can be argued to represent symbols of agricultural fertility and may also have been tools to conceptualise the lifecycle of household, the fecundity of the family or success of the community.

#### 15.10.4 Crafts and activities at BLoM

Agricultural production at BLoM was a key activity of the settlement throughout its duration, but none of the other crafts or activities in evidence (woodworking, skin or hide processing, textile production, non-ferrous and ferrous metalworking etc) appear to have been undertaken at a large scale. The duration and locale of these activities will be considered later in the distribution of the finds across the site.

##### 15.10.4.1 Woodworking

One of the most important strands of evidence for on-site crafts is that of woodworking. Although evidence of the working of wood is not unexpected on a waterlogged site, the high quality of craftsmanship on display on items such as the decorated bowl (SF219) and the yew baton (SF237) are remarkable. Most items in the assemblage are prosaic but they stand out due to their fineness, as does the offcut (SF291) from a finely dressed oak plank, which together hint at the high quality of portable artefacts and structural elements alike.

The most spectacular of the finds from the settlement is undoubtedly the substantially intact but now deformed decorated bowl (SF219) recovered from the midden [800] relating to Episode 1 activities. The bowl, in form and decoration, is unique amongst the panoply of surviving Iron Age wooden containers, leading to a question of whether it could have been made and used on site or was imported onto the settlement from further afield. In the absence of any ready parallels for the bowl, this is a question that cannot be definitively answered. However, the discovery of a turning waster (SF298) from ST3 (Episode 2) in the same species of wood used to make the bowl suggests that it is quite possible that the bowl was a product of on-site working.

##### 15.10.4.2 Textile production

Undoubtedly BLoM's most enigmatic object is the yew baton (SF237) recovered from flooring deposit [1153] in ST2. It clearly represents a single component from a spindle-turned composite object, possibly some kind of frame. The closest items in terms of form and method of production are associated with weaving and textile production. It is thought that the baton may be part of the frame for a tapestry or similar. The long-handled antler comb (SF188) discussed in more detail below is also an implement that may be associated with textile production, potentially used in conjunction with weaving braids but a role in personal grooming cannot be ruled out.

Although three possible stone spindle whorls (SF132, SF160 & SF254) are present only two, SF132 and SF160, were finished and used. SF132 had been decorated with closely spaced radial incised lines across its face. It had been heat-damaged as though thrown on the fire after use and was found amongst an active floor surface [209/210] around Hearth 1, relating to post-ST2 activity. SF160 was also found in a deposit surrounding a hearth, this time the Phase 8 hearth in ST3, suggesting that the spinning of yarn was a task undertaken around the fire. The third example, SF254, appears unfinished and that another disc-shaped piece of slate (SF301) may be a roughout for a whorl. Both of these were found in association with ST3, the former from topsoil in the SE quadrant and the latter, from a floor surface [1743] relating to Phase 2/3.

#### 15.10.4.3 Bone and antler working

The process of fashioning bone and antler into various objects and the use of those tools and implements made from these durable materials was probably a day-to-day practice and yet their limited survival at BLoM restricts the inferences that can be made about their use and practicality. The long-handled antler comb (SF188) is a fine and delicate example that preserves valuable tool marks from production on its surfaces. Rather than the teeth being sawn to shape, they appear to have been cut from both faces, creating teeth with an unusual cross-section. The likely association of this comb with textile production is of interest in light of the other evidence of textile working on site. The notched rib (SF230 and SF231), interpreted here as a possible drill or fire-starter handle or net gauge, has been made out of bone that would have been readily available following the butchery of carcasses for meat. Like the antler comb fragment, the bone appears to have been cut to shape rather than being sawn.

The production of probable bone/ antler points and pins, and potentially pins of metal, is attested on site by whetstone SF166 which displays scores on the surface, potentially made by abrading the shanks and tips of these objects across the surface to shape and finish.

#### 15.10.4.4 Ferrous metals and metalworking

The general paucity of iron objects from BLoM is not surprising as this pattern is widely reflected across Iron Age lowland settlement sites in Scotland. This is particularly apparent in SW Scotland and Wigtownshire more specifically where only a handful of sites have produced iron objects or ironworking debris, implying most of the iron in use at this time was either recycled in prehistory or has corroded over time (Hunter et al 2018: 208). Where iron objects do survive in the area, they are often recovered from special contexts suggesting purposeful deposition rather than casual loss. The iron foreshore tip (SF003) was recovered from a layer of decayed occupation material [002] that overlies ST1 relating to Episode 1 activity. Given the rarity of casual discard of iron during this period, it is probable that this object was purposefully deposited during the refurbishment of the many floor levels that [002] represents.

The recovery of small quantities of ironworking waste is also of interest as it demonstrates that at least one episode of small-scale ironworking took place on the site and that the foci for this activity appears to have taken place in conjunction with Hearth 7 in ST3. Although the locus for blacksmithing is typically identified by concentrations or spreads of micro-debris in the form of hammerscale flakes or spheres which are released as a result of the impact of the smith's hammer on the hot bloom or iron (Dungworth & Wilkes 2009), at BLoM the recognition of flecks of slag and fuel residues amongst the trampled floor surfaces identified by soil micromorphological analysis

has proved a valuable strand of evidence to supplement the macroscopic characterisation of the slag assemblage. Further ironworking waste incorporated within hearth debris [723] was used in the construction of the rampart during Episode 3. It is possible that this is earlier waste relating to the Episode 2 metalworking activities which was incidentally incorporated in the rampart but it could also imply the presence of a later, second locus of ironworking taking place somewhere in the vicinity but outside the boundary of the investigated area.

Further evidence for the maintenance of iron blades lies in the proxy record provided by the small quantity of whetstones (SF28, SF166 & SF288). These would have been used to sharpen the dulled cutting edges of knife blades and similar cutting tools.

Although this evidence of ironworking at BLoM is scant it is of interest as it attests at least to the episodic maintenance and repair of iron implements and tools. The forging of new objects of iron cannot be ruled out. The earlier discovery of 'masses of corroded iron and vitreous slag' (Munro 1885: 83) from the loch provides a tantalising suggestion of the former presence of metal artefacts and possible metalworking debris in the vicinity of the settlement. However, as none of this material was retained for further study, no comment on the form, function or date of these finds can be offered.

#### 15.10.4.5 Non-ferrous metals and metalworking

Evidence of copper-alloy working in the region is rare, making the well-stratified finds from BLoM an important addition to the existing small corpus from only four other sites (Hunter et al 2018: 208–209). This regional rarity emphasises how restricted this craft was during the Early and Middle Iron Age despite access to local metal resources (*ibid*: 209).

At BLoM the earliest evidence of non-ferrous metalworking comes from the Episode 1 midden [800] and consists of a large globular and handled crucible, heavily vitrified by use. A further handled crucible fragment of the same form, also heavily vitrified and coated in copper-containing residues, came from the northern half of ST3, Episode 2, alongside a tuyère fragment (SF251). Both of these crucibles are large in size, bearing a resemblance to the heavily vitrified pear-shaped example from Dowalton Loch (Hunter et al 2018: 208, *illus* 159b). The third crucible from BLoM, SF210, is also large in size but is of triangular form. It is similar in shape but larger than examples from Luce Sands and Airrieoland crannog (*ibid*: 208). It is curious that the triangular crucible at BLoM is vitrified, demonstrating that it came into prolonged contact with the heat of the fire but no metalliferous deposits were detected on the surfaces during scientific analysis. This is all the more intriguing due to its remarkable recovery, found in an upright position, on the Phase 7 sub-floor

[1127/1128] of ST3. There can be little doubt that it was deliberately placed in this position, perhaps as an offering made during the construction or refurbishment of the plant-litter flooring.

Also relating to Episode 2 activity is the recovery of the little copper-alloy bead amongst the hearth debris of the primary hearth in ST4. There was no other evidence of metalworking taking place within this structure, but its lack of wear implies it may have been lost in the process of manufacture.

These finds create a picture of small-scale, short-lived, episodic metalworking spanning a few generations between *circa* 435 BCE to *circa* 360 BCE. The focus of this activity in Episode 2 is ST3. Given the gap in time between the casting event that resulted in the disposal of the crucible fragment in the Episode 1 midden and those deposited at various phases of use of ST3, the similarity in form of the large globular handled crucibles – a rare type, but not without parallels – indicates a continuity of process and technology through time. Could these episodes of metalworking be the result of occasional visits from local smiths as the need arose, perhaps drawn to the settlement due to its strategic position and access to abundant natural resources?

#### 15.10.4.6 Skin/ hide processing

Evidence of skin or hide processing is represented by a handful of cobbles used as smoothers which are covered in dark staining from animal fats transferred on the stones from use as hide rubbers. These have been made on simple unmodified water-rounded cobbles. SF85 was found in association with ST2, from [244] relating to Episode 1, Phase 3. SF25 came from the from Episode 2 activity over ST2. The third example (SF297) was associated with ST3 associated with Episode, Phase 2/3 activity. The sparsity of skin/ hide processing tools is noteworthy.

#### 15.10.4.7 Stone working and the use of stone on site

The identification of two possible unfinished spindle whorls within ST2 and ST3 implies that expedient stone working took place at the settlement as the need arose. The same can be said for much of the lithic material amongst the assemblage. At least one Mesolithic microlith (SF151) was recognised but the remainder of the chipped stone (eg SF162 and SF289) recovered is best seen as contemporary with the use of the structures and represents expedient use of flint throughout the duration of settlement. Much of the chipped stone was located within hearth debris, suggesting that the flints were being used in close proximity to the hearths, perhaps in association with cooking activities, preparing food or the processing of hides or plant material around the fire.

As noted in the discussion of agriculture, the number of quern stones and rubbing stones amongst the assemblage

is regionally significant and the manner in which some were treated after use speaks of deliberate destruction or damage and provides hints of purposeful deposition.

The remainder of the worked stone is dominated by cobble tools used for a variety of functions which display a spectrum of levels of wear and a multitude of different use-wear facets. These are predominantly formed on water-rounded cobbles or pebbles that must have been gathered from a local water source and brought to site with the intent to use them as tools or pot boilers. The analysis of wear patterns of the cobble tools has enabled the recognition of particular idiosyncrasies of wear (see ST3 especially) which are either reflective of the specific manner of use by an individual or the particular task that the tool was put to, but it falls short of identifying the precise function that the tools were employed in, a limitation observed elsewhere (McLaren & Hunter 2014: 284).

In addition to the worked stones, small quantities of unworked cobbles identified as ‘manuports’ intended for use as tools and large numbers of small unworn water-rounded pebbles were noted during the excavation. The pebbles were dominated by small ovoid stones of white and off-white quartzite and were routinely observed amongst sub-floor wattle screens of all the roundhouse structures, either in caches or in alignments respecting the radials and weave of the screens. The pale colour of the pebbles stood out strongly against the dark humic peat and were noticeably absent outside of the roundhouses. The significance of the white pebbles will be discussed in more detail later in considering the distribution of finds across the site.

#### 15.10.5 Decoration, adornment and personal objects

In an assemblage dominated by tools and practical items, decoration is rare, as are finds that could be considered ‘personal’ objects. Embellishment of objects in the form of incised decoration is restricted to two items: the spectacular wooden bowl (SF219) with its unique series of geometric motifs and lines of punched dots, and a sandstone spindle whorl with sets of incised lines which radiate outwards from the central spindle hole across the flat faces, extending on to the vertical sides. Whilst we can envisage the decorated bowl being admired for its beauty, fine design and skilled manufacture during use, the embellishment of the spindle whorl is much simpler and more crudely produced but its application to a dynamic object that would have been spun in a rotational motion during use would have altered its appearance whilst in operation. Similarities in decoration between stone spindle whorls and rotary querns, both disc-shaped objects which rotated during use, have been highlighted previously (McLaren & Hunter 2008: 119) and these motifs seem, in part at least, to emphasise the movement of the object.

Personal ornaments are also restricted to the single small copper-alloy bead, probably lost in the hearth during manufacture, and a spall from the surface of a cobalt blue glass bead. Although neither of these objects are flashy, high-status ornaments, they provide valuable insights into personal choices of ornament type as well as conforming to local practices where beads, particularly those of glass, are the most common type of jewellery to be found on Iron Age sites in the region (Hunter et al 2018: 210–222, table 22).

Items that might be considered ‘personal’ objects used or worn by an individual as opposed to a general tool are rare amongst the assemblage. Concepts of ownership of objects in prehistory should always be considered with caution. For example, with our modern and western preconceptions of ownership and the perceived cultural value of objects, we may consider items such as the delicate and finely made antler comb as an item belonging to an individual rather than one shared by an extended family or community due to the care in its production. In contrast, we may see a cobble grinder or saddle quern as a communal resource. However, we have no way of truly assessing this with confidence. With this question in mind, how should we consider the wooden baton or decorated bowl? Could these also be considered personal objects? Examination of their contexts of discovery may shed further light on this question.

#### 15.10.6 Structured deposition at BLoM

The roundhouse interiors have, in general, been kept remarkably clean by virtue of repeated, frequent, and apparently routine removal and replacement of the plant litter floors, as demonstrated by ecofact and thin-section soil morphological analysis. This routine refurbishment creates a mechanism for any household detritus to be regularly removed with the organic flooring, preventing any casual build-up of artefact-rich waste deposits within the structures themselves. Although evidence of floor refurbishment was recognised in all of the BLoM structures, the pattern of artefact deposition provides useful insights into deposition strategies as well as the activities undertaken within the structures over time.

Those that cannot be easily explained as small items accidentally lost during production or use (eg the copper-alloy bead – perhaps falling into the ashes of the hearth in the final stages of production and not recovered) or casually discarded alongside hearth waste (as identified in deposits that make up the enclosing bank) merit further explanation. Are these artefacts left behind on abandonment of the structures as they were no longer perceived as valued objects? Or is their presence within the structures more meaningful? Have these objects been specifically chosen to be purposefully buried within the roundhouses?

It is well acknowledged that Iron Age settlements cannot simply be considered as a domestic setting where activities, and the objects associated with them, are set apart from ritualised actions (Büster 2021). Rather, the sacred and profane of the domestic sphere has long been understood to be remarkably intertwined, forcing us to consider the processes by which objects in such a setting came to be left behind. Previous studies of artefacts in later prehistoric domestic settings have amply demonstrated that although some items may have been lost during use or casually abandoned in the final days of occupation of the settlement, many artefacts from Iron Age roundhouses were deliberately deposited (Webley 2007). These deposits are often highly structured (Hill 1995; Garrow 2012) with similar practices being widely distributed across Britain and Ireland. These purposeful depositions of objects often accompany the construction of new structures (eg as foundation deposits) or on abandonment of structures or sites (eg as closing deposits) (Brück 1999). An important concept to understanding the BLoM assemblage and the multiple instances of potential structured deposition that are observed is that such acts can also occur at important transitional moments within the life of the household, marking the development of the ‘physical’ house and the natural cycles of the social ‘household’ (Büster 2021: 661–662).

Of particular relevance to BLoM, where the roundhouses, or at least their interior floor surfaces, have been repeatedly refurbished is Büster’s (2021: 663) concept of cyclical biographies of structures. With each refurbishment, a new opportunity would arise for aspects of social memory to be renegotiated, reaffirmed or replaced and this may help us to explain the practice of artefact deposition within the sub-floor levels. Such acts are best considered as transitional deposits, defined by Büster as those ‘marking significant moments of transformation within the life of a structure and its household’ (*ibid*: 664). Like the stone-built roundhouses at Broxmouth, East Lothian (Armit & MacKenzie 2013), each successive modification to the interior of the roundhouses at BLoM (eg the refurbishment of the floors and hearths), left the earlier structural fabric (the posts, walls and roof) intact, creating nested biographies told through the medium of artefacts and structural elements.

In order to interrogate the meaning of objects in such a setting, consideration of the cultural biography of objects – tracing the life history of an object from production, use, damage, repair and deposition or abandonment (Kopytoff 1986) – enables avenues into understanding the cultural significance of objects beyond their functional properties as well as relationships between people and objects (Joy 2009: 540). The concept of the cultural biography of objects also is founded on the proposition that ‘*as the meaning of objects is in part constructed through*

*their context*... *'the change of context results in a change of meaning'* (MacGregor 1999: 259). Objects and their meaning are tied with the construction and maintenance of social identities not just of the individual but of the family and the community as well as being fundamentally linked to the life cycle or 'use-life' of the household (Tringham 1994: 175, 1995: 98; Hoskins 1998; Gosden & Marshall 1999: 169; Joy 2009; Büster 2021).

This approach is not without its difficulties and limitations as outlined by Joy (2009: 543). Two key issues should be discussed with reference to the BLoM assemblage. The first is the perception that the significance and meaning of an object is fixed, passive and singular. MacGregor argues that the *'Maintenance of the material form of an object readily allows us to believe that it continues to represent the same thing and therefore holds the same meanings. ....the meaning of the object is not stable and may change with context'* (MacGregor 1999: 258). An object may become invested with meaning or gain significance through use, associations (with people or processes), performance or context (Gosden & Marshall 1999: 170) but may also embody a range of meanings for a variety of people. This creates potential ambiguity and provides an avenue to multiplicity of meaning in any interpretation surrounding the significance of objects and the meanings behind acts such as purposeful deposition. The interpretation of the cultural significance of objects and the circumstances that led to their deposition on a settlement are typically presented as a single inflexible hypothesis, influenced by the snapshot of evidence revealed by partial excavations. There is little room within traditional excavation reports to discuss or outline a variety of interpretations (Clarke 2004: 46–47) or even acknowledge the lack of tangibility that can accompany interpretation of such ephemeral acts and the complexity of beliefs that underpinned such actions for which we observe only the final stage. The second problem is that even if purposeful deposition of objects is evidenced, it is easy to create an assumption that the meaning behind the act was universally understood and accepted by the entire community and that the act of deposition held the same meaning or significance for all involved when this may not have been the case. With these caveats and limitations in mind, ample evidence is found amongst the BLoM assemblage for purposeful deposits that mark moments of transition in the life-history of the structures and settlement, but whether the deposits would have been known to everyone in the community or held a singular meaning for those 'in the know' is open to debate.

### 15.10.7 Distribution

Due to the character of the organic flooring deposits surviving within the roundhouses (Chapter 9.6.4) it has been possible to identify multiple lenses of degraded and conflated flooring material that macroscopically appeared to be a single deposit. As such, during excavation and at the

macro-level it was not possible to distinguish between these distinct re-flooring episodes; each 'phase' of a structure's use may well encompass a series of sequential re-flooring episodes. The type and quantity of plant material deposited in each floor surface renewal and the rapidity with which each surface was buried following its deposition created variation in the sedimentary sequence but this was often only observable through post-excavation analysis. Although the following discussion attempts to consider the distribution of objects by Episode, Structure and Phase, this issue with conflated floor surfaces undoubtedly affects the accuracy of any discussion on the phasing of deposition at BLoM. As an example of this problem, the yew baton (SF237) was recovered from floor deposit [1153/1743] which consisted of 0.6 m of organic flooring material; soil micromorphological analysis determined that this consisted of at least 11 separate sedimentary units, each equating to the vestiges of a refurbished surface. It is now impossible to determine which of the lenses of flooring the baton was directly related to, due to the levels of degradation and conflation of the surrounding organic materials. With this in mind, a summary of the distribution of the BLoM finds will be presented by episode and structure with reference to phasing where possible.

#### 15.10.7.1 Episode 1

##### ST1

The material culture from this structure was scant and consists of a single fragment of a pottery vessel (SF013) from [018], a scatter of struck lithics indicative of expedient production and use, and a small assemblage of coarse stone tools. A possible polisher (SF15) was recovered from hearth clear-out [035] from Hearth 3 and a combination grinder/ rubbing stone (SF10) came from stony surface [008]. Also, from [008] were a small group of unworked egg-shaped or ovoid water-rounded quartzite pebbles (SF16) collected as a sample of a much more numerous spread found across the excavated area of the structure. Although there is evidence of deliberate placement of such stones in some of the other structures, no distinct pattern to the distribution was recognised in ST1.

The most significant of the finds from this structure are a number of fractured fragments of an incomplete saddle quern, SF005 and SF011, recovered from hearth clear-out [004] around Phase 3 Hearth 3. The quern fragments represent only a small proportion of the original stone and the pattern of breakage, as already discussed, is inconsistent with accidental damage. Rather, the stone may have been deliberately smashed and the edges removed, with some fragments retained and left in position with deposits associated with the hearth. It is unknown where the missing pieces of the quern were deposited.

This pattern of deliberate breakage and purposeful deposition of saddle querns complements the evidence from the Iron Age crannog and palisaded enclosure at Cults Loch, Dumfries and Galloway, where several of the querns (both saddle and rotary types) appear to have been deliberately damaged prior to discard or abandonment (McLaren 2018: 111). Larger synthetic studies of quern deposition confirm that not every Iron Age quern was subject to special treatment after it had come to the end of its use but the deliberate destruction, fragmentation and defacing of quern stones, particularly rotary querns, is a practice that occurs widely across Iron Age assemblages in Britain (Hingley 1992; Pope 2003: 267; Heslop 2008: 69; McLaren 2013). The incorporation of the broken quern fragments around Hearth 3 in ST1 emphasises the possible significance that quern fragments could hold despite their incomplete condition. The association of Iron Age quern fragments (saddle and rotary) and hearth features is one that can be widely paralleled across Scotland, including examples from Burland, Shetland (McLaren & Hunter 2014) and Grantown Road, Forres (Engl & McLaren 2016: 39), to name a few.

The general paucity of items of worked stone from ST1 implies that the building was kept clean and that casual discard of stone tools in the interior space was not a regular occurrence.

## ST2

The artefact assemblage from this structure is restricted to items of chipped and coarse stone. Looking specifically at the coarse stone, it is possible to detect some subtle changes in character of the objects deposited throughout the phases of use of this building, in terms of quantity, range and condition. The number of tools increases over time. A single rubbing stone (SF116), a tool used in conjunction with a saddle quern to grind grain into flour, was associated with Phase 1, suggesting that the interior space was kept very clean and free from detritus. In Phase 2, only four tools are present including a grinder (SF102), a pounder (SF93), a multifunction tool (SF101) and a rubbing stone (SF103). The rubbing stone did not display much wear, in contrast with the rest of the Phase 2 tools which were all extensively worn and may have been considered exhausted at the time of their discard. The largest group of stone tools from ST3 comes from Phase 3, consisting of 10 worked stone tools. Most came from floor surfaces surrounding Hearth 2 and include examples of pounders (eg SF83), some of which saw vigorous physical force, grinders (eg SF90), a rubbing stone (SF39), a smoother (SF83) and a working surface (SF59). Although two rubbing stones (SF39 & SF116) were recovered from ST2, no saddle quern or saddle quern fragments were present. This may suggest that if any cereal processing took place within the structure, the valuable querns were removed for use elsewhere on the

abandonment of the structure. Could one of these saddle querns be that (SF234) recovered from the terminal of the ditch/ midden [800] feature considered below?

As in ST1, a scatter of struck lithics indicative of expedient production and use were recovered from various hearth and flooring levels and are best seen as accidental loss.

Overall, the character of the assemblage from ST2 is prosaic and suggestive of food-processing activities including grain processing, expedient lithic production and limited hide or skin processing.

Both scatters and discrete caches of small white pebbles were noted in all three phases and correlate with refurbishment of the flooring deposits. It is possible that some of the isolated examples may represent the vestiges of a more comprehensive deposit that was partially removed during the removal of soiled flooring materials.

## Terminal of ditch/ midden [800]

A series of interesting and significant objects was recovered from the midden-rich fill [800] of the terminal of the ditch. Soil micromorphology analysis of deposits [18026] and [18027] confirmed these to comprise mainly dumps of old flooring stripped out of the structures and, in the case of [10826] some stabling waste (Chapters 3.1.6.6 & 3.1.6.7). The most significant object is the substantially intact but now distorted decorated lathe-turned wooden bowl (SF219). Vessels of various material types are often the focus of deliberate deposition in the local area, including the series of vessel deposits spanning the Late Bronze Age to medieval periods made in Dowalton Loch (Hunter 1994; Hunter et al 2018: 196) so this practice is far from unique. The BLoM bowl displays no evidence of damage that might explain its discard. Rather, it was found containing and surrounded by a deposit of willow leaves – a species of wood or leaf not commonly used on the site – implying that the leaves were purposefully collected and deposited within the bowl at the time of its placement in the terminal of the ditch (Chapter 11.5.7.2). The bowl was found near a substantial intact saddle quern (SF234) that must also have been purposefully selected for deposition, perhaps marking either the foundation or closing of this deposit. More broadly, the purposeful placement of both saddle and rotary querns in thresholds, floor surfaces and ditch terminals is well attested throughout the Iron Age (Hingley 1992: 32; Heslop 2008: 65–68; Watts 2014: 119).

Also from this feature were recovered a withy rope (SF215), a carved wooden peg (SF218) and a birch bark roll (SF227), perhaps representing objects accidentally lost within successive layers of flooring material stripped out of one of the early structures. This suggests that the objects that come from this feature may have found their way into the ditch by two very different mechanisms:

deliberate and purposeful placement, and incorporation within discarded flooring materials.

At Broxmouth, East Lothian, the hillfort and roundhouse ditches were infilled with midden material containing many broken and incomplete artefacts. Maxwell (2013) argues that the practice of depositing midden material in such features was used as a means to mark transitional stages in the biography of a community or household and that the midden itself was a valuable resource (*ibid*: 230; see also McOmish 1996; Needham & Spence 2017). At BLoM, the midden material within the ditch appears to principally contain dumps of old flooring material, potentially incorporating lost, discarded and purposefully deposited objects. This must surely prompt a wider re-evaluation of our understanding of midden-rich deposits, and in particular, the taphonomy of artefacts incorporated within such deposits.

### The trackway

The artefacts associated with this feature during Episode 1 are restricted to scatters of quartz pebbles and a very large timber structural peg (SF280). It is thought that this peg may have served as part of the locking mechanism of a gate structure.

## 15.10.7.2 Episode 2

### ST3

The deposition of artefacts in this structure is the most significant, complex and intriguing of all of the roundhouses at BLoM. In contrast to ST1 and ST2 which both have concentric divisions of internal space, ST3 is radially divided. The majority of artefacts were found in the southern half (both the SE and SW quadrants) whilst almost nothing was recovered in the northern half of the house. It is also significant that the classifications of artefacts see a distinct change from the earlier phases (Phases 2–3 in particular) where there is an emphasis on objects relating to woodworking and textile production to the later phases (Phases 6 onwards) where debris relating to metalworking (particularly copper alloy-working) predominates, implying a change in function of the building during the duration of its use.

Most of the wooden and stone objects found in the ST3 floor deposits are related to these earlier phases (Phases 2–3). Many could represent accidental loss or casual discard. They are all small and/or broken and could readily have become incorporated into the thick deposit of plant litter floor covering [1153/1743] which was one of the richest on the settlement in terms of artefacts. Some of the wooden objects – the waste core (SF298), for example – provides important evidence of on-site lathe turning of wooden objects and its incorporation in the layers of plant litter floor could have been accidental, having been dropped on the floor during manufacture, or it could have been brought into the house to be used as fuel. A single heavily weathered body sherd from a pottery vessel could

easily have been accidentally lost within the microgenic surface [1119] relating to Phase 8 activity.

More difficult to dismiss as a casual loss is the carefully produced, spindle-turned yew baton (SF237). Although its function is not well understood, it is thought to be part of a composite object probably associated with textile production or weaving, such as a side bar from a hand-held weaving frame or part of a skein winder. The skilled production of the baton, using a wood type almost exclusively used in the production of decorative items during this period, suggests the baton may have been a prized personal possession. The fact that it is only one component from a composite object is of interest here as it suggests that the tool was deliberately disassembled prior to the deposition of this piece. This dislocation of pieces of a single object and a variety in the treatment of chosen fragments is a practice noted on some quern fragments from Broxmouth hillfort (McLaren 2013: 317; Büster 2021: 669). The size of the object also makes it impossible to dismiss its incorporation within the floor layers as an accidental loss.

An alternative view of the yew baton sees it as a skeuomorph rather than a finished object although this seems unlikely. Traces of wear on the surfaces were hard to detect due to the inherent properties of the material and the burnished condition of the surfaces, so a question remains on whether it had been used or not. This is also true of the adze haft (SF21) from [1144], Phase 6, which displays no sign of use and may have been specifically made for deposition during an episode of refurbishment of the internal flooring deposits in the SW quadrant. The question over the evidence of use of this object is significant in light of the fact that the only adzes known from Scotland come from potential votive environments. The deposition of a wooden skeuomorph of a functional implement is paralleled at Cults Loch crannog where a wooden ard point, of such fine manufacture that it would never have been functional, was found under a house floor (Crone 2018b).

More difficult to interpret are the fragments of the notched rib bone (SF230 and SF231), tentatively identified here as the handle of bow drill or fire-starter, or a netting gauge. It was also recovered from the early floor surface [1153]. It may have broken during use and been casually discarded but it is possible that it was deliberately snapped prior to deliberate deposition as argued for the yew baton.

Items of coarse stone associated with Phases 2 and 3 were recovered from the northern half of the structure and SE quadrant but were notably absent in the SW quadrant. A single small cobble (SF208), fractured at both ends perhaps after a single attempt to use as a hammerstone came from [15018] in the N half of the structure alongside a handful of fragments of fire-cracked stone (SF211 and SF249). The stones from the SE quadrant

[1743] are more numerous and allow insights into the pattern of deposition. These include an intact rubbing stone (SF295), an intact smoother (SF297) and a split perforated stone disc (SF301), possibly a roughout for a spindle whorl. Considering the other evidence for textile production associated with Phase 2/3, the recovery of an unfinished whorl is of interest.

No items of worked stone were recovered from Phase 4 deposits and a single circumferential grinder/pounder (SF303) came from [1745], the active floor surface around Hearth 4, Phase 5. SF303 is not a large cobble but still large enough to question whether this represents an example of casual discard amongst a floor surface otherwise kept relatively clean and devoid of objects.

In the later phases of ST3's use (Phase 6 onwards) the character of the objects deposited shifts to those associated with metalworking, perhaps indicating a concurrent change in the function of the structure. Amongst these objects are the small, shattered fragments of crucible body sherds recovered during soil sample processing from hearth debris [1150] relating to Hearth 5, in Phase 6. An intact grinder (SF266) and a large angular fractured block (SF276) with a series of sharpening grooves and indentations from use as a working surface came from deposits in the SE quadrant. Although no metal, bone or wooden points or pins were found during the excavation, the sharpening grooves imply their manufacture. It was recovered from the stones [1706] of Hearth 6 and is likely to have been deliberately incorporated into this feature.

A definite candidate for purposeful deposition is the robust, three-sided crucible (SF210) which was discovered intact, in an upright position at the terminals of one of the radials in the SW quadrant, amongst the sub-floor [1127/1128] within the Phase 7 active floor surface. Although the crucible had undoubtedly been exposed to the intense heat of the fire and was found in a sooted and vitrified condition there were no detectable metalliferous residues on the surfaces. It is possible that the crucible was never used for metal casting and was produced and deliberately vitrified as a votive representation of a metalwork-associated object.

Further small, shattered fragments of crucible body sherds come from hearth debris [1113] associated with Hearth 7 in Phase 8. A fragment of a tuyère (SF192), used to shield the organic nozzle of the bellows from the heat of the fire, and coated in copper alloy residues came from the same context in the SW quadrant. A further tuyère fragment (SF251) was unstratified but also came from the SW quadrant of this structure, whilst a broken but substantially complete and heavily vitrified handled crucible (SF248) came from unstratified soils in the N half of the roundhouse. Although small flecks and fragments of fuel ash slag were recovered from the S half of the structure in earlier phases, it is Phase 8, associated with

the construction of Hearth 7 [1113], when ironworking waste is found. This takes the form of a plano-convex slag cake (a possible smithing hearth bottom) and unclassified iron slag fragments alongside vitrified ceramic pieces that are likely here to represent fragments of hearth lining relating to ironworking. Small pieces of bog ore, the raw material used to smelt iron, came from a surface [1109] associated with the construction of Hearth 7, and fragments of unclassified iron slag, bog ore and vitrified ceramic also came from a minerogenic surface [1119] associated with the same hearth. Despite the lack of micro debris (eg hammerscale) indicative of *in situ* blacksmithing, abundant slaggy residues were noted in thin section by soil micromorphological analysis. This implies that during Phases 7/8, ST3 was the focus for both copper-alloy and ironworking.

The largest group of worked stone came from Phase 8, relating to deposits in the SE and SW quadrants and associated with Hearth 7. Only a single stained stone (SF184) came from the northern half and it is unclear if this stone is even worked. From the SE quadrant, three multifunction cobble tools (SF256, SF257 & SF259) came from [1704], a spread of sharp angular stones which had been laid down as a foundation for Hearth 7. The consistency in the pattern and character of use-wear displayed amongst these three cobble tools suggests a close similarity in the processes that they were associated with and may even hint at being handled during use in a very similar way by the user or users. In the SW quadrant, relating to the same foundation layer for Hearth 7, was a heavily heat-fractured and incomplete rubbing stone. Both ends were missing, one of which (SF250) was found unstratified in the same quadrant. Although it could be argued that the heat-damaged condition of the tool was perhaps the result of its position in relation to the hearth, it should be noted that none of the other worked stone from this foundation layer was heat-affected. It is suggested here that its heat-damaged condition pre-dated any attempt to incorporate it into the hearth stones and may represent a deliberate attempt to destabilise the stone to allow it to be broken up. Analogous examples, albeit involving later rotary querns, were noted amongst the assemblage at Broxmouth, East Lothian (McLaren 2013).

Also from this phase was a rubbing stone (SF262) with secondary use of the grinding surface as a working surface. It had been incorporated into the surface of Hearth 7.

In the SW quadrant of the roundhouse, a further seven stone tools were collected alongside a fragment of fire-cracked stone. From hearth debris [1113] associated with Hearth 7 was a strike-a-light (SF187) used in fire-lighting, a pounder/ possible rubbing stone (SF194), a grinder (SF197) and a multifunction cobble tool (SF200). A lightly used pounder (SF204) came from active floor surface [1120]

whilst a spindle whorl (SF160) was retrieved from debris [1104] overlying Hearth 7. A further spindle whorl (SF254) came from topsoil [1700] in the SE quadrant of the structure and a scatter of other tools, including a multifunction tool (SF175) and pounders (SF176 & SF198) were found in soils overlying ST3.

#### ST4

The finds from this structure were scant. The small copper alloy bead (SF314) came from hearth debris [1018] relating to the primary hearth and may represent an accidental loss during production.

The remainder of the finds from this structure are items of worked stone. The earliest object stratigraphically was a broken saddle quern (SF253) which was recovered from debris [1018] from Hearth 1 (Phase 1). As this tool was recovered in a fragmentary state built into the earliest hearth, it is likely that the quern relates to the earlier episode of activity on site and was subsequently incorporated into this hearth feature; its association cannot be read as an indication of the structure's function or association with grain processing.

A grinder (SF159) was recovered from a thick deposit of heat-shattered stones [1005] that overlay the third refurbished floor layer and a further example (SF161) came from the burnt uppermost floor layer [1003].

Several cobble tools came from sub-soil [1002] and topsoil [1001] deposits overlying ST4. These comprise two grinders (SF154 and SF156) and a multifunction tool (SF155). An indeterminate granite quern fragment (SF165), either deriving from a saddle quern or rubbing stone, was unstratified. The multifunction tool (SF155) is significant due to the presence of adhering ferrous globules and spheres which implies that it was used for ironworking despite there being no other evidence for this activity from the roundhouse.

#### 15.10.7.3 Episode 2/3

##### Post-ST1 and ST2 activity

Although the structural remains relating to post-ST1 and ST2 activity are not well understood, the deposits and associated finds may represent an extension of the activities represented in ST3 and ST4.

Casual losses are probably represented by, for example, the fragment of glass bead (SF02), recovered from a spread of stones [203] lying between ST1 and ST2 and likely to immediately post-date ST2. Less clear is the iron foreshare tip (SF03) which came from a degraded occupation deposit immediately post-dating ST1. Could this have been an object deliberately deposited during refurbishment of this area after ST1 had gone out of use?

The small ceramic thumb pot (SF79) is a remarkable recovery; although damaged, it is substantially complete despite its relatively soft fired surfaces. It came from an

organic rich deposit [241] interpreted as a degraded floor material overlying and therefore post-dating ST2. Due to the degraded condition of this context, no meaningful position to the thumb pot's placement was noted in the field but could this have been deposited in a similar fashion to the triangular crucible in ST3? Also of note is a quern stone (SF51) which had been used as packing within a post-setting [215] and an inverted saddle quern (SF86) recovered from a discrete cluster of boulders.

Significant quantities of coarse stone came from deposits surrounding the various hearths in this area. These include a pounder (SF9), a smoother fragment (SF25) and rubbing stone (SF53) from a deposit [209] around Hearth 1 which were found alongside caches of white pebbles, consistent in their pattern of deposition to those seen in all of the roundhouse structures already discussed. Several worked stones were incorporated within degraded flooring material [210/213] including a saddle quern (SF50), rubbing stone (SF29), whetstone (SF28) and a decorated heat-affected spindle whorl (SF132), *inter alia*. Associated with Hearth 6 was a deposit of charcoal associated with a rubbing stone (SF81), a pounder (SF88) and several small pebbles and fire-cracked stones.

#### 15.10.7.4 Episode 3

##### The trackway

As in earlier phases of the site's use, very little anthropogenic material or objects were found in association with this feature. Relating to this episode, however, is an enigmatic large, slotted timber (SF310) from [19004] produced from willow. It is possible that the slots carved on one face of the timber would have functioned as the spine onto which a withy framework would have been installed to form a drying rack for meats, fish etc or it may be a very stylized anthropomorphic figurine. The interpretation as a figurine is subjective (Chapter 15.7.6) but its position in relation to the trackway can be mirrored by examples from Ireland and Europe and remains plausible. It is possible that this may represent the depiction of a local deity who was thought to offer protection to the community. The specialness of this object is reinforced by the use of willow, which was rarely used at BLoM; the only other instance of its deliberate use was the willow leaves found in and around the bowl deposited at the terminal of the Episode 1 ditch.

##### Rampart 2

The bank that forms this rampart appears to have been at least in part built up of deposits of hearth waste collected from other areas or structures of the site. As would be expected, the majority of material associated with these deposits include fragments of fuel ash slag and other low-density vitrified materials that could be associated with low-temperature but sustained burning

as would be expected in a household hearth. Of more significance are the fragments of the long-handled antler comb (SF188) which was found in an incomplete and burnt condition, implying its discard into the fire prior to being re-deposited along with the hearth debris in the core [709] of the rampart. Also associated with this feature were fragments of ironworking debris from [723]. A multifunction cobble tool (SF190) came from the stones of the eastern terminus [1114] and a fragment of abraded haematite (SF180) from one of the deposits forming the rampart. The presence of ironworking waste within the hearth debris dumps that make up the core of the rampart is significant as it suggests ironworking was taking place in the vicinity, either deriving from waste cleared out of ST3 or from another location, perhaps even situated beyond the excavation area.

### 15.10.8 Quartz pebbles

Small ovoid water-rounded pebbles were found scattered amongst the sub-floor wattle screens of all of the roundhouse structures. Sometimes these were found in small caches as though collected together and deposited in a small discrete group amongst the sub-floor screens and radials. In other instances, they formed alignments respecting the radials and weave of the screens. There can be no doubt about their purposeful placement. But the reasons behind such a practice is not well understood. Although those from BLoM display a range of sizes and lithologies, there was a preference for small ovoid quartzite or quartz pebbles. Whether the significance of these stones lay in their colour, their lithology or the place they were gathered, is impossible to discern (see earlier discussion in Chapter 15.1.2.8) but their deposition was a site-wide practice. A large cache of water-worn, white and off-white quartzite pebbles (SF07/05) was uncovered at Cults Loch crannog (McLaren 2018: 109–110) providing a local parallel for this practice.

### 15.10.9 Conclusions

The relatively short-lived roundhouses at BLoM all appear to have their own character, with some buildings being predominantly associated with tools signalling the processing of agricultural produce (ST2) with others involved in an array of craft processes (ST3) including regionally significant evidence of metalworking and woodworking. The pattern of distribution within the radial divisions of the latter structure suggests that certain parts of the house were reserved for certain activities. Yet, with the exception of the remarkable and unique

wooden objects recovered, very few items amongst the assemblage are unusual or unparalleled. This presents a largely prosaic picture of life at the settlement, illustrating a community who cultivated the land, utilised the local resources naturally available to them, creating tools and other objects as needed, and welcoming visiting craftspeople at intervals.

Many of the objects studied within the assemblage were recovered from contexts that suggest their planned abandonment; tools that could be easily replaced or were broken were left behind within the structures during moments in the settlement's transition. More important are those that have been subject to purposeful deposition. Challenges remain in identifying them and it will remain subjective and open to debate. Whether votive, unused items, dislocated fragments or objects with a use-history displayed by their wear or residues, these take on the role as descriptors of moments of transition signalled by their deliberate incorporation below or within refurbished floor levels or their purposeful incorporation within hearth features, *inter alia*. It is of interest that many of these transitional markers involve objects which were themselves implements of transformation: the crucible used to melt copper ore or copper-alloy scrap for casting, the querns used to grind grain into flour, the wooden baton that may have seen use in the process of turning wool into fine fabrics and the adze haft that may have symbolised the harnessing of living wood into structural timbers. This practice appears inextricably linked to the use-cycle of the buildings as artefacts symbolic of agricultural fertility, transformation, and control of natural resources were placed as offerings woven into the very structure of the settlement.

The pattern of deposition of artefacts at BLoM is a complex one and cannot be explained by a single neat narrative. An outstanding question and one that cannot be answered during this current study is what effect stripping out of the floor surfaces within the roundhouses had on the concealed objects. Were the objects within the flooring removed alongside the plant matter and deposited to form midden, suggesting that their significance was the moment of deposition? Or were they recovered, re-interred or re-circulated? Either way, the BLoM finds and their contexts of discovery provide an unusual and important insight into Iron Age household depositional practices which have significant implications to our current understanding of artefact taphonomy in contemporary roundhouse settlements in lowland Scotland.



# Investigations on the crannog in the White Loch of Myrton

## 16.1 Background

The role and significance of BLoM within its immediate environment cannot be fully understood without some knowledge of the crannog in the White Loch of Myrton (WLoM), which lies some 300 m to the NW of BLoM (Figures 1.3 & 1.4). WLoM is typical of the lochs of Wigtownshire, a relatively shallow, eutrophic body of water about 20 Ha in area and 12 m in maximum depth. The loch has apparently changed very little since the time of Murray and Pullar's survey *circa* 1906, which remains the only bathymetrical survey of the loch (Figure 16.1). The crannog lies at the southern end of the loch, in a small bay on its eastern shore, a short walk from BLoM.

The presence of a crannog site in the loch has been known since the 19th century, and was included by Munro in his compilation of the evidence for crannogs in Ayrshire and Galloway in 1885, where he cites this report, provided to him by Dr Stuart:

'In the White Loch of Mertoun (a name which reminds us of the Cluainfin Lough in Roscommon, which is said to mean "the enclosure of the White Lake"), about three miles westward from Dowalton, there was formerly a stockaded island. The discovery of the islands in Dowalton Loch brought to the recollection of an old man in the service of Sir William Maxwell that, when the loch was partially drained by Sir William's grandfather, he had seen a small island in it with timbers, piles and flat stones on its surface. This led to an examination of the island, from which it appeared that it was surrounded by piles and was constructed, like those at Dowalton, of layers of furze, faggots and brushwood, layers of fern, etc. This island, prior to the lowering of the loch, had been covered by eight feet of water.' Munro (1885, 92)

The island was not then inspected until 2002, when it was included in the South-West Crannog Survey (Henderson et al 2003). The island was surveyed on 13 July 2002; extremely poor visibility in the loch meant that observations made by the dive team were based on 'feel' alone, but the surveyors noted that there was a dense concentration of small piles immediately N of the visible island, extending up to *circa* 30 m from the dry area. Two small ash piles were extracted from the submerged area on the N side of the island, one of which was subsequently radiocarbon dated (Table 16.1).

Above water, the island is tree-covered and stony; reeds and lilies grow in the shallow waters. It is difficult to discern any built structure on the surface of the island, but it is possible that a low stone bank on the NE, N and W sides of the site are the remains of a wall, or perhaps more likely a form of revetment.

Lab Code	Age BP	Error ±	Description	δ13C	Cal (95.4% probability)
SUERC-68527	2461	29	<i>Fraxinus</i> fragment from core at depth 190 cm	-26.9	758–417 BCE
SUERC-68528	2456	26	<i>Fraxinus</i> fragment from core at depth 295 cm	-25.8	754–416 BCE
SUERC-68529	2245	29	Context [102], deposit overlying paving	-27.7	391–204 BCE
SUERC-68530	2246	27	Context [104], deposit beneath paving	-26.3	390–205 BCE
GU-10921	2080	50	<i>Fraxinus</i> pile from submerged area to N of islet	-27.0	346 BCE–60 CE

Table 16.1. Calibrated radiocarbon dates from the White Loch of Myrton (calibrated using OxCal 4.4 [175] using the IntCal 20 curve).

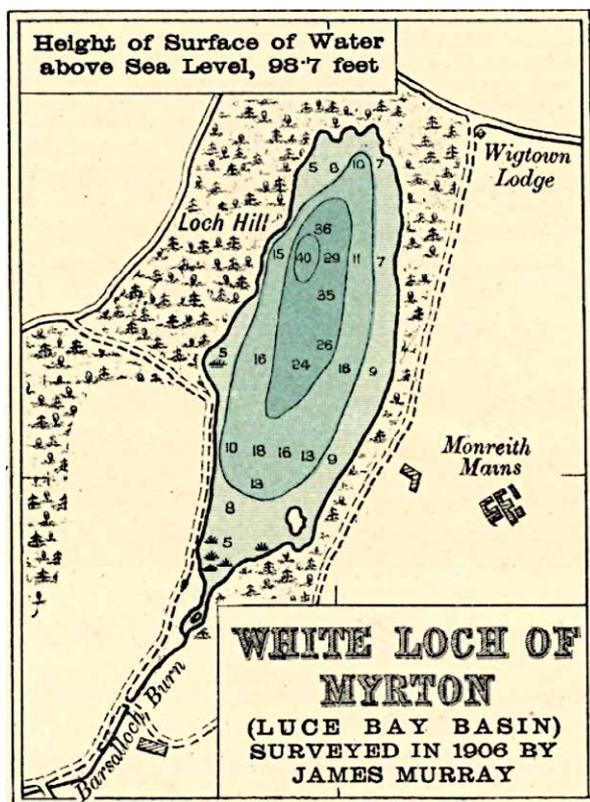


Figure 16.1. White Loch of Myrton, bathymetrical survey by Murray and Pullar, surveyed circa 1903–6 (right), overlain on modern satellite imagery (left).

## 16.2 Trial excavation: aims and methodology

As part of the *Celtic Crannogs Project (CCP)*, a series of lake sediment cores were retrieved from the White Loch in order to provide samples for multi-proxy indicators of archaeological activity on and around the loch in antiquity (Chapter 17.1). As a means of providing archaeological context for the environmental analysis, a small trial trench was excavated on the surface of the island. The aim of the excavation was to establish the character of any surviving archaeological deposits on the

surface of the crannog, and to collect samples for dating and archaeological/ environmental analysis that might be correlated with the results of the analysis of the cores. A trench measuring 2 m by 1 m was excavated by hand on the W side of the island in an area that was as clear of tree roots and vegetation as possible.

### 16.2.1 The excavation (Figure 16.2)

A loose, very wet topsoil [100] containing living tree and plant roots was removed from the trench, within which, at the W end of the trench, was a rough linear arrangement of rounded stones [101], averaging 0.4 m across and 0.15 m thick. These stones were very loosely arranged, and it was difficult to be confident in their interpretation given the small area exposed, but it is possible that this formed part of a ruinous low wall. Directly beneath [101], a loose, peaty deposit [102] was encountered, containing a high proportion of heat-shattered angular stones, ashy, orange silts, charcoal and burnt bone. Deposit [102] was approximately 0.3 m in depth, and directly overlay a series of flat, slab like stones [103], averaging 0.5 m across, which may be a paved surface. These slabs were arranged as a level surface across the trench and appeared to continue to the east but may have ended close to the western extent of the trench. Flooding prevented detailed investigation of the levels below [103], but a very organic, peaty layer containing woodchips, charcoal and burnt bone [104] was bulk sampled from beneath one of the slabs. A monolith sample (M1) was also collected from deposit [102] in order to provide samples for the assessment of insect remains.

#### 16.2.1.1 On-site coring

Once excavation had been abandoned due to flooding, a core was taken from the crannog mound beneath the paved surface [103]. This core showed that the deposits making up the body of the crannog were almost 4 m thick, consisting of six levels of undressed logs laid horizontally (Table 16.2). Fragments of charcoal were visible in the peaty deposits separating the timber layers, and natural glacial clay was encountered at a depth of 4.55 m.



Figure 16.2. Plan and section through deposits in the trial trench excavated in the upper levels of WLoM, showing possible paving.

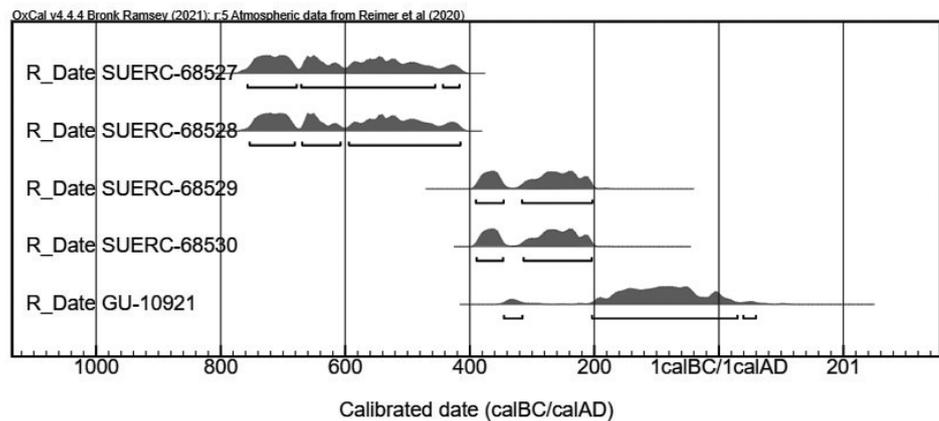


Figure 16.3. OxCal multiplot of C14 determinations for samples from WLoM.

### 16.2.1.2 Radiocarbon dating

Radiocarbon dates of terrestrial plant remains were taken throughout the core to produce an age-depth model as part of the *CCP* (Chapter 17.1.2.1). Five radiocarbon dates were also obtained with the aim of determining the date of construction and duration of activity on the crannog

(Table 16.1 & Figure 16.3). As well as the ash pile extracted from the submerged area of the crannog in 2002 samples were collected from the occupation deposit above and below stone surface [103] found in the trial trench, and from two timbers within the on-site core.

Depth (cm, starts at base of trial trench, ie 90 cm)	Description	Dated
90-180	coarse organic debris with monocot, wood (twigs and a 3 cm-diameter branch at 48-52 cm), hazelnuts, peaty matrix	
180-187	timber 7 ( <i>Alnus glutinosa</i> )	
187-190	coarse organic debris in peaty matrix, some silt	
190-203	timber 6 ( <i>Fraxinus excelsior</i> )	•
200-114	timber 5 ( <i>Alnus glutinosa</i> )	
211-216	organic debris	
216-226	timber 4 ( <i>Alnus glutinosa</i> )	
226-230	broken-off piece of timber	
230-234	coarse organic debris in peaty matrix, some silt	
234-240	timber 3 ( <i>Quercus</i> sp.)	
240-254	coarse organic debris, 3 cm-diameter wood, in peaty matrix	
255-263	timber 2 ( <i>Alnus glutinosa</i> )	
263-295	gap	
295-300	timber 1 ( <i>Fraxinus excelsior</i> )	•
300-320	coarse organic debris with 2-3 cm diameter wood	
320-340	felted peat with trace of silt	
340-355	gap	
355-379	felted peat with sharp angular stone at 270 cm	
379-455	(1cm transition) medium olive-grey organic marly silt (343-354 has more precipitated marl)	

Table 16.2. White Loch of Myrton; stratigraphy of the on-site core, taken through the occupation deposits on the crannog from within the trial trench.

### 16.2.1.3 Ecofact analyses

Jackaline Robertson

The contents of two waterlogged bulk samples from deposits [102] and [104] were analysed. Nomenclature for plants follows Stace (2010).

#### The waterlogged macroplants

The waterlogged plant assemblage was composed of fruits, building material, woodland, weeds, peat and moss (Table 16.3). The macroplants were recovered in larger and more diverse numbers from [104] with a much smaller number observed in [102]. This could be because the anaerobic conditions in [104] were noticeably better than those observed in [102]. Some of the plant material, such as the alder leaf, moss and roots, display little evidence of decay which suggests that they are intrusive.

#### The carbonised macroplants

The charred macroplant assemblage was small and there were six cereal caryopses, two weeds and fragments of peat. The cereal species were one hulled barley (*Hordeum vulgare* L.), one barley (*Hordeum* sp.), one emmer/ spelt

(*Triticum dicoccum/spelta* sp.) and one wheat (*Triticum* sp.). The remaining two cereal caryopses could not be identified further due to poor preservation. The weeds were fat hen (*Chenopodium album* L.) and sedge (*Carex* sp.). These were concentrated within [102] as the only find from [104] was a single cereal caryopsis.

#### The charcoal

There were 14 fragments of charcoal (14.9 g) identified as alder (*Alnus glutinosa* L. – 42%), hazel (*Corylus avellana* L. – 42%) and oak (*Quercus* sp. – 16%). Hazel roundwood (16%) was noted. The charcoal (14.6 g) was concentrated in [102] with (0.3 g) in [104]. The alder fragments from [104] were partly vitrified. The charcoal fragments are fuel debris.

#### The burnt bone

The burnt bone assemblage was small (2.7 g) and consisted of 2.4 g from [102] and 0.3 g from [104]. Preservation was poor and most fragments were completely calcified and smaller than 10 mm. A single fragment of a cattle molar from [102] was the only identifiable component. These remains may have derived from cooking and cleaning refuse.

<b>Context</b>			[102]	[104]
<b>Sample Vol (kg)</b>			2.5	2.5
<b>% Analysed</b>			100	100
<b>Species</b>	<b>Name</b>	<b>Plant part</b>		
<i>Hordeum vulgare</i> L.	Hulled barley	Caryopsis/es ©	1	
<i>Hordeum</i> sp.	Barley	Caryopsis/es ©	1	
<i>Triticum dicoccum/spelta</i> L.	Emmer/spelt	Caryopsis/es ©	1	
<i>Triticum</i> sp.	Wheat	Caryopsis/es ©	1	
<i>Cerealia</i> sp.	Cereal	Caryopsis/es ©	1	1
<b>Fruits</b>				
<i>Rubus idaeus</i> L.	Raspberry	Seed(s)		**
<b>Building material</b>				
<i>Juncus inflexus/ effusus/ conglomeratus</i> sp.	Hard/soft/compact rush	Seed(s)		*
<i>Juncus</i> sp.	Rushes	Seed(s)		**
<i>Carex curta</i> L.	White sedge	Nutlet(s)		*
<i>Carex</i> sp.	Sedges	Nutlet(s)		**
<i>Carex</i> sp.	Sedge	Nutlet(s) ©	1	
<i>Carex/Juncus</i> sp.	Sedge/rush	Stem(s)		*
<i>Pteridium aquilinum</i> L.	Bracken	Pinnule/ Fronds frag(s)		**
<b>Turf</b>				
Peat	Peat	Frag(s)		
Peat	Peat	Frag(s) ©		*
<b>Woodland</b>				
<i>Alnus glutinosa</i> L.	Alder	Leaf frag(s) (M)	*	
Bark	Bark	Frag(s)	*	***
Wood	Wood	Frag(s)	*	****
<b>Weeds</b>				
<i>Agrostemma githago</i> L.	Corncockle	Seed(s)		*
<i>Aphanes arvensis</i> L.	Slender parsley piert	Achene(s)		*
<i>Atriplex</i> sp.	Oraches	Fruit(s)	***	**
<i>Chenopodium album</i> L.	Fat hen	Seed(s)	*	*
<i>Chenopodium album</i> L.	Fat hen	Seed(s) ©	1	
<i>Chenopodiaceae</i> sp.	Goosefoot	Seed(s)		**
<i>Fallopia convolvulus</i> L.	Black-bindweed	Achene(s)		*
<i>Persicaria lapathifolium</i> L.	Pale Persicaria	Achene(s)	*	**
<i>Persicaria maculosa</i> L.	Redshank	Achene(s)		*
<i>Ranunculus</i> sp.	Meadow/ creeping/ bulbous buttercup	Achene(s)		**
<i>Rumex acetosella</i> L.	Sheep's sorrel	Achene(s)		*
<i>Sambucus nigra</i> L.	Elder	Fruit(s)	*	
<i>Stellaria media</i> L.	Common chickweed	Seed(s)	*	*
<i>Stellaria</i> sp.	Chickweed	Seed(s)	*	
Unknown	Indet	Achene/Fruit/Seed		*

Context			[102]	[104]
Sample Vol (kg)			2.5	2.5
% Analysed			100	100
Species	Name	Plant part		
Moss				
<i>Sphagnum</i> sp.	<i>Sphagnum</i> sp.	Leaves/stems		*
Moss	Moss	Leaves/stems	***	*
Moss	Moss	Leaves/stems (M)	*	*
Other				
<i>Cenococcum</i> sp.		Spore(s)	*	
Midden type material		Frag(s)		***
Roots		Frag(s) (M)	***	**

Table 16.3. WLoM macroplant assemblage. Key: \* = <10, \*\* = 10–29, \*\*\* = 30–99, \*\*\*\* = >100, © = carbonised, (M) = modern.

### Other finds

A small quantity of daub was retrieved from [102] as well as quartz in [104].

### Discussion

The cereal species recovered from WLoM are typical finds from this part of Scotland from the Iron Age onwards in that both wheat and barley were cultivated for food. The presence of raspberry (*Rubus idaeus* L) suggests that wild foods were exploited, but the absence of hazel is of note, given the large quantities found at nearby BLoM. This could be due to the size of the sub-sample, as normally hazelnut shells are over-represented within the archaeobotanical record. Sedge, rush (*Juncus* sp.) and bracken (*Pteridium aquilinum* L.) were used in the construction of the active floor surfaces at BLoM, and it seems probable that they were put to the same purpose at WLoM. The peat could be evidence for turf used as a building material or fuel resource, although as only a few fragments were observed this is speculative. The weed assemblage was composed of a mix of plants that grow in a range of landscapes including arable fields, waste ground and damp habitats. The composition of the weed assemblage is very similar in character to the species recovered from BLoM.

The combination of food and fuel debris, weeds and flooring materials reflects domestic occupation and is identical to that seen at BLoM in the active floor surfaces. It therefore seems likely that both [102] and [104] were also active floor surfaces.

### Wood use at WLoM

The logs used to construct the mound were a mixture of alder (x4), ash (x2) and oak (x1) (Table 16.2). The two piles retrieved from the halo around the mound for radiocarbon-dating were also ash. This is a very small

assemblage on which to base observations but ash, which constitutes 44% at WLoM, appears to have been used more extensively here than at BLoM where it comprised only 6% of an admittedly much larger assemblage. The ring-pattern of T6, the largest of the ash samples retrieved from the core, was measured; the surviving sequence had 70 rings. It was compared against the ash data from BLoM but this produced no significant correlations.

#### 16.2.1.4 Artefacts

##### *Dawn McLaren*

A small group of 10 water-rounded pebbles (SF1) of various sizes and lithologies were collected from [102]. Only one has signs of being used as a tool; it is a flat oval fine-grained stone with a smooth, dished and polished face, wear which is consistent with use as a whetstone for sharpening metal blades. Two further pebbles of similar shape but different sizes display no evidence of wear.

#### Catalogue

Elongated, flat, ovoid, fine-grained cobble, water rounded but heavily weathered surfaces. The original surface of the stone survives only on one face and in small patches on the edges. This face is dished and smoothed and the facet is associated with a well-developed sheen consistent with use as a whetstone for sharpening metal blades. L 132.5 mm, W 50.5 mm, T 17–20 mm [102].

### 16.3 Discussion

The deposits encountered in the WLoM crannog trial trench can be considered fairly typical of the Iron Age crannogs of SW Scotland; the heat-shattered stone, burnt bone and charcoal-rich deposits are similar to deposits interpreted

as occupation levels encountered on other excavated sites, such as Dorman's Island in Whitefield Loch (Cavers et al 2011), Cults Loch (Cavers & Crone 2018) and Loch Arthur (Henderson & Cavers 2011). The presence of large quantities of stone in the upper layers is similar to Dorman's Island; in both cases the stone seems likely to have been used in the building that stood on the crannog (as opposed to in creation of the mound). Roman glass from the upper deposits at Dorman's Island suggested occupation in the early centuries CE, although radiocarbon and dendro-dating of timbers used in the construction indicated a much earlier construction date, in the final quarter of the 1st millennium BCE. Stone superstructures are known on crannogs of middle Iron Age date in the area, eg Rough Loch, where a roundhouse with a heavy stone wall, *circa* 18 m in diameter, was uncovered in an excavation reported by Munro (1885: 112–116). The possible walling recorded at White Loch [101] was separated from the paving [103] by occupation deposit [102] and could feasibly relate to a relatively late use of the site, but in the absence of other evidence it is perhaps more probable that it belongs to the Iron Age occupation. It is possible that the addition of stone to the superstructures of buildings on crannogs can be tentatively correlated with the middle Iron Age and later levels on south-western crannogs, whereas buildings so far dated to the earlier Iron Age seem to have been exclusively timber-built.

The ecofact remains indicate that food preparation was undertaken on the crannog, but the limited investigation means that very little more can be said about the nature of the occupation there. The offsite investigations, presented in Chapter 17 provide more insights, suggesting that crop processing on the crannog was probably low intensity and that cattle were possibly butchered on the crannog.

### 16.2.3.1 Contemporaneity of the Lochs of Myrton settlements

The main settlement phase of BLoM is dated to 437–223+ BCE, with the dendrochronology for the Episode 1 indicating construction by 435 BCE. These dates correspond with the timings of WLoM construction, albeit only on the basis of radiocarbon chronology (*circa* 759–415 cal BCE), if we allow the true felling date for the ash timbers sampled in the on-site core to be at the youngest end of that range. As such, it is feasible that WLoM and BLoM were constructed simultaneously, or in very close sequence. Further links between the BLoM and WLoM settlements include the overlapping period of intense use between the 5th and 2nd centuries BCE. Precise comparisons of settlement timings are limited by the greater chronological uncertainties associated with the WLoM radiocarbon chronology, but it is clear that both were in use at the same time. The intensive phase of WLoM crannog use ends *circa* 170 cal BCE based on the sediment core chronology (Chapter 17.1.3), a date horizon that is very similar to the estimated terminal date for the BLoM settlement, ie the final dendro date of 223 BCE date plus an allowance of 30 years for a generation of occupation after that. These results present the possibility that both WLoM and BLoM were contemporaneously abandoned in the first quarter of the 2nd century BCE. It is possible that the date for the timber from the submerged area of the site recovered in 2003, which calibrates in the range 346 BCE to 60 CE (95.4% probability) indicates a third phase of use in the middle Iron Age at WLoM, if the true date is not in the very earliest range of that span.



# The physical environment of the settlements

## 17.1 The physical and biological environment of the Lochs of Myrton settlements

*Helen Mackay, Kim Davies, Thierry Fonville, Maarten van Hardenbroek, Andrew Henderson, Nicki Whitehouse, Pete Langdon, Katie Head, Calum Edward, Phil Barratt & Antony Brown*

### 17.1.1 Introduction

The AHRC- and HES-funded Celtic Connections and Crannogs project (2015–2018) aimed to advance understandings of the chronologies, functions and environmental impacts of crannogs in Scotland and Northern Ireland by exploiting the wealth of palaeoenvironmental information preserved in lake sediments. This project showcased the ways in which geochronological, biomolecular and palaeoecological analyses of wetland sediment cores can provide independent insight into the timings of construction and use as well as activities associated with these artificially enhanced islands and therefore act as an additional or alternative approach to excavation (Brown et al 2021, 2022). Sediments from many wetland sites were investigated as part of the wider project, but two of the main study sites were the Black Loch of Myrton and neighbouring White Loch of Myrton, located in SW Scotland on the Machars peninsula, Wigtownshire.

The Black and White Lochs of Myrton lie in separate but adjacent hydrological catchments circa 500 m apart, approximately 35 m above sea level. The current land use of the surrounding area is dominated by pastoral and arable agriculture (including cattle, sheep and cereal crops) and areas of managed woodland (Figure 17.1). The modern environmental setting of the Black Loch of Myrton (BLoM) is forested marshland (fen), whilst the White Loch of Myrton (WLoM) is a shallow eutrophic lake around 0.2 km<sup>2</sup> with a maximum water depth of 12 m in the NE of the lake basin.

WLoM contains a crannog, which is located in the southern end of the lake basin with a currently exposed land surface of circa 35 m in diameter. Some limited excavation was undertaken on the crannog in WLoM as part of the AHRC study (Chapter 16); there was very little structural evidence in the small trenches but radiocarbon dates from the deposits (Table 16.1) indicate that the crannog was probably contemporary with the more extensively excavated wetland settlement in BLoM, the main subject of this volume. The nature of the relationship between these two settlements is explored in Chapter 18.6.

The physical environment changes over time due to influences such as climate, landscape evolution and human impact. The environmental settings of the Lochs of Myrton in the Iron Age therefore differed from those observed today. This chapter aims to provide environmental context for periods of settlement construction, use and abandonment by reconstructing the physical environments of the Lochs of Myrton

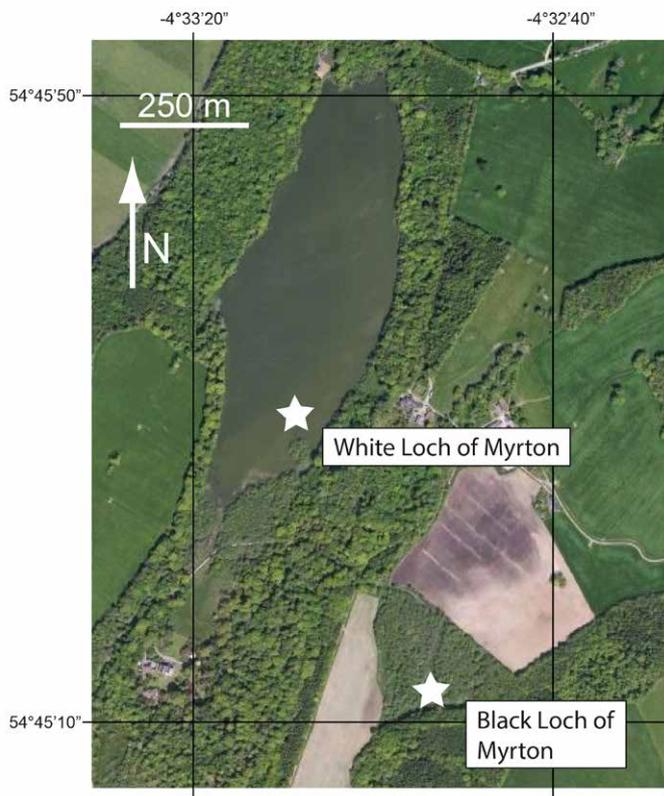


Figure 17.1. Location of the White and Black Lochs of Myrton. Sediment coring locations are highlighted by white stars (WLoM: 54° 45' 28" N, 4° 33' 09" W; BLoM: 54° 45' 14" N, 4° 32' 54" W). More details on coring process in Chapter 17.1.2.1.

over the past 5,000 years using evidence obtained from sedimentary archives. Four key questions will be addressed in this chapter:

1. What was the hydrological setting of BLoM around the time of settlement construction and occupation? This question aims to contextualise the local environmental conditions of BLoM and provide an understanding of conditions present prior to and during construction and occupation (Chapter 17.1.4).
2. What was the character of the vegetated landscape before, during and after the BLoM settlement? This question aims to reconstruct the vegetation composition of the wetland catchments and provide insights into the environmental surroundings of the settlements (Chapter 17.1.5).
3. What natural resources (plants and animals) were exploited in association with the BLoM and WLoM sites and did the natural resource use change over time? This question aims to provide evidence for plants and animals that were available and used, eg as construction material and food sources, at BLoM and WLoM (Chapter 17.1.6).

4. What impacts did the Lochs of Myrton settlements have on the wetland ecosystems? This question aims to assess the extent to which the BLoM and WLoM wetland environments changed in response to human activity associated with the Iron Age settlements (Chapter 17.1.8).

### 17.1.2 Methods of environment reconstruction

The environmental reconstructions presented here are developed using stratigraphic, geochemical, biomolecular and palaeoecological analyses of sedimentary cores obtained proximal to the archaeological settlement sites (Figure 17.1). These sediments have been naturally accumulating over time, incorporating and preserving signals of environmental change, often termed environmental ‘proxies’ (Figure 17.2, Table 17.1). The sediment cores were obtained using a combination of gouge corer (top 66 cm) and Livingstone corer at BLoM and a combination of a gravity corer (top 50 cm) and Livingstone corer at WLoM. We analyse a suite of different proxies from a single sediment coring location (with no overlapping core sections) at each site to reconstruct environmental conditions. Our independent sedimentary records also identify occupation timings and associated anthropogenic activities, which therefore complement archaeological findings from excavation. Bayesian chronologies are developed for the sediment records using radiocarbon dates (calibrated using INTCAL20 (Reimer et al 2020)) OxCal modelling (Bronk Ramsey 2009) (Chapter 17.1.2.1).

Environmental changes registered by proxies can be driven by both natural and anthropogenic influences. To disentangle the natural versus anthropogenic drivers of environmental change, we analyse multiple proxies that respond to different stimuli and compare results with other regional records of environmental change, including undisturbed sites, to highlight contemporaneous large-scale climatic changes.

#### 17.1.2.1 Sediment core stratigraphies and chronologies

The master research sedimentary cores were obtained proximal to the settlements of both Black and White Lochs following a stratigraphic investigation at each site based on a coring transect. The cores were located as close to the settlements as possible to maximise exposure to the anthropogenic signals, whilst ensuring that the risk of disturbances to sediment accumulation (eg avoiding areas of post-depositional mixing associated with construction/use and/ or modern excavation) was minimised. The WLoM crannog is a discrete structure whilst the BLoM wetland village settlement is more expansive with multiple structures; therefore, the WLoM core could be obtained closer to the structure (circa 3 m) than the BLoM core

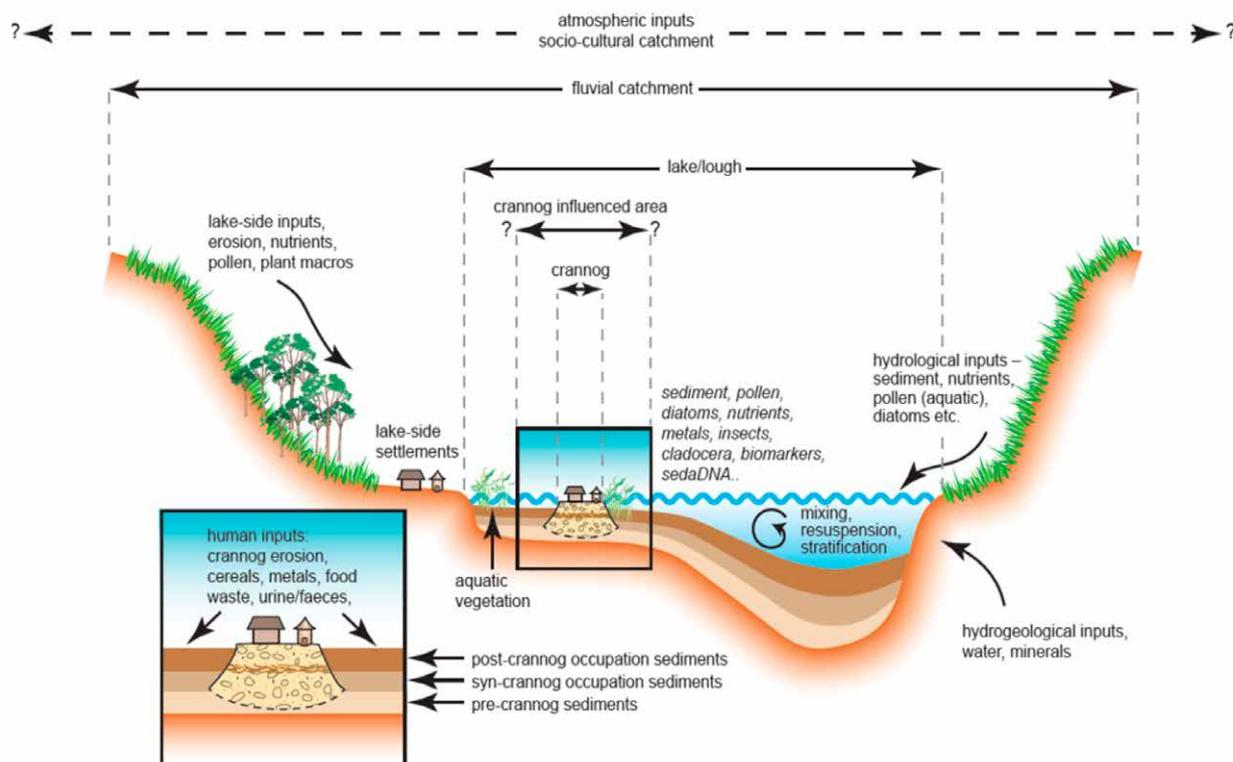


Figure 17.2. Simplified representation of a crannog depositional model in a wetland environment (Brown et al, 2021). Possible anthropogenic inputs arising from activity in the catchment and on the crannog are noted. Signals of these activities can be characterised using the palaeoenvironmental analysis of sedimentary archives, which accumulate over time and preserve geochemical, biomolecular and palaeoecological proxies of environmental change.

(circa 40 m; Figure 17.1). The age of the sediment cores obtained and analysed from both sites extend beyond the Iron Age settlement dates to ensure that sufficient environmental context is provided for comparison with the period of settlement construction, use and abandonment.

### BLoM core stratigraphy and chronology

The Black Loch sediment core was obtained circa 40 m from the northwestern edge of the excavated settlement and extends to a total depth of 327 cm below the current ground surface. The deeper sections of the core (327–170 cm) contain gyttja (organic rich sediments typically deposited in lake environments) but the sediment gradually transitions to herbaceous peat around 170 cm, which persists to the present day (Figure 17.3A).

Seventeen radiocarbon ( $^{14}\text{C}$ ) measurements were analysed from leaf fragments (where macrofossils were available) and bulk sediments extracted from the BLoM master core (BLoM27; Table 17.2). The  $^{14}\text{C}$  dates were calibrated using INTCAL20 (Reimer et al 2020) and modelled using OxCal (Bronk Ramsey 2009) (Figure 17.3A). One boundary at 170 cm was included in this model to account for the changes in sedimentology from gyttja to herbaceous peat. The model is extrapolated from 305–306 cm, which

represents the oldest measured date, to the end of the core at 327 cm.

Six of the seventeen  $^{14}\text{C}$  dates were identified as outliers using the OxCal outlier analysis general model (Table 17.2). This approach assumes that outliers are in the time dimension and are distributed according to a student's T distribution with 5 degrees of freedom (Bronk Ramsey 2009). The majority of the identified outlier dates were obtained from plant macrofossils and seeds, with only one outlier date originating from bulk sediment. Five out of six of the outlier dates were too young but there is no consistent age offset: several dates returned ages that are circa 500 years younger than the age-depth model, whilst the plant remains analysed from 225–226 cm returns a date circa 1,500 younger than the age-depth model. The most likely explanation is that these outliers represent fluctuating water levels or in-wash from the terrestrialising lake-fen system at the BLoM coring location and/or some possible intrusion from root penetration (Chapter 17.1.4). The oldest sections of the core date back to circa 1050 cal BCE (Figure 17.3A) and lake gyttja material is deposited until circa 460 cal CE (170 cm), when the sediment transitions to herbaceous peat. Despite the changes in sediment type within the Black Loch core, sedimentation rates are generally consistent throughout the record.

Proxy	Description and method overview	Indicator (as used in this study)	Samples analysed	Eg references
Loss-on-Ignition 550 °C (LOI)*	Measurement of % organic matter, calculated from sample weight loss after combustion at 550 °C for 4 hours.	Accumulation and preservation of organic matter	BLoM: 5 cm resolution, whole core WLoM: 4 cm resolution, whole core	Heiri et al (2001)
X-ray fluorescence (XRF)*	Measurement of the elemental composition of sediments via IRAX scanning.	Erosion (titanium)	Both sites: 2 mm resolution, averaged to 1 cm, whole core	Davies et al (2015) Croudace et al (2006)
Biogenic silica (BSi)*	Measurement of the abundance of siliceous organism remains via alkaline digestion and spectrophotometry analysis.	Aquatic productivity (primarily diatoms in lake environments)	BLoM: 1 cm resolution, whole core WLoM: 2 cm resolution, whole core	Conley & Schelske (2001)
Carbon:nitrogen ratios (C:N)*	Measurement of the amount of carbon and nitrogen using an elemental analyser.	Source of organic material (terrestrial 'v' aquatic)	BLoM: 5 cm resolution, whole core WLoM: 4 cm resolution, top 1.8 m	Leng et al (2006)
$\delta^{13}\text{C}^*$	Measurement of stable carbon isotope ratio ( $^{13}\text{C}/^{12}\text{C}$ ) via mass spectrometry.	Carbon sources and/ or levels of ecosystem productivity	BLoM: 5 cm resolution, whole core WLoM: 4 cm resolution, top 1.8 m	Leng et al (2006)
$\delta^{15}\text{N}^*$	Measurement of stable nitrogen isotope ratio ( $^{15}\text{N}/^{14}\text{N}$ ) via mass spectrometry.	Nitrogen sources and cycling and/ or eutrophication and productivity	BLoM: 5 cm resolution, whole core WLoM: 4 cm resolution, top 1.8 m	Leng et al (2006)
Faecal lipid biomarkers (sterols and bile acids)+	Analysis of the abundance and ratios of sterols and bile acids derived from faecal matter via microwave assisted solvent extraction, column chromatography and gas chromatography mass spectrometry.	Dung input representing the presence of invertebrates (humans, cattle/ sheep/ goats, pigs, horses)	BLoM: 4-26 cm resolution, 2.2-3.2 m (spanning settlement occupation) WLoM: 8-24 cm resolution, top 2 m	Prost et al (2017)
Sedimentary ancient DNA ( <i>sedaDNA</i> )+	Extraction of chloroplast and mitochondrial DNA from plants and mammals using a lysis buffer prior to PCR. Mammalian DNA was targeting the 16S gene and chloroplast DNA was targeting the P6 loop region. Note: human DNA is not considered due to contamination during sample processing in the methodology used.	-Vegetation change (woodland, grassland and aquatic species, cereals, weeds, edibles) -Presence of mammals	BLoM: 4-16 cm resolution, top 2.7 m WLoM: 8-32 cm resolution whole core (higher resolution top 1.8 m)	Giguet-Covex et al (2014) Peyr�gne & Pr�fer (2020) Brown et al (2021)

Table 17.1 Summary of geochemical\*, biomolecular+ and palaeoecological^ proxies analysed in this study and their interpretation. Resolution of palaeoecological^ proxies is increased at time periods associated with BLoM archaeology, changes in core stratigraphies and increased levels of organic matter preservation. Resolution of biomolecular+ proxies was determined by results from higher resolution geochemical\* and palaeoecological^, targeting periods of change within the cores and spanning the settlement timeframe established from BLoM excavations.

### WLoM core stratigraphy and chronology

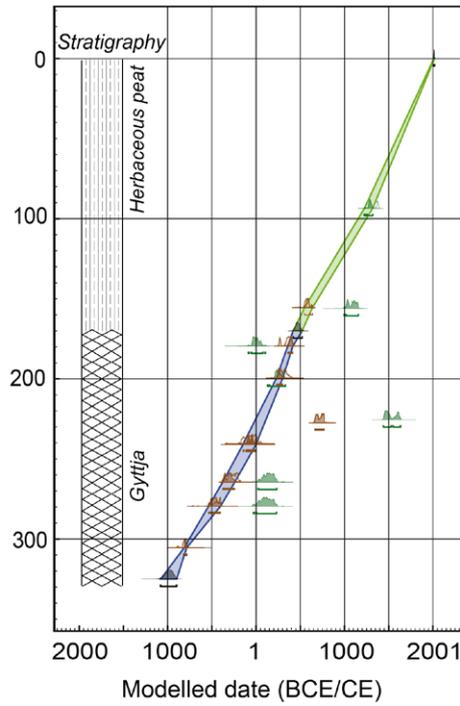
The White Loch sediment core was obtained 3 m from the currently exposed northern edge of the crannog and extends to a total sediment depth of 292 cm. The stratigraphy is composed of gyttja, with additional organic debris evident, including anthropogenic wooden debris and charcoal, between 168–40 cm (Figure 17.3B). Large pieces of wood are present in the stratigraphy from 138 cm and large charcoal particles *circa* 1 cm in diameter are present between 80–40 cm. The stratigraphy returns to gyttja in the top 30 cm.

Eight radiocarbon ( $^{14}\text{C}$ ) measurements were analysed from terrestrial plant remains extracted from the WLoM core (Table 17.3). These  $^{14}\text{C}$  dates were calibrated using INTCAL20 (Reimer et al 2020) and modelled using OxCal (Bronk Ramsey 2009) (Figure 17.3B). Two boundaries were inserted at 167 cm and 40 cm in this model to account for the influx of anthropogenic organic debris, as described above. The model is extrapolated from 200 cm, which represents the oldest

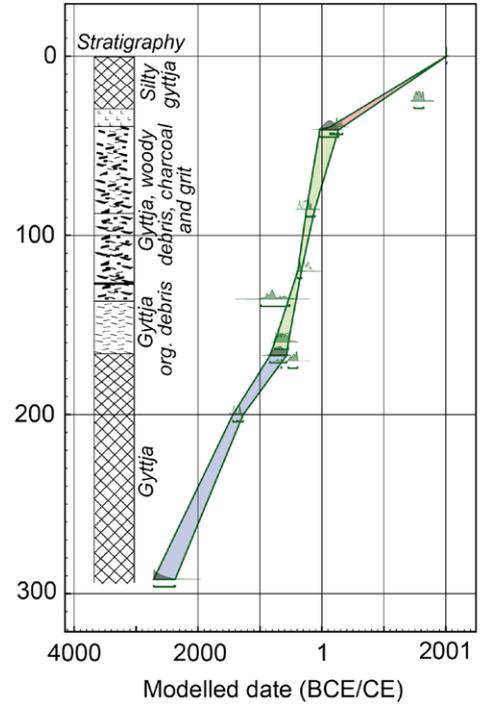
measured date, to the end of the core at 292 cm. Three  $^{14}\text{C}$  dates measured from *Pteridium* and terrestrial remains were identified as outliers using the OxCal outlier analysis general model (Bronk Ramsey 2009; Table 17.3). Two of these outliers are younger than the modelled age, which could suggest that they are influenced by modern contamination or may represent mixing of *Pteridium* if it was brought on-site rather than growing *in situ*. Conversely, the *Pteridium* fragment analysed at 135–136 cm is approximately 500 years older than the modelled age, which likely represents erosion of older crannog material since it has been deposited in the zone of increased organic debris. The oldest section of the core dates to *circa* 2,600 BCE (Figure 17.3B). The period of accumulation of anthropogenic organic debris, including wood and charcoal, persists from *circa* 570 BCE (160 cm) until *circa* 180 CE (40 cm) and corresponds with a pronounced increased accumulation rate compared with the other sections of the core.

Figure 17.3. Sediment stratigraphies and Bayesian chronologies developed for A: BLoM and B: WLoM sedimentary cores (developed in OxCal using INTCAL20 calibrated radiocarbon measurements). Green distribution symbols represent plant-based radiocarbon measurements and brown distributions represent bulk dates. Colour changes within the modelled age distribution represent locations of accumulation rate boundaries entered into OxCal model (ie between blue-green and green-red segments) as outlined in Chapter 17.1.2.1.

A: Black Loch of Myrton



B: White Loch of Myrton



Sample Code	Sample depth	Material	<sup>14</sup> C date	δ <sup>13</sup> C	Calibrated Age (B) CE 95.4% min (cal yrs)	Calibrated Age (B) CE 95.4% max (cal yrs)
OXA-34956	BLoM27 93-94	Terrestrial leaf fragment	688 ± 38	-26.1	1266 CE	1353 CE
OXA-34268	BLoM27 155-157	Terrestrial leaf fragment	978 ± 31	-27.4	1017 CE	1159 CE
OXA-35687	BLoM27 179-180	Potamogeton seeds	2012 ± 27	-24.0	54 BCE	78 BCE
OXA-37119	BLoM27 200	Bulk sediment	1813 ± 28	-30.5	115 CE	259 CE
OXA-35931	BLoM27 225-226a	Plant remains (undiff.)	385 ± 37	-30.4	1141 CE	1529
OXA-34957	BLoM27 240-242	Monocot stem and leaf	2081 ± 38	-27.9	197 CE	15 CE
OXA-35932	BLoM27 264-265a	Monocot stem fragments	1900 ± 45	-26.8	25 CE	236 CE
OXA-35933	BLoM27 279-280a	Nymphaee seeds	1920 ± 50	-24.3	7 CE	231 CE
OXA-35688	BLoM27 305-306	Bulk sediment	2595 ± 28	-29.6	813 BCE	761 BCE
SUERC-86339 (GU51288)	BLoM27 155.5	Bulk sediment	1507 ± 24	-29.3	538 CE	609 CE
SUERC-86340 (GU51289)	BLoM27 179.5	Bulk sediment	1702 ± 22	-29.5	331 CE	413 CE
SUERC-86344 (GU51290)	BLoM27 199.5	Bulk sediment	1752 ± 27	-29.5	239 CE	381 CE
SUERC-86345 (GU51291)	BLoM27 227.5	Bulk sediment	1292 ± 26	-29.6	665 CE	774 CE
SUERC-86346 (GU51292)	BLoM27 240.5	Bulk sediment	2028 ± 24	-29.8	56 BCE	62 BCE
SUERC-86347 (GU51293)	BLoM27 264.5	Bulk sediment	2217 ± 27	-29.4	330 BCE	197 BCE
SUERC-86348 (GU51294)	BLoM27 279.5	Bulk sediment	2376 ± 27	-30.1	540 BCE	392 BCE
SUERC-86349 (GU51295)	BLoM27 305.5	Bulk sediment	2659 ± 27	-30.2	841 BCE	790 BCE

Table 17.2. BLoM radiocarbon measurements (outliers are highlighted in red).

Sample Code	Core	Sample	Material	<sup>14</sup> C Date	±	δ <sup>13</sup> C	Calibrated Age (B) CE 95.4% min (cal yrs)	Calibrated Age (B) CE 95.4% max (cal yrs)
OXA-37121	Lake core	WLoM2+3 25	Terrestrial leaf matter	325	26	-28.8	1490 CE	1641 CE
OXA-35725	Lake core	WLoM2+3 39-40	Terrestrial plant matter	1795	27	-28.4	276 CE	342 CE
OXA-35726	Lake core	WLoM2+3 85-86	Pteridium remains	2226	27	-26.2	323 BCE	200 BCE
OXA-37122	Lake core	WLoM2+3 120	Pteridium remains	2205	29	-27.3	371 BCE	176 BCE
OXA-35938	Lake core	WLoM2+3 135-136	Pteridium remains	2630	80	-26.4	986 BCE	539 BCE
OXA-35964	Lake core	WLoM2+3 159-160	Dicot and bark remains	2482	27	-28.7	772 BCE	513 BCE
OXA-37123	Lake core	WLoM2+3 170	Pteridium remains	2383	29	-28.0	542 BCE	394 BCE
OXA-37125	Lake core	WLoM2+3 200	Monocot cf. Dicranales	3132	30	-35.8	1451 BCE	1292 BCE

Table 17.3. WLoM radiocarbon measurements of the lake core (outliers are highlighted in red).

### 17.1.3 BLoM and WLoM archaeological chronologies

Dendrochronological analyses of the BLoM settlement shows that the earliest evidence for tree-felling activity in the vicinity occurred between the late 7th century and the early half of 6th century BCE (felling range 622–586 BCE, Chapter 7.2.5). The main settlement phase occurred between 437 and 223 BCE, with a century-long hiatus between Episodes 2 and 3 (approximately 360–280 BCE, Chapter 2).

The chronology of the WLoM crannog is currently less well-defined than the chronology of the BLoM settlement but is based on radiocarbon measurements of the layer of *Fraxinus* timbers underlying the crannog (obtained by gauge coring at its centre) and measurements obtained from *Corylus avellana* charcoal from upper WLoM contexts. The dates of the lower WLoM timbers are calibrated to circa 760–410 cal BCE and the calibrated ages of the upper contexts are circa 390–200 cal BCE (Table 16.1). The upper context dates overlap with the only other published WLoM age of 350 cal BCE–60 cal CE, obtained from a small pile from the N of the island (Henderson et al 2003). Whilst the radiocarbon chronologies of WLoM presented here are less precise than the chronologies of the BLoM settlement developed using dendrochronology and <sup>14</sup>C wiggle matched dating, the timings of the BLoM settlement and the WLoM crannog appear to overlap in the early Iron Age and in Episode 3 of the BLoM settlement. Further insight into the chronology of the WLoM crannog construction, use and abandonment is provided by the multiproxy results from the lake sediment core discussed in Chapter 17.1.7.

### 17.1.4 Hydrological setting of BLoM

The modern environmental setting of BLoM is a forested marshland; however, the name ‘Black Loch of Myrton’ and early maps indicate that the site was previously

characterised by an open body of water (on-stream lake), before being drained around the start of the 19th century (Figure 1.2). Here we adopt three approaches to reconstruct the extent of the previous BLoM lake basin and characterise the hydrological setting at the time of BLoM construction and occupation: (1) describe changes in sediment composition of 31 cores obtained across a 320 m SW to NE transect located to the N of the excavated settlement (Figure 17.4), (2) model catchment hydrological change based on aerial LiDAR data, and (3) analyse geochemical and palaeoecological indicators of hydrological change from the BLoM master core.

#### 17.1.4.1 Characterisation of the former BLoM lake basin

The sediment cores obtained in the transect survey range in depth from 1.2 m to 12.8 m (Figures 17.4 & 17.5). Core depths extended to the point of maximum corer penetration, ie, when the resistance from the sediments exceeded the force available for manual coring. The deepest sections of the cores are characterised by sandy silty clays (eg BLoM6–10; Figure 17.5). Within the last circa 0.7 m of the sandy silty clay unit, the sediment transitions to more organic silty clays and then to silty clays. A continuous unit of gyttja (organic lake mud) is then present across the transect and reaches depths of 6 m in BLoM01 and BLoM27 (Figure 17.5). A gradual transition to herbaceous monocotyledon peat then occurs, extending over 1–2 m depending on the transect coring location. The sediment becomes less organic towards the top of the sequence, ending in a sandy silty clay that has accumulated over circa 40 cm.

The sediment sequence described above is representative of a classic Late Glacial to Holocene record of lake sediments: the sandy silty clays found in the deepest section of some of the cores represent sediments deposited during the Last Glacial Maximum–Late Glacial; the overlying organic silty clays represent



Figure 17.4. Transect of coring locations at BLoM. 'BLoM27' is the research master core analysed in this study and 'BLoM Site' is the location of the excavated settlement.

the Bølling/Allerød warm period; the subsequent silty clays are representative of the Younger Dryas cold period and the highly organic gyttja indicates the onset of the warmer Holocene. Due to incomplete sediment recovery in the deeper sections of some sediment cores, the clays at the base of the deposits were not always captured in the core descriptions evident in Figure 17.5. Water depths in the deepest area of the lake likely reached *circa* 7.5 m during the Holocene based on the maximum depth of gyttja deposits (Figure 17.6).

The location of the central part of the former lake basin is identified by the deepest sediments obtained from the coring transect (BLoM01) and the locations of shallower sediment cores (eg BLoM03 and BLoM08–10) mark the edges of the former lake basin (Figures 17.4 & 17.5). The change towards herbaceous monocotyledon peat in the sediment stratigraphies represents a gradual infilling and shallowing of the lake until a more littoral and/ or ephemeral lake environment or fen developed with reeds and fringing vegetation. Based on the chronology and stratigraphy of the master core (BLoM27; Figure 17.3A), the transition from gyttja to fen peat occurs *circa* 460 cal CE. The process of terrestrialisation continued over

time, developing soils in the higher banks of the former lake and conditions suitable for the development of the woodland. There is no open body of water present today at BLoM but the currently wooded area is prone to seasonal flooding in particularly wet years.

Using Phase III LiDAR data available from the Scottish Government Remote Sensing Portal, a digital elevation model was created for the area (Figure 17.6), with a flood model superimposed to highlight the entire basin which would disappear underwater if water levels were to rise by 4–5 m. The flood model shows that the BLoM settlement is not presently positioned on an elevated promontory or naturally higher area. We then used the sediment core stratigraphies (Figure 17.6) to indicate the start of lake gyttja deposits. These points were interpolated to produce a model of the bathymetry of the former lake basin when the lake formed, likely in the early Holocene. The basin was nearly 7.5 m deep, and this deepest point is located 100 m to the NE of the settlement. The position of the BLoM settlement was between higher ground to the S and the shallow lake margin, which partially surrounded the settlement (Figure 17.6), providing direct and easy access to the lake.

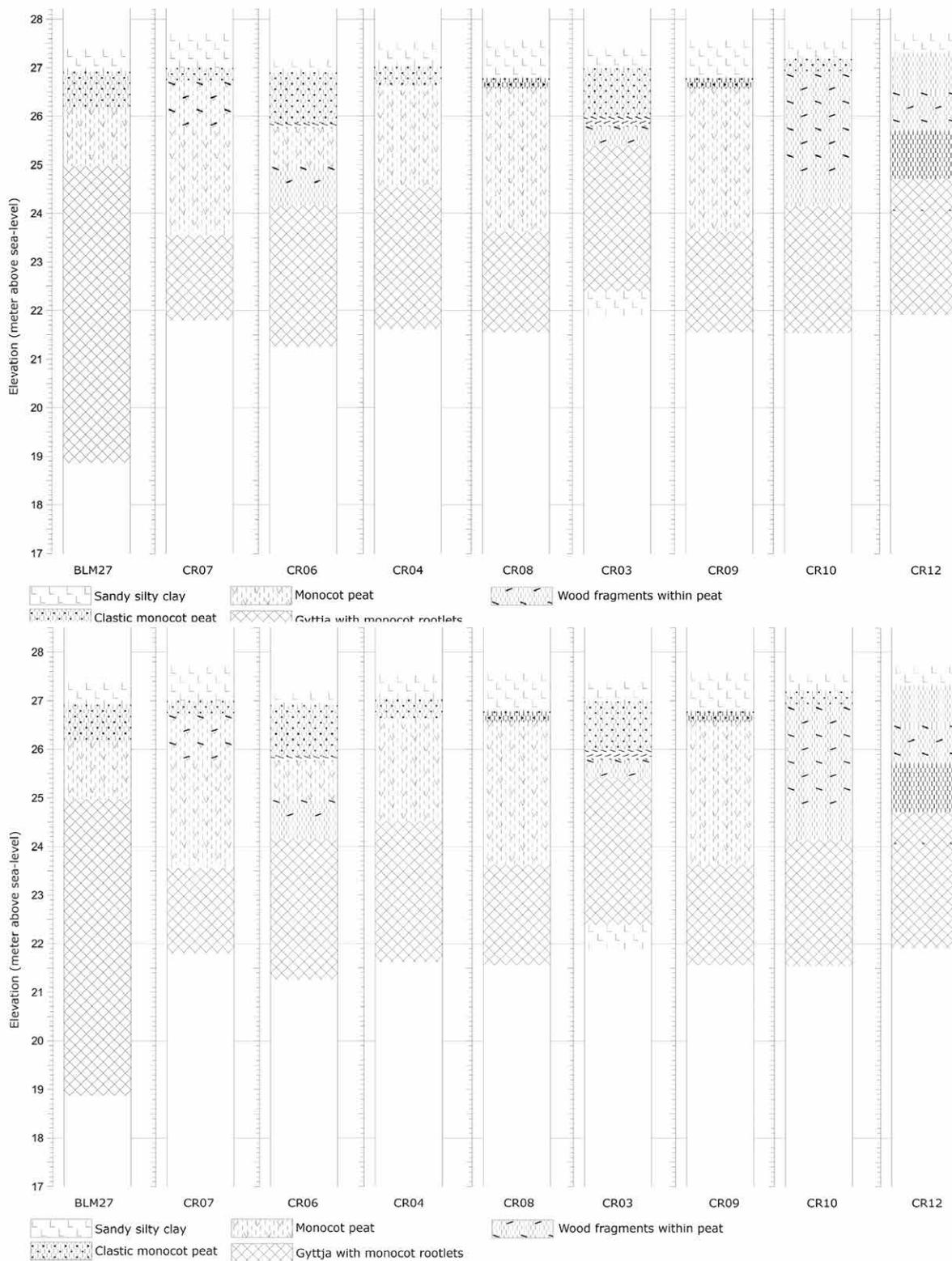


Figure 17.5. Example summary stratigraphies from the BLoM core transects to show the depths of gytja (organic rich lake sediment) deposition. Sandy, silty clays and clay rich material were detected at the bottom of some sequences, but sediment recovery from the base of all cores was not possible. Absences of these sedimentary layers does not therefore provide evidence of absence. The basal units of 'sandy silty clay' denoted here include a transitional period from sandy silty clays to organic silty clays to silty clays. BLM27 (upper left) is the master core used in the multiproxy analyses of this study.

#### 17.1.4.2 Reconstructing the terrestrialisation process at BLoM

Reconstructions of the BLoM terrestrialisation process are obtained through the analysis of geochemical and palaeoecological indicators of hydrological change from the master BLoM master core (Figure 17.7). C:N ratios, reflecting differences in terrestrial versus aquatic organic matter input, increase over time representing a gradual change from aquatic dominated organic matter *circa* 900 cal BCE (when C:N ratios are *circa* 7) to terrestrial dominated organic matter from *circa* cal 700 CE (when C:N ratios fluctuate above 20). The change towards a more terrestrial organic matter source over time is supported by the increasing trend in  $\delta^{13}\text{C}$  towards more positive values. The increases in C:N ratios and  $\delta^{13}\text{C}$  provide the strongest evidence for terrestrialisation (ie drying conditions) at the BLoM master coring location, alongside the visual change from gyttja to peat in the core stratigraphy, which occurs *circa* 460 cal CE (170 cm) in the master BLoM core (Figure 17.3A).

Whilst the geochemical indicators support a persistent terrestrialising trend over time, the palaeoecological indicators present a more complex story of fluctuating hydrological conditions. Aquatic and wetland pollen taxa vary throughout the record but increase from *circa* 1 CE to *circa* 1350 cal CE (Figure 17.7). An example of this is the presence of open water plants *Nymphaea* and *Nuphar* (water lilies) early in the pollen record, which then decrease before returning towards the end of the record (see Chapter 17.1.5.1 below for more detailed palynology discussions). *Equisetum* (horsetail) and *Typha* (bulrush) pollen are detected in the latter half of the record, from *circa* 300 cal CE in the case of *Typha*, which represents an expansion of fringing aquatics.

The chironomid and diatom species assemblages, which extend from *circa* 1000 cal BCE to 1100 cal CE, both indicate a shallow and fluctuating fen-like wetland environment, rather than a deep standing body of water (Figure 17.7). This is demonstrated through the persistent presence of littoral chironomid taxa within the *Polypedilum* genus, many of which are associated with macrophytes, throughout the record and the presence of diatom taxa that can be classed as periphytic (attached to substrates including plants and rocks, eg *Achnanthes minutissima* and *Gomphonema angustum*) and tychoplanktonic (loosely attached to substrates, eg *Stauroforma exiguiformis*), particularly in the early part of the record (*circa* pre-600 BCE). The presence of *S. exiguiformis*, which generally persists throughout the record, is indicative of a shallow, slightly acidic environment (Flower et al 1996) and there is a persistent low abundance of planktonic diatom taxa (<1%). The diatom and chironomid assemblages therefore support inferences that areas of open water proximal to the coring location would have been shallow.

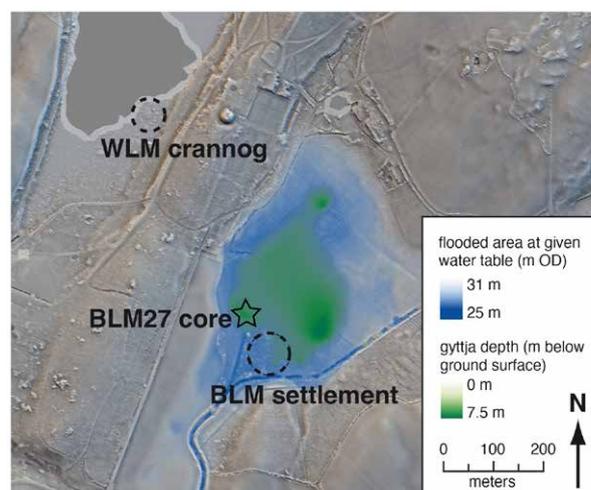


Figure 17.6. LIDAR and flood modelling of BLoM. Darker blue indicates deeper parts of the basin. Basal depth of gyttja (lake sediments) is shown in green. WLoM crannog and the BLoM settlement are indicated by dashed circles and location of BLoM27 master core is the centre of the black star.

The chironomid and diatom assemblages indicate a change in hydrological conditions *circa* 700–600 BCE to 100 CE: the presence of *Rheotanytarsus* provides some indication of the presence of moving water near the coring region and a reduction in periphytic diatom taxa is indicative of siltation. From *circa* 100 cal CE, increased abundances of *A. minutissima*, which is an early coloniser of plant substrates (Eulin & Le Cohu 1998; Sojininen & Eloranta 2004; Yallop & Kelly 2006), and tychoplanktonic *S. exiguiformis*, indicates expansion of substrates in the local area and this further terrestrialisation is supported by the increasing trend in *Polypedilum* abundance. A more established shallow wetland system is reconstructed from *circa* 450 cal CE, as indicated by the increase in abundance of *G. angustum* and a decrease in *A. minutissima*. An established fen-like wetland community is reconstructed *circa* 1000–900 cal CE based on the diatom assemblage in which periphytic *G. angustum* and tychoplanktonic *S. exiguiformis* are dominant (Figure 17.7).

#### 17.1.4.3 BLoM hydrological setting

The stratigraphic information obtained from the coring transect and the basin bathymetry reveal that BLoM was originally a lake, with open water extending approximately 10 ha. Hydrological reconstructions indicate that the deepest area of open water was located at the southern end of the lake and water depths reached over 7.5 m. The BLoM settlement is located 100m SW of the reconstructed area of greatest water depth (Figure 17.6). The gyttja present in the dated BLoM master core transitioned to herbaceous peat *circa* 460 cal CE, showing

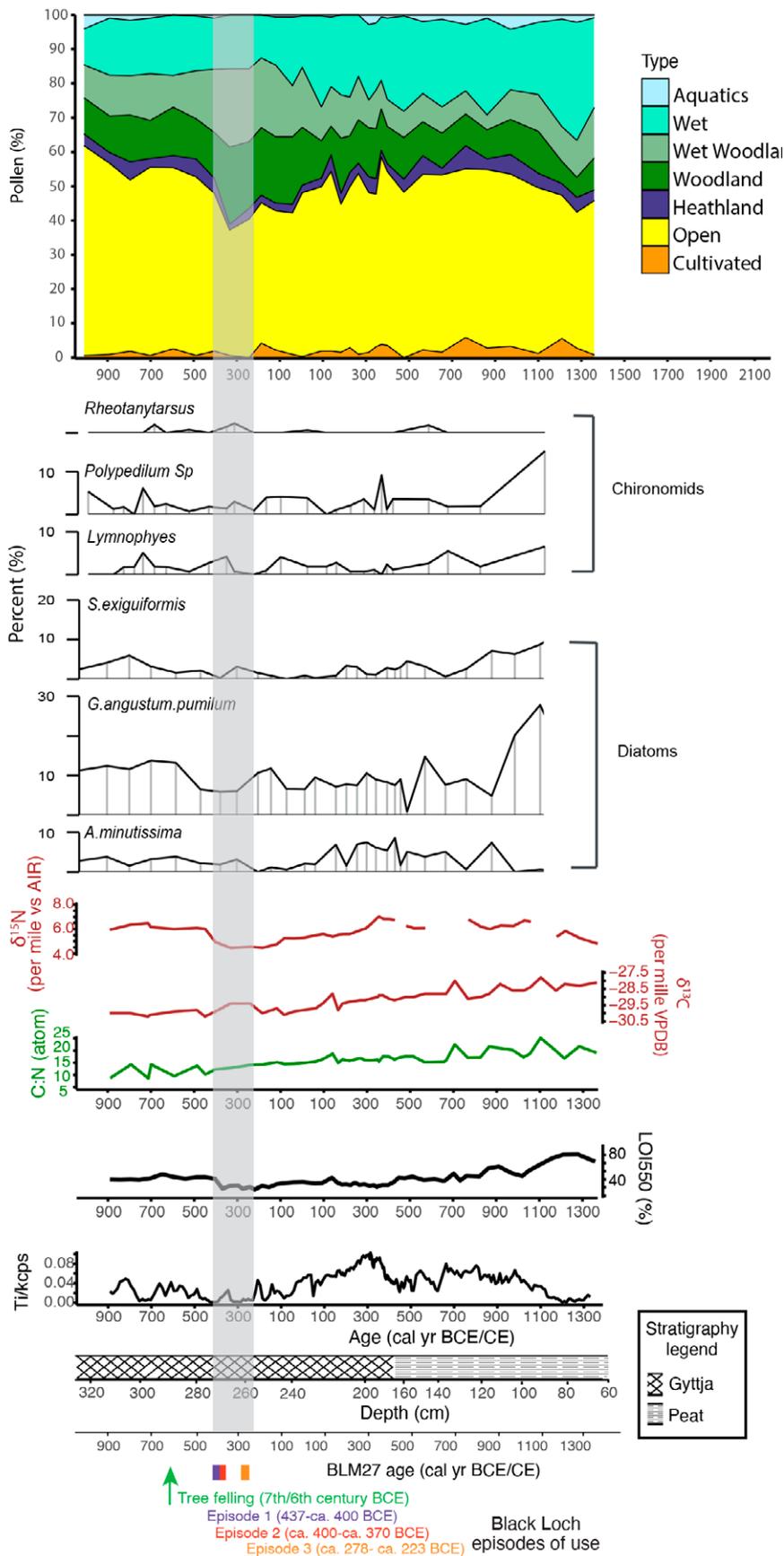


Figure 17.7. BLoM27 master core geochemical and palaeoecological indicators of environmental change and particularly terrestrialisation. Depth represents depth of core (where current surface sediment is 0 cm) and stratigraphy has been simplified into two categories of gyttja and peat. Ti = titanium mineralogical input, LOI550 = organic carbon content, C:N = carbon: nitrogen ratio, representing aquatic (low values) to terrestrial input (high values),  $\delta^{13}\text{C}$  represents productivity or source of organic matter,  $\delta^{15}\text{N}$  can represent nutrient input or changes in bacterial activity, selected diatoms respond to changes in macrophytes and selected chironomids are indicative of running water (*Rheotanytarsus*) and shallow, vegetation-rich conditions (*Lymnophyes* and *Polypedium*). Coloured rectangles represent the age of the settlement.

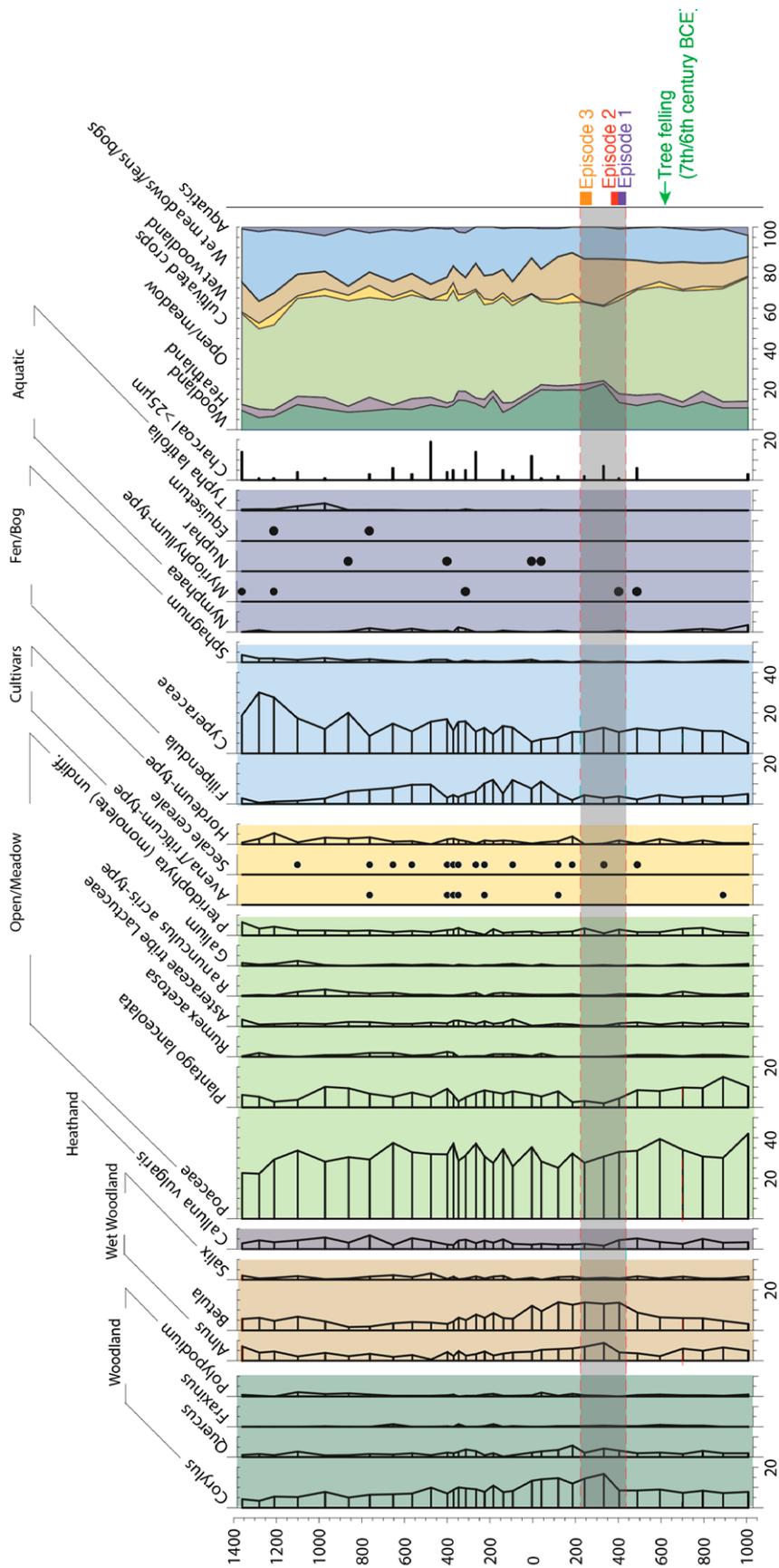


Figure 17.8. BLom pollen and spore assemblage diagram. Woodland taxa are indicated in forest green, heathland taxa in dark magenta, open meadows in light green, cultivated crops in gold, wet woodland in chocolate brown, wet meadow, fen and bog taxa in teal and aquatic taxa in blue. To compare shifts in these vegetation types the percentage is based on the pollen and spore sum including bryophytes, ferns and aquatic pollen. The red dashed lines are based on the dendrochronology of the settlement site. The grey box delineates the three episodes of settlement (coloured boxes on right-hand side of diagram represents different episodes: Episode 1 (437–circa 400 BCE), Episode 2 (circa 400–circa 370 BCE) and Episode 3 (circa 278–circa 223 BCE). Green arrow represents the tree-felling event/s (7th/6th century BCE).

that the lake margin retreated centuries after the BLoM settlement had been in use. The presence of *Rheotanytarsus* within the chironomid assemblage indicates flowing water sources (Figure 17.7), which might be related to a previous version of the present day Monreith Burn (now diverted to the S of the settlement). These conditions persist throughout the occupation period of the settlement, with increased terrestriation occurring from *circa* 100 cal CE. The environment would have been more likely typical of a fluctuating, possibly ephemeral pooling wetland from *circa* 100 cal CE, before the full transition to a fen-peatland *circa* 460 cal CE.

### 17.1.5 Landscape vegetation characteristics around the Lochs of Myrton

#### 17.1.5.1 BLoM pollen vegetation reconstruction

The pollen reconstruction from the BLoM master sediment core characterises the environment before the first archaeological evidence of activity at BLoM (prior to 622–586 cal BCE) as a fairly open landscape, based on the dominance of open/ meadow/ wetland taxa (including grasses Poaceae, *Phragmites* and ribwort plantain *Plantago lanceolata*), which account for *circa* 60% of the assemblage, and small amounts of heathland taxa (mainly ling, *Calluna vulgaris*) (Figure 17.8). Woodland pollen species account for a small proportion of the assemblage (*circa* 10%) but are dominated by *Corylus* (hazel) – which can over-dominate pollen rain – accompanied by *Quercus* (oak) and *Fraxinus* (ash). Wet woodland species, including *Alnus* (alder), *Betula* (birch) and *Salix* (willow), also account for *circa* 10% of the assemblage. The only cereal crop present prior to the BLoM settlement is *Avena/Triticum*-type (Figure 17.8), detected *circa* 900 cal BCE, which presents the possibility of late Bronze Age *Triticum*-based arable agriculture activity occurring nearby, likely within the BLoM catchment.

The earliest tree-felling date at BLoM (622–586 BCE) occurs decades after the minor reduction in *Corylus* and *Quercus* pollen and an increase in grass pollen (Figure 17.8). Whilst this may be indicative of small-scale localised tree clearance prior to settlement construction, the reductions in pollen percentages are within baseline fluctuations. Between the *tpq* date (662 BCE) and the start of the occupation period (437 BCE), the open landscape taxa are stable but there is some expansion of wet woodland taxa. The presence of charcoal in the record is rare until this phase after which it persists in relatively low concentrations throughout the remainder of the record (Figure 17.8). This period is also associated with *Hordeum* (barley) and the first occurrence of *Secale cereale* (rye) (*circa* 500 cal BCE) in the BLoM pollen record, representing the presence of *hordeum*-dominated agricultural activity near the settlement during this period.

During the BLoM settlement (437–223 BCE), the environment was characterised by wet woodlands with increases in *Betula* and *Alnus* and decreases in *Plantago* compared with the preceding *circa* 250 years (Figure 17.8). This increase in wet woodland therefore suggests that conditions around the settlement were becoming more sheltered. *Hordeum* and *Secale cereale* pollen grains are also present in the early stages of the settlement. Later, following the abandonment of BLoM (post-223 BCE) the presence of *Secale cereale* persists and *Avena/Triticum*-type is sporadically present, supporting continued cultivation of the landscape. The post-settlement phase is characterised by an opening up of the landscape through an expansion of wet meadows and a reduction in woodland taxa (*Corylus*, *Betula* and *Quercus*) (Figure 17.8).

#### 17.1.5.2 WLoM pollen vegetation reconstruction

The WLoM pollen record extends back to *circa* 3200 cal BCE (Figure 17.9), providing longer environmental context than the BLoM record (Figure 17.9). The pollen record at WLoM prior to the BLoM settlement is dominated by woodland taxa *Corylus* and *Quercus* (*circa* 45% combined) and, unlike BLoM, contained a small component of taxa representing an open landscape (*circa* 25%). Cereal-type grains are persistently present, albeit in low concentrations, throughout the WLoM record: *Hordeum* grains are first detected *circa* 3050 cal BCE and their presence is persistent throughout the record, whilst *Secale cereale* grains are detected later (*circa* 2750 cal BCE) and their presence is more infrequent with lower overall numbers than *Hordeum*. Whilst *Secale cereale* may be a weed species associated with other crops in some areas (eg Zohary et al 2012) this is unlikely here since it is not an endemic species. Additionally, the presence of *Hordeum* demonstrates the long history of agricultural land use within the surrounding area.

The dates associated with felling date and therefore earliest re-used timbers in the BLoM settlement (622–586 BCE) overlap with the radiocarbon age estimates from the oldest dates obtained from the WLoM crannog (757–416 BCE). At this time, there is a small decrease in *Corylus* and *Quercus* pollen taxa (*circa* 5%) and an increase in grasses and *Plantago* in the WLoM pollen record (Figure 17.0). These subtle changes in the WLoM record indicate that levels of anthropogenic activity around the BLoM *tpq* date of 622 BCE were small-scale, supporting conclusions obtained from the BLoM pollen record.

The main BLoM settlement period (437–223 BCE) corresponds with radiocarbon dates on excavated and cored material from the WLoM crannog. This period is characterised by a forest clearing horizon in the WLoM record (Figure 17.9): woodland taxa decline (primary *Corylus* and *Quercus*), the landscape opens up (sharp



expansion of Poaceae and *Plantago* accompanied by an increase in herbaceous species such as Asteraceae) and burning events are indicated by a persistent low concentration of charcoal (Figure 17.9). The vegetation changes associated with this period are therefore typical of a 'Landnam' type clearance.

Species such as *Corylus*, *Alnus* and *Quercus* provided wood for use within the BLoM settlements (Figure 14.1). However, shifts in these taxa appear more prominent in the WLoM record rather than BLoM, indicating exploitation of these taxa was taking place further away from the BLoM settlement. *Corylus* peaks within the WLoM record near the end of BLoM occupation, which could either be indicative of woodland management practices (for example, coppicing has been shown to result in prolonged increase in *Corylus* pollen production (Waller et al 2012) or the recolonisation of woodlands in parts of the landscape. Alder pollen production is known to decline in the period after coppicing (Waller et al 2012) and, whilst abundances of alder pollen are lower than hazel and oak in the WLoM record, there are small reductions of alder pollen during the occupation window that could also represent alder woodland management and coppicing.

The opening of the landscape and the maintenance of meadows/ field systems is evidenced by the presence of *Hordeum*, *Secale cereale* and *Avena/Triticum*-type throughout the settlement period at WLoM. The presence of these cereal grains in the WLoM record support arable activity and/ or crop plants within the vicinity of the lake. This is supported by the detection of *Hordeum Vulgare L*, *Hordeum* spp. and *Triticum* spp. cereal caryopses in the WLoM crannog test-pit (Chapter 16.2.1.3). After the settlement period of BLoM (post-223 cal BCE), most woodland taxa decrease whilst wet woodland taxa expand.

#### 17.1.5.3 Comparisons between the BLoM and WLoM pollen vegetation reconstructions

The pollen records from BLoM and WLoM differ, with a higher abundance of grasses, sedges and wet woodland taxa in the BLoM record and around twice as much pollen from woodland taxa in the WLoM record compared with BLoM. The major differences between the two sites are their depositional environments and size: BLoM is a terrestrialsing water body within a wet fen, reconstructed as approximately half the size of WLoM (Chapter 17.1.4.1), whilst WLoM is a persistent open lake environment. The fringing vegetation around the fen-lake environment of BLoM and its smaller size may reduce the amount of pollen originating from more distal woodland sources entering into the sedimentary record compared with WLoM. The higher abundance of woodland taxa such as *Corylus* and *Quercus* in WLoM pollen record may also represent a denser woodland in the WLoM catchment compared with BLoM, which was more likely surrounded by an alder-carr type environment.

*Corylus* is the dominant woodland taxon when both pollen records are considered together, with *Quercus* accounting for the second-most abundant tree species present in the first half of the record (circa 3200–1000 cal BCE) when overall woodland cover was more expansive. The woodland taxa change to include a greater proportion of *Betula*, compared with *Quercus*, from circa 500 cal BCE. The timing of this change in woodland composition corresponds with the BLoM settlement phase and may therefore reflect either the use of *Quercus* in settlement construction and maintenance and/ or natural landscape change to increased wet woodland. *Alnus* and *Salix* are present throughout the record but generally make small contributions to the overall woodland cover when both catchments are considered together.

#### 17.1.5.4 Comparison with regional records of landscape change

A review of published reconstructions of environmental change obtained from sites in SW Scotland is provided within the following sections and results show that landscape change varied over both time and space within the Galloway region. This suggests that the heterogeneity of landscape change was localised; however, it is also important to note that differences between records may also arise from chronological uncertainties associated with many of these reconstructions that were developed around two decades ago, when radiocarbon dating approaches were less precise, and the temporal foci of the studies differed. Obtaining robust comparisons of environmental records from regions proximal to SW Scotland is therefore challenging; however, the available information is summarised here to place the BLoM and WLoM landscapes in a regional context.

#### Regional climatic context for BLoM settlement

SCARF (2012) provides a national overview of Scottish Iron Age climate change. Here, we specifically focus on climatic changes that likely impacted SW Scotland to determine the extent to which climate change influenced Iron Age settlements and vegetation cover associated with Lochs of Myrton. Regional patterns of climate change can be inferred based on reconstructions from the Solway Firth and Cumbria, as summarised by Langdon et al (2003, 2004) and Barber et al (2013). The available climate records have been developed from ombrotrophic (rain-fed) peatland proxies, which are sensitive to changes in effective precipitation (Charman et al 2009). Two lacustrine temperature reconstructions are also available from this extended region over the time period of interest: the northern Cumbrian Talkin Tarn and more southern Bigland Tarn records (Langdon et al 2004; Barber et al 2013). These reconstructions exploit the sensitivity of chironomid head capsules to temperature changes in undisturbed temperate lake catchments (Brooks et al 2007).

Available palaeoecological climate reconstructions for SW Scotland and NW England highlight a multi-century climate deterioration in the early Iron Age period, with wet and cooler conditions centred around 750 BCE based on peatland water table depth reconstruction (Barber et al 2013). The timings of colder, wetter conditions are later than the initial reduction in woodland taxa around the Lochs of Myrton but appear to correspond with the BLoM settlement *tpq* date and a reduction in *Corylus and Quercus* pollen in WLoM. The reduction in *Corylus and Quercus* cover around the Lochs of Myrton may therefore be attributed to a combination of both natural climatic change as well as anthropogenic deforestation prior to the BLoM settlement.

Summer temperatures fluctuate but generally increase from *circa* 750 cal BCE–*circa* 150 CE (Langdon et al 2003; Barber et al 2013) when hydrological conditions remain variable but predominately wet. These wet and warming conditions would have therefore characterised the BLoM settlement phase. Whilst climate influences vegetation assemblages, there are no clear trends linking vegetation change and climate over this time period to suggest a dominant climatic control in the landcover for the Lochs of Myrton. Higher resolution climate reconstructions from the area, with greater chronological control over the Iron Age period are required to comprehensively test the link between climate, vegetation and the Lochs of Myrton settlements.

### Regional landscape change prior to the Lochs of Myrton settlements

Pre-Iron Age activity in the Machars peninsula was widespread (Chapter 1.1.3). Early evidence of anthropogenic activity in Galloway is also identified in pollen vegetation reconstructions, with evidence of small-scale arable agriculture from the Early Neolithic (Flitcroft 2005) and areas of grazed grassland from the Late Neolithic (Jones et al 1989) and Bronze Age (Flitcroft 2005).

The presence of cereal grains around the Lochs of Myrton, first detected in the WLoM pollen diagram *circa* 3050 cal BCE, demonstrates that land management and cultivation was a longstanding practice around the Lochs of Myrton from the early Bronze Age. Earlier pollen evidence of small-scale arable agriculture in the wider area has been identified at Lagafater, *circa* 40 km NW of the Lochs of Myrton, from *circa* 3850–3500 cal BCE, although cereal pollen was detected later in the record *circa* 2250–2000 BCE (Flitcroft 2005). Cereal pollen from elsewhere in the region dates to *circa* 1100 cal BCE from the middle Bronze Age at Rispain Camp located <10 km from the Lochs of Myrton (Ramsay et al 2007) and *circa* 1000 cal CE from Brighthouse Bay, located 30 km E of the Lochs of Myrton (Wells et al 1999). The WLoM pollen record therefore presents an early record of land cultivation in the region.

Several pollen records from Galloway reveal a decline in woodlands and an increase in openness and grazing

from the Neolithic/ Early Bronze Age that intensifies towards the Iron Age. For example, the pollen record from the Round Loch of Glenhead in the Galloway Forest Park, *circa* 40 km N of the Lochs of Myrton, highlights an increase in the level of openness and grazing from *circa* 2500 cal BCE into the Iron Age (Jones et al 1989). Adjacent to the Round Loch of Glenhead, Ellergower Moss record reconstructed grassland within the hazel-oak and alder landscape from *circa* 1750 cal BCE and an increase in grassland from *circa* 700 cal BCE (Dumayne-Peaty 1999). The Ellergower Moss timings of the start of grassland expansion are similar to grazing indicators in the records from Lagafater (*circa* 1700 cal BCE) (Flitcroft 2005) and Brighthouse Bay (*circa* 2000 cal BCE) (Wells et al 1999) and the intensification of grazing indicators from these records are dated to *circa* 1300–500 cal BCE (Flitcroft 2005) and *circa* 760–230 cal BCE respectively (Wells et al 1999). The trend towards increasingly grazed spaces around the Lochs of Myrton is thus similar to the emerging regional picture: the intensification of grazing land is represented by an increase in Poaceae from *circa* 1400–1050 cal BCE at WLoM, peaking at *circa* 40% of the WLoM pollen assemblage between 450–150 cal BCE (Figure 17.8).

Whilst a regional trend towards a more open landscape in the Iron Age is evident, there are some examples of woodland persistence or regeneration *circa* 1400–700 BCE. For example, the Brighthouse Bay record shows a limited recovery of alder woodland *circa* 1400 cal BCE (Wells et al 1999) and the pollen record from Ellergower Moss supports regeneration of the hazel-oak-alder woodland *circa* 1250–700 cal BCE (Dumayne-Peaty 1999). Woodland cover does subtly expand from *circa* 2000–1400 cal BCE around the WLoM, with increases in the area cover of *Quercus*, *Alnus* and *Betula* (Figure 17.9). However, this expansion of woodland is short-lived at WLoM: from *circa* 1400 cal BCE, woodland cover temporarily declines before experiencing a more pronounced decrease *circa* 500 cal BCE. A decline in BLoM woodland taxa also occurs around this later date but is shorter lived than the decline experienced at WLoM. The correspondence between the Lochs of Myrton woodland decline dates and the settlement chronologies suggests that the decline in woodland near BLoM and WLoM may relate to the construction and maintenance of the Iron Age settlements.

### Regional landscape change BLoM settlement phase (437–223 BCE)

An existing pollen record from Cults Loch, a late Iron Age wetland settlement located *circa* 30 km NE of the Lochs of Myrton, contains little evidence of settlement-related woodland clearance and agricultural intensification, but it does show that *Quercus* was a common feature of the local woodland and therefore was available for construction purposes (Cavers & Crone 2018; Fonville et al 2018). The

pollen evidence from the Lochs of Myrton also reveal the availability of *Quercus*, as well as *Alnus*, in the landscape for construction purposes and the abrupt decrease in *Quercus* and *Alnus* pollen in the WLoM record around the time of BLoM settlement construction adds weight to this theory and also presents the possibility of *Alnus* wood management (Figure 17.9). Interestingly, the decrease in woodland and wet woodland species only occurs in the WLoM record and as these species increase in the BLoM record. This finding is indicative of spatial patterning in landscape use around the Lochs of Myrton.

The WLoM pollen record contains a pronounced, abrupt but temporary increase in *Corylus* pollen during the settlement phase and *Corylus* pollen increases in the BLoM record. These trends in pollen data may reflect localised *Corylus* management strategies such as coppicing, since modern studies of coppicing has shown that *Corylus* catkin production is high in the first six years after coppicing (Waller et al 2012). *Corylus* is used as brushwood within the BLoM settlement, which would require frequent repair, compared with species such as *Alnus*, which is more often used as structural timbers (Chapter 14.2). Whilst the spike in *Corylus* pollen in the WLoM record may also indicate that foliage (and therefore pollen) was brought onto the crannog, archaeological information from other crannog sites supports the practice of coppicing. For example, whilst later in date, the large quantities of withies used within Buiston crannog, located N of Kilmarnock, would have likely required the presence of coppiced woodlands (Crone & Brunning 2000).

#### Regional landscape change BLoM post-settlement phase (200 BCE–present day)

Woodland taxa around the Lochs of Myrton increases between 225–1 cal BCE, driven by an increase in *Corylus* and *Betula* (Figures 17.8 & 17.9). This increase in woodland taxa after settlement abandonment may reflect the establishment of trees on the crannog, thereby providing a highly proximal source of pollen to the coring location, or a reduction in woodland management in the catchment. There is no evidence of woodland regeneration at this time from other published regional pollen records, suggesting that this is likely primarily driven by local changes in anthropogenic influence rather than climate. The increase in woodland species is temporary since woodland cover reduces again from *circa* 1 cal BCE towards the present day (Figures 17.8 & 17.9), with the exception of the increase in *Alnus* at WLoM from *circa* 500 cal CE (Figure 17.9). The continued presence of cereal grains demonstrates the persistence of cereal cultivation and/ or processing within the vicinities of the Lochs of Myrton. This is also supported by the pollen record from Carsegowan Moss which contained cereal pollen from *circa* 300–1 cal BCE (Dumayne-Peaty 1999).

### 17.1.6 Exploitation of natural resources around the Lochs of Myrton

#### 17.1.6.1 Plant exploitation

##### Sedimentary evidence of plants exploited at BLoM

Vegetation reconstructions of plant exploitation were obtained using sedimentary ancient DNA (*sedaDNA*) and pollen flux, analysed from the master BLoM27 sedimentary core (Figure 17.10). Pollen fluxes, rather than percentages, are used here to account for any changes in the pollen record that may be driven by changes in sedimentary accumulation rates. The temporal foci of the analyses vary, since no *sedaDNA* analyses were conducted on samples older than *circa* 400 cal BCE, whilst the pollen extends to *circa* 1000 cal BCE. We originally aimed for the *sedaDNA* analyses to encompass the full occupation period; however, laboratory constraints meant that they were completed before the final BLoM27 chronology was developed, which resulted in the sediments being younger than previously modelled. *SedaDNA* and pollen data represent plant exploitation at BLoM from settlement Episode 2 onwards, whilst pollen data alone represents prior to and during BLoM settlement Episode 1. The sampling resolution of these vegetation proxies is around one sample every 100 years; therefore, dates referenced in the following sections are coarse guides to timings of species presence and absence.

The pollen record at BLoM reveals the presence of a mixed *Betula*, *Corylus*, *Quercus* and *Fraxinus* woodland prior to and during the settlement phase (Figure 17.10). The pollen fluxes of all four tree species are increasing during the settlement phase and, whilst high fluxes of *Betula* persist after the settlement phase, *Quercus*, *Corylus* and *Fraxinus* decrease after site abandonment. Results from the *sedaDNA* reads indicate that *Betulaceae* reduces from the time of the settlement; however, this is a mixed signal of *Betula* and *Corylus*. The wet meadow and wet woodland indicators in the *sedaDNA* have combined reads of >10,000 in samples analysed between 450–425 cal BCE, compared with averaged combined reads of <2000 before 5000 cal BCE and <4000 after 2000 cal BCE. These findings highlight the expansion of the wetland taxa during the settlement period, as discussed in Chapter 17.1.4.

Evidence of arable agriculture corresponding with the dates of the BLoM settlement includes *Hordeum*-type cultivation, which first occurs *circa* 600 cal BCE, prior to the settlement of BLoM but within the *tpq* date range. The first evidence of *Secale cereale* pollen is detected later at *circa* 500 cal BCE (Figures 17.8 & 17.10). During the settlement phase, *Hordeum*-type pollen persists in the early phase (*circa* 400 cal BCE) and this is followed by the presence of *Secale cereale* grains in the later phase (*circa* 325 cal BCE) (Figures 17.8 & 17.10). There is no pollen evidence of cereals

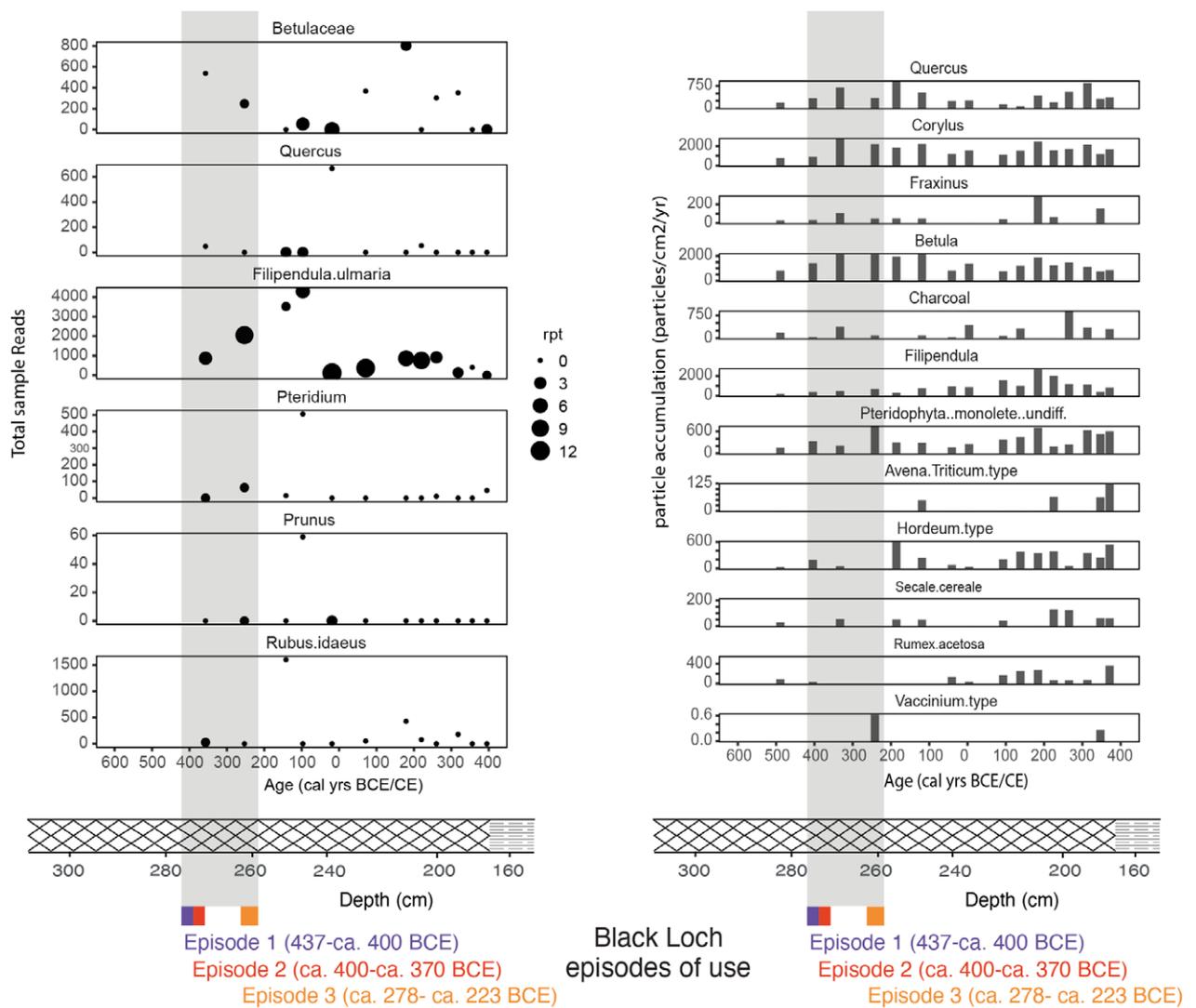


Figure 17.10. Left panel: BLoM DNA reads on the y-axis, whilst the size of the dots reflects the number of repeats in which the DNA sequence was found in each sample. Right panel: BLoM pollen, spore and charcoal accumulation rate (particles cm<sup>2</sup> yr<sup>-1</sup>) of selected taxa indicative of woodland use, cultivated crops and other edible plants.

throughout the remainder of the settlement phase. The presence of cereal pollen becomes more persistent after the BLoM settlement from *circa* 200 cal BCE, with *Hordeum*-type grains present in the majority of samples and *Avena/Triticum*-type and *Secale cereale* grains are common occurrences (Figures 17.8 & 17.10). *Avena/Triticum*-type pollen is therefore only detected before and after the BLoM settlement phase in the BLoM record.

Whilst the pollen record provides an overview of arable agriculture around BLoM, there is no evidence of cereal crops from the *sed*aDNA data (Figure 17.10). The results from *sed*aDNA are dominated by wetland taxa, highlighting a dominance of vegetation highly localised to the coring location. These differences in the geographical source-areas between the *sed*aDNA and pollen records (with the *sed*aDNA

being a more local signal) are advantageous in terms of obtaining a holistic view of plants available to the BLoM settlement. For example, edible species, *Prunus* and *Rubus*, are detected in the *sed*aDNA data from the settlement phase (Figure 17.10). The pollen record does not register either *Prunus* or *Rubus* but does reveal the presence of *Rumex* and *Vaccinium* during the settlement phase (Figure 17.8). All four edible species may therefore have supplemented diets of those associated with the BLoM.

#### Sedimentary evidence of plants exploited at WLoM

The pollen data from WLoM indicate the presence of a mixed *Quercus* and *Corylus* woodland and some mixed wet woodland of *Betula* and *Alnus* around the lake with

*Fraxinus*, *Pinus* and *Ulmus* present at points throughout the record (Figure 17.9). The pollen flux of *Quercus* and *Fraxinus* decreases circa 450 cal BCE, around the time of the start of the BLoM settlement phase and corresponding to early dates of the WLoM crannog (Figure 17.11). *Quercus* and *Fraxinus* pollen fluxes remain low towards the end of the BLoM settlement, when the fluxes increase again after circa 300 cal BCE. *Corylus* pollen fluxes are more stable around the time of the start of the BLoM settlement than *Quercus* and *Fraxinus* but do show a decline circa 350 cal BCE. *Corylus* pollen flux abruptly increases temporarily circa 300 cal BCE, corresponding with the end of the BLoM settlement phase and is within the later WLoM crannog age ranges, with pollen flux exceeding four times that of any other point in the record.

Evidence of arable taxa associated with WLoM is detected from the pollen analysis through the presence of *Hordeum*-type, *Secale cereale* and *Avena/Triticum*-type grains. *Hordeum*-type pollen is first detected circa 3100 cal BCE and low numbers of *Secale cereale* grains are detected circa 2750 cal BCE. *Avena/Triticum*-type is first registered later in the record circa 450 cal BCE (Figure 17.9). These results extend inferences from the BLoM pollen data which show that arable taxa were present within the Lochs of Myrton area before the BLoM or WLoM settlements. *Hordeum*-type and *Secale cereale* grains are more persistent within the WLoM pollen record than *Avena/Triticum*-type, with *Hordeum*-type pollen fluxes peaking circa 300 cal BCE, whilst *Secale cereale* pollen fluxes peak later circa 250 cal BCE (Figure 17.11). There is no evidence of *Avena/Triticum*-type during the time of the BLoM settlement phase. Pollen from all three cereal crops persists beyond the BLoM settlement phase and the dates associated with the WLoM crannog.

The WLoM *sedadNA* record does not reveal evidence of cereal crops (Figure 17.11), which again suggests that the *sedadNA* record is capturing a more local vegetation signal compared with the pollen record and that the arable plants were not likely located proximal to the lake shore. The lack of cereal crop *sedadNA* from the WLoM sediment core indicates that crop processing activity on the crannog was minimal and/ or low intensity. Individual occurrences of cereal caryopses from *Hordeum Vulgare L*, *Hordeum* spp. *T dicocum/Spelta* spp. and *Triticum* spp. were, however, recovered from the WLoM crannog test-pit, in contexts dating to approximately 400–200 cal BCE (Chapter 16.2.1.3). The *sedadNA* record provides evidence of other plants that may be used in WLoM construction, such as *Pteridium* (with elevated reads between circa 500–100 cal BCE) and *Phragmites* (Figure 17.11).

The *sedadNA* record provides interesting insight into edible species available proximal to WLoM, which include *Maleae* (apple/ pear tribe of the Rosaceae family) and *Prunus* which are present during the settlement phases (Figure 17.11). Other edible species present around WLoM

around the settlement phase that were likely growing wild include *Urtica* and *Rumex* (detected within *sedadNA* record; Figure 17.11) and *Rumex* and *Vaccinium* (detected within the pollen record; Figure 17.11).

### 17.1.6.2 Exploitation of animals

#### Sedimentary evidence of animal exploitation and human activity at BLoM

On-site evidence of animals from faunal (Chapter 12) and insect remains (Chapter 13) and faecal lipid biomarkers (Chapter 10) analysed from ST2 at BLoM show that *Bos* (cattle), *Ovis* (sheep/ goat) and *Sus* (pigs) were associated with the settlement alongside the possible presence of *Equus* (horses) (Mackay et al 2020). Despite this evidence of animals on-site, no domesticated mammal *sedadNA* was detected in the BLoM master sediment core. This indicates that evidence of the remains of animals (dung deposits or bones) associated with the BLoM settlement did not extend to the coring area, which was likely located upstream from the settlement based on the reconstructions of the hydrology (Chapter 17.1.4). The only mammal *sedadNA* detected in the core originates from *Castor* (beaver) circa 250 cal BCE, which corresponds with the end of the BLoM settlement (Figure 17.12). Whilst this finding does not advance understandings of domestic animals at the site, it does support the environmental reconstructions in Chapter 17.1.3, since beaver habitats are preferentially characterised by areas of wet woodland with local access to fresh water. It also incidentally supports a proposition by Coles (2006) that beaver lodges and pond areas were favourable for human settlement and could have provided ready-timber, although no beaver-chewed wood was found on the site.

Lipid biomarker analysis of the BLoM mastercore provides evidence of sporadic faecal matter deposition between circa 500 and 100 cal BCE, as supported by faecal sterol ratios >0.3 and the presence of bile acids compounds (Figure 17.12). However, the low DCA:LCA ratios detected here are indicative of human faecal deposits rather than those from domesticated mammals (Prost et al 2017). These results demonstrate that the first detection of human faecal matter occurs between the BLoM *tpq* date and the settlement phase and that the faecal signal persists after the settlement phase, both of which indicate sustained human activity within the area.

#### Sedimentary evidence for human activity and animal exploitation at WLoM

The first evidence of faecal matter input within the WLoM sediment core is detected circa 1400 cal BCE (Figure 17.13). The concentrations of these faecal lipid compounds are low, which prevents specific identification of the source organisms beyond domesticated mammal and/ or human.

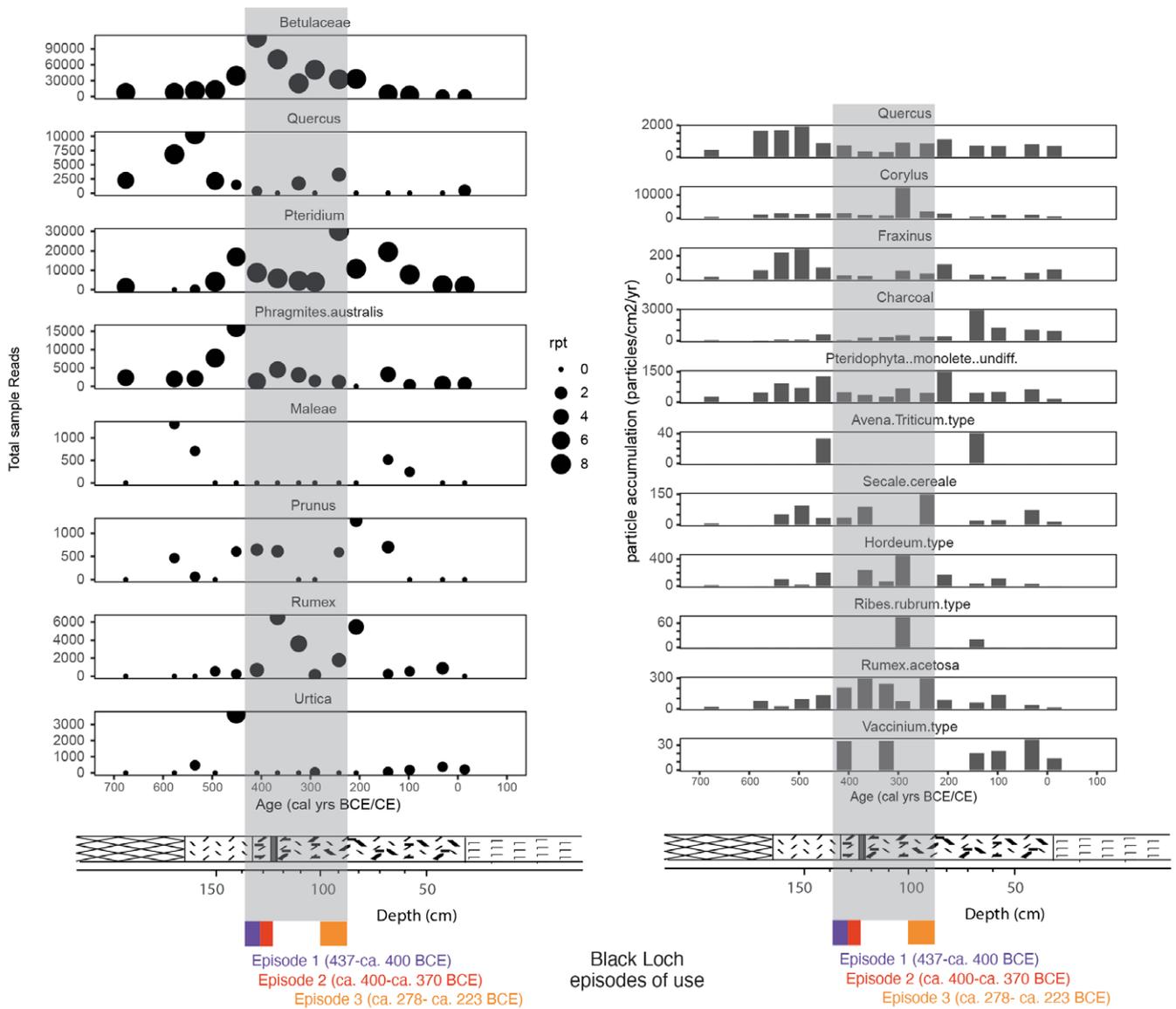


Figure 17.11. Left panel: WLoM DNA reads on the y-axis, whilst the size of the dots reflects the number of repeats in which the DNA sequence was found in each sample. Right panel: WLoM pollen, spore and charcoal accumulation rate (particles cm<sup>2</sup> yr<sup>-1</sup>) of selected taxa indicative of woodland use, cultivated crops and other edible plants.

The detection of faecal matter input prior to dates obtained from the WLoM crannog agrees with evidence of early anthropogenic activity from cereal pollen grains, which are first detected *circa* 3100 cal BCE (Figure 17.9). These multiple lines of evidence demonstrate that human activity occurred near the lake prior to the construction of the crannog.

The highest *seada*DNA reads and lipid biomarker fluxes occur during between *circa* 500–250 cal BCE (Figure 17.13), which corresponds to the crannog settlement phase, as identified by the stratigraphy, geochemistry and independent WLoM crannog chronology. Sedimentary ancient DNA reads were detected from *Ovis*, *Sus* and *Bos*. However, probability modelling, which indicates the likelihood of the

species presence based on reads and prior samples (Chen & Ficetola 2019), only presents clear evidence for the presence of *Bos* during the crannog phase. This dominance of *Bos* and absence of other species at WLoM is at odds with the mixed faunal remains analysed from BLoM excavations. This may be a feature of sensitivity of different proxy signals to different animals (eg more *Bos seada*DNA from larger dung deposits) or this may indicate that cattle dominated the WLoM landscape, using the nearby meadows and the edge of the lake waters, or that they were preferentially kept and/ or slaughtered on the crannog, leading to the observed increase in DNA input via dung, urine, blood, or gut contents.

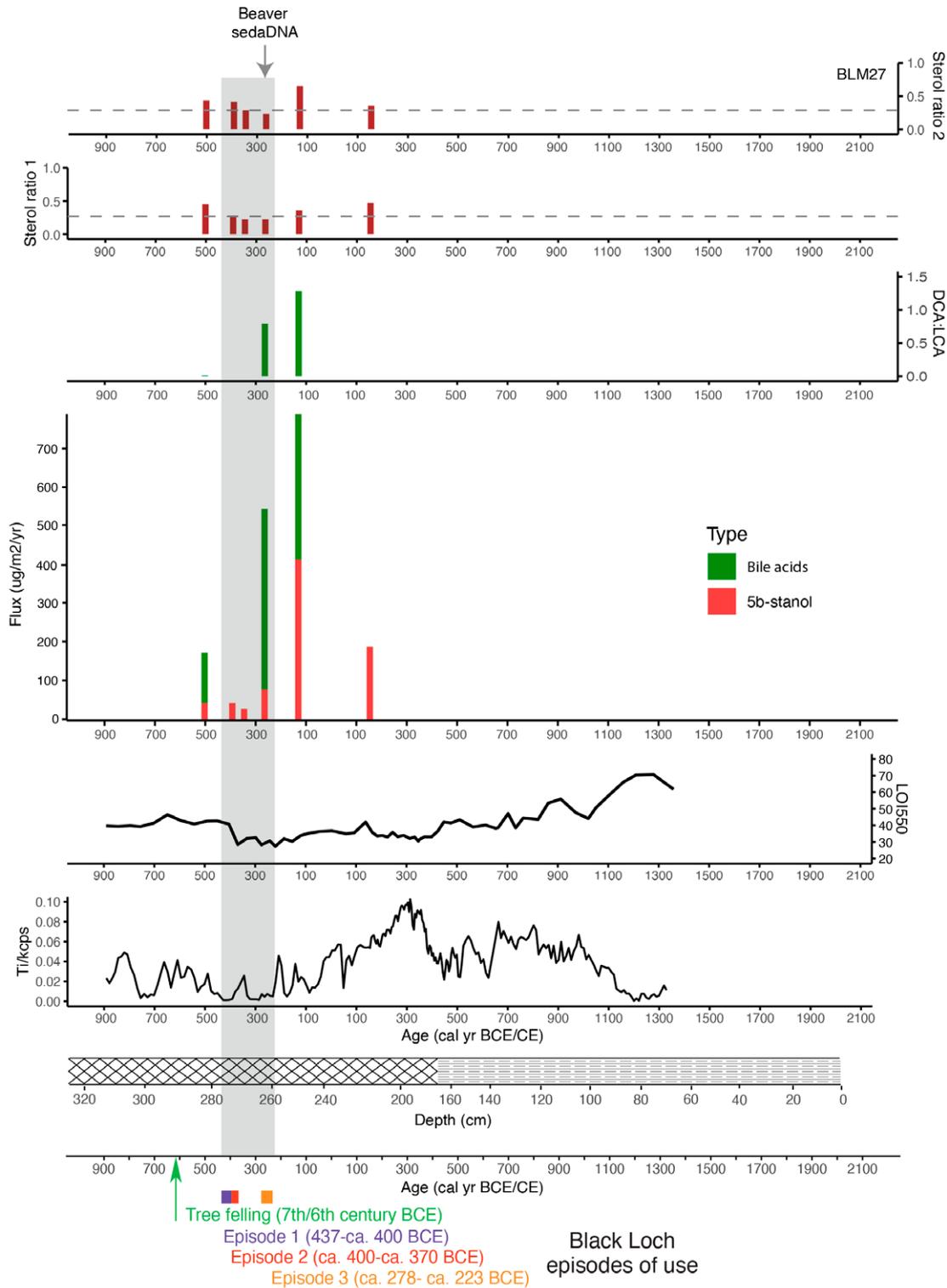


Figure 17.12. Faecal steroid evidence for BLoM faecal matter input. Sterol ratios 1 and 2 are applied to detect the presence of faecal input, with values  $>0.3$  representing possible faecal input (Prost et al 2017). Sterol ratio 1: (coprostanol + epicoprostanol)/ $5\alpha$ -cholestanol + coprostanol + epicoprostanol (Bull et al 1999). Sterol ratio 2:  $5\beta$ -stigmastanol + epi- $5\beta$ -stigmastanol/ ( $5\alpha$ -stigmastanol +  $5\beta$ -stigmastanol + epi- $5\beta$ -stigmastanol) (Prost et al 2017, modified from Bull et al (1999)). Bile acid ratio of deoxycholic acid (DCA) to lithocholic acid (LCA), 0.6–4.5 is indicative of human or horse faecal deposition (Prost et al 2017). Grey box denotes episodes of settlement.

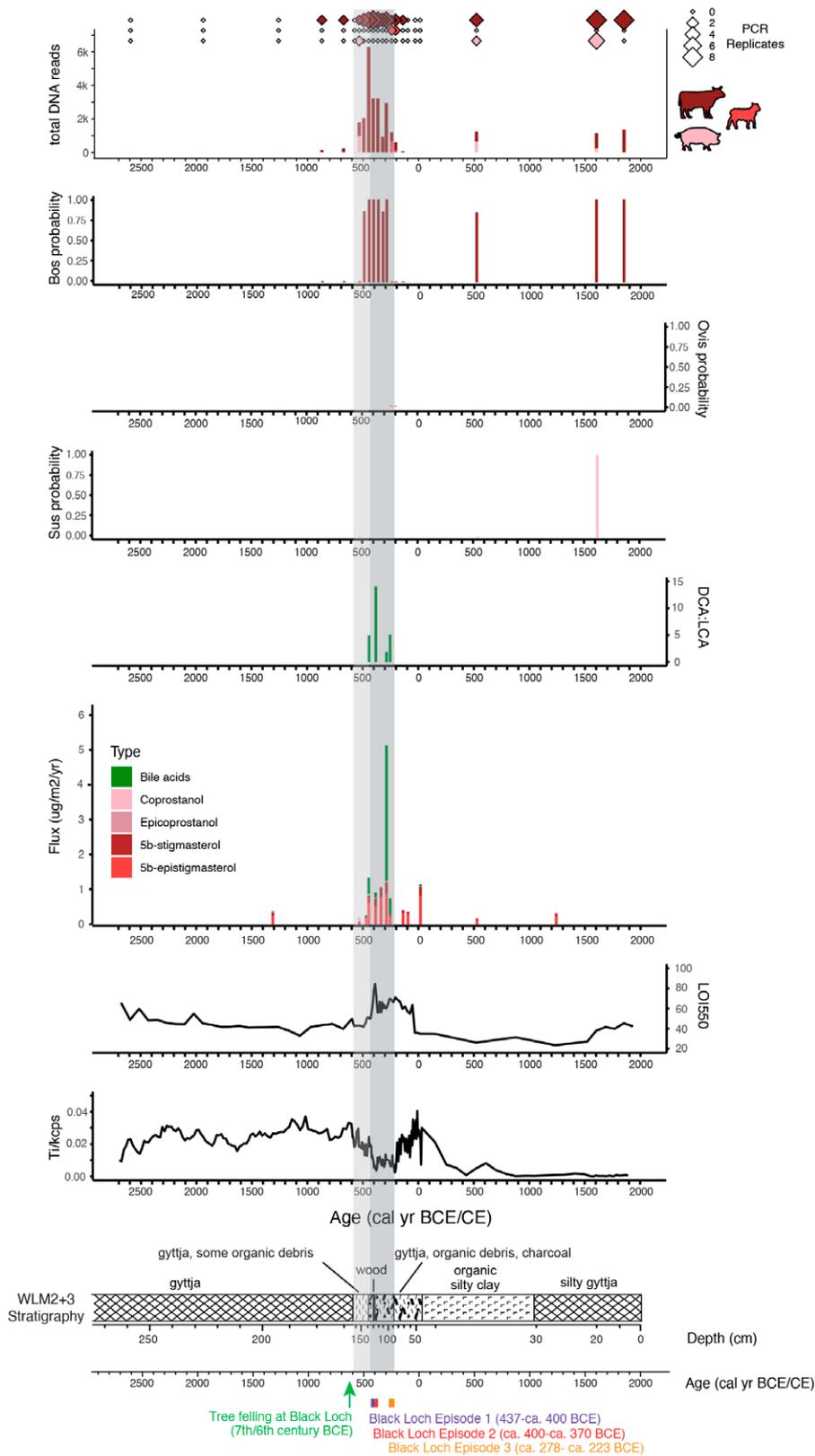


Figure 17.13. WLoM *seda*DNA and faecal steroid animal evidence. Bile acid ratio of deoxycholic acid (DCA) to lithocholic acid (LCA) represents faecal sources: <0.4 pigs and/ or geese, 0.6–4.5 human and/ or horse, >5 ruminant (cattle, sheep and goats) (Prost et al 2017). Light grey box denotes change in stratigraphy from gyttja to gyttja with organic debris in the WLoM core stratigraphy and approximate tree-felling date at BLoM. Dark grey box denotes episodes settlement at BLoM.

Sedimentary ancient DNA reads and lipid biomarker fluxes are consistently lower post-*circa* 250 cal BCE, but evidence for the presence of *Bos* is detected *circa* 500 and 1600 cal CE and *Sus* is detected *circa* 1600 cal CE (Figure 17.13). The lower *sed*aDNA reads and repeats after the crannog phase could indicate a smaller *Bos* population or a change in *Bos* management after the crannog abandonment compared with the crannog phase. The lower reads could also reflect the proximity of the *Bos* to the coring location, suggesting that the higher reads during the crannog phase might support the presence of *Bos* on the island compared with around the lake edge once the crannog is no longer in use. Distinguishing between these hypotheses is unfortunately not possible with data that is currently available, but this should be explored further in future projects through the analysis of a transect of cores from the lake edge towards the crannog.

### Lochs of Myrton plant and animal exploitation in the Scottish Iron Age context

The Lochs of Myrton vegetation reconstructions reveal the local presence of a mixed woodland, providing a wood supply dominated by *Quercus* and *Corylus* but with *Betula*, *Fraxinus*, *Pinus*, *Alnus* and *Ulmus* also available. The decline in *Quercus* and *Fraxinus* *circa* 450 cal BCE suggests preferential use of these species at the start of the BLoM settlement phase, whilst the *Corylus* pollen record suggests use and coppicing of this species later in the settlement phase from *circa* 350 cal BCE (Chapter 17.1.5.4).

The pollen and *sed*aDNA data obtained from the paleoenvironmental sedimentary archives provides an overview of the cultivated species that were growing in the catchments of the Loch of Myrton before, during and after the Iron Age settlements. The dominant cereal pollen types identified from both sites over the settlement phases were *Hordeum* and *Secale cereale*. Cultivation and/or processing of *Hordeum* was a long-standing practice around the catchments prior to the Iron Age with the first detection of *Hordeum* dating back to the start of the WLoM pollen record, at least 3,000 years BCE. The first detection of *Secale cereale* in the sediment records dates from *circa* 2,500 years BCE. During the Iron Age settlement phase, *Secale cereale* grains were increasingly persistent in the pollen record, albeit in low numbers (Figure 17.9). The cultivation and/or processing of *Hordeum* and possibly *Secale cereale* persisted beyond the Iron Age settlement towards the present day, demonstrating the consistency of local cultivated land use post-Iron Age settlement abandonment. A clear signal from cultivated *Avena/Triticum*-type during the Iron Age at the Lochs of Myrton is lacking: the taxonomic resolution of the pollen record is insufficient to discriminate between cultivated oats (*A. sativa/strigosa*), wheat or the weeds of barley crops. However, *Triticum* spp. cereal caryopses were detected

in the WLoM crannog test-pit around 400–200 cal BCE (Cavers & Crone 2016), suggesting that the pollen is more likely originate from *Triticum* spp. than *Avena* spp. *Avena/Triticum*-type pollen was only detected around settlement timings at WLoM and not at BLoM.

The cereal species diversity identified within the paleoenvironmental sedimentary archives is coarser in taxonomic resolution than those identified from the macroplant remains analysed on-site at BLoM; however, it does highlight the persistence of both *Hordeum* and *Secale cereale* when considering local land use. The persistence of *Hordeum* pollen supports findings from medieval crannogs in Lough Kinale, central Ireland (O'Brien et al 2005; Friendengren et al 2010) and Lough Yoan, Northern Ireland (Brown et al 2021), indicating consistencies in agricultural land use associated with these types of wetland structures, albeit in different geographical locations and different time periods. Comparisons with published cereal pollen records from other Scottish crannogs or wetland villages with robust chronologies are unfortunately lacking. Two lake pollen records have been produced from nearby earlier Iron Age crannog sites at Barhapple Loch and Cults Loch and, based on the basic age-depth models, the earliest evidence of cereal-type grains (>40 µm Poaceae) in Barhapple Loch is contemporaneous with the crannog activity but there is no evidence of cereal pollen until the 11th century at Cults Loch, well after the crannog occupation there (Fonville et al 2018). Published non-crannog pollen records from the region also highlight the local diversity in the commencement timings of cereal agriculture (Chapter 17.1.5.4).

Several edible wild plants that may have been used for food are associated with the Lochs of Myrton settlements including *Maleae* (apple/pear), *Prunus*, *Urtica* (identified using *sed*aDNA), *Vaccinium* (identified within the pollen assemblages) and *Rumex* (present in both *sed*aDNA and pollen). The presence of these species indicates the availability of additional wild food sources; however, it is important to note that several of these species (eg *Rumex*, *Vaccinium*) may have had other uses such as bedding and animal fodder.

The presence of *Bos*, *Ovis* and *Sus* around the BLoM settlement has been confirmed through archaeological evidence (Chapter 12.1). Whilst *Ovis* and *Sus* may have been present around WLoM at the time of the BLoM settlement, the only dominant mammal signal from the WLoM *sed*aDNA originated from *Bos*. The strong *Bos* *sed*aDNA signal suggests that cattle were present on the crannog and possibly butchered there. The burnt bone assemblage from the small trench on WLoM did include a fragment of a cattle molar (Chapter 16.2.1.3), further supporting their association with the crannog. Whilst no butchery remains were detected within the WLoM trench, there is clear evidence of butchery practises at

Median Age	Age Range*	Core/context Depth (cm)	Activity signal	Indicator
3375 cal BCE	3272–3405 cal BCE	282	Burning, woodland clearance	Charcoal, pollen
596 cal BCE	757–417 cal BCE	295–299		WLoM crannog timber
621 cal BCE	781–450 cal BCE	167	Anthropogenic material into lake sediments	Stratigraphic break
590 cal BCE	762–427 cal BCE	165–160	Stabilisation/ reduction in inorganic input	Titanium reduction
456 cal BCE	541–378 cal BCE	138	Clearance, animal husbandry	Pollen, faecal lipid biomarkers, <i>sedaDNA</i>
172 cal BCE	242–97 cal BCE	80	Abandonment/ active destruction?	Titanium increase
18 cal CE	127 cal BCE –184 cal CE	48	Low level human activity	Titanium decrease, no <i>sedaDNA</i> – small increase in lipid biomarkers

Table 17.4. Evidence of WLoM human activity. Colours represent key sections described above (light green = low level human activity in prehistoric period; dark green = crannog construction; yellow = intensive crannog activity; orange = decline of crannog activity). Timing is the median date derived from the modelled age range and \*reported age ranges are the 95% confidence intervals based on calibrated <sup>14</sup>C dates.

BLoM based on remains recovered from a midden deposit (Chapter 12.1.5.10). *Bos* may have also been present around the WLoM from *circa* 1400–1100 cal BCE, based on a dung signal that is registered in the faecal lipid biomarkers and a low number of *sedaDNA*, but the main cattle signal from WLoM is detected *circa* 500 cal BCE.

The faunal assemblage analysed from BLoM reflects that of a typical Scottish Iron Age domesticated mammal species assemblage, owing to dominance of cattle and sheep, with minor pig components (Chapter 12.1.5.2). The *sedaDNA* mammal assemblage from the WLoM lake core differs during the crannog settlement phase since the only clear mammal signal at this time is cattle. Whilst horses are associated with other Scottish Iron Age sites as occasional food sources (Smith 1994; Cussans & Bond 2010), there is no clear evidence of horses associated at either BLoM or WLoM based on the faunal remains of the former site and *sedaDNA* of the latter site. Whilst wild mammals such as red deer, hare and roe deer were occasionally exploited in some Scottish Iron Age faunal assemblages, there is no evidence of any of these species from the *sedaDNA* results from the Lochs of Myrton. The *sedaDNA* analyses of WLoM only focused on mammals; therefore, the absence of other common Scottish Iron Age food supplies such as fowl/geese and fish in the *sedaDNA* record here is not evidence of absence.

### 17.1.7 Refining the chronology of WLoM crannog activities using the lake sedimentary record

In this section we discuss the full chronology of known human activity associated with WLoM crannog (summarised in Table 17.4), based on dates obtained

from the crannog timbers (Table 16.2) and human activity indicators identified from the WLoM lake core based on stratigraphic, geochemical, biomolecular and palaeoecological analyses (discussed in Chapters 17.1.5.2, 17.1.6.1 & 17.1.6.2). The chronology of settlement at BLoM is discussed in Chapter 2.

Differences in the proxy records indicate that the WLoM chronology can be separated into five key sections (indicated by colour-coding) based on changes in human activity signals:

#### 17.1.7.1 Low levels of human activity in the Neolithic–Bronze Age period *circa* 3200–620 cal BCE

A short period of human activity *circa* 3100 cal BCE is evidenced by increases in charcoal, changes in vegetation composition such as reduction in *Quercus* and increases in Poaceae (Figure 17.14) and first detection of cereal-type pollen (*Hordeum*). An increase in grazing, as indicated by an increase in Poaceae, is registered *circa* 1400–1050 cal BCE alongside a declining trend in *Quercus* toward *circa* 620 cal BCE (Figure 17.9).

#### 17.1.7.2 Iron Age crannog construction *circa* 620–460 cal BCE

The lake core contains a clear horizon of anthropogenic material (eg chunks of wood and visible charcoal) *circa* 620 cal BCE, which corresponds with the earliest median calibrated radiocarbon date of the timbers extracted from the WLoM crannog. The relative concentration of titanium (representing minerogenic material related to crannog building (Brown et al 2021)) also begins to decrease *circa* 600 cal BCE (Figure 17.14), indicating a reduction in

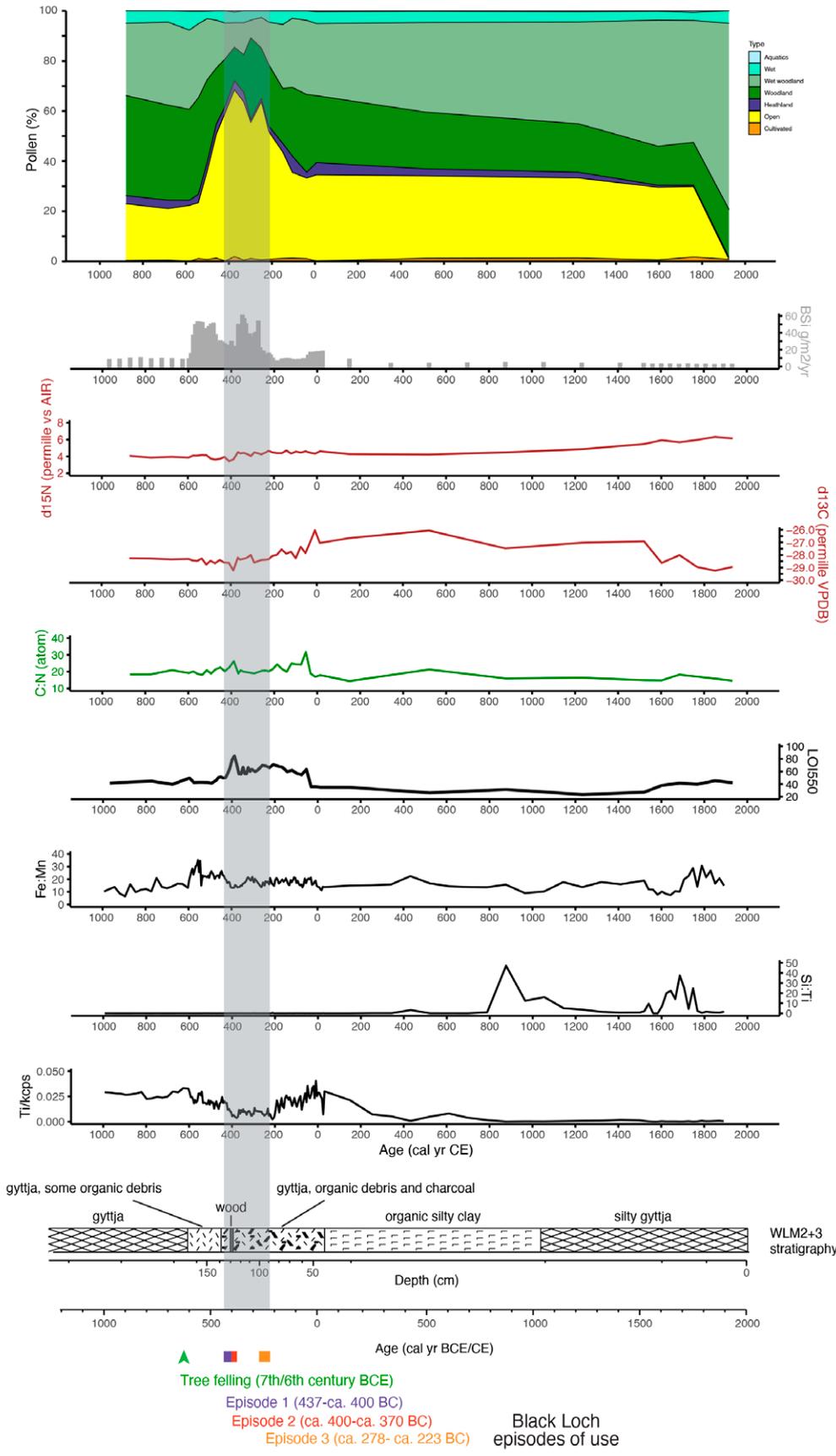


Figure 17.14. WLoM geochemical and sedimentary indicators of environmental change. Ti = titanium minerogenic input, LOI550 = organic carbon content, C:N = carbon: nitrogen ratio, representing aquatic (low values) to terrestrial input (high values),  $\delta^{13}\text{C}$  represents productivity or source of organic matter,  $\delta^{15}\text{N}$  can represent nutrient input or changes in bacterial activity.

erosion of sediments into the lake, which supports the notion of crannog 'platform' stabilisation at this time.

### 17.1.7.3 Intensive Iron Age crannog and landscape activity *circa* 460–175 cal BCE

A striking 'Landnam' clearance (decline in woodland taxa (primarily *Corylus* and *Quercus*), opening of landscape (eg Poaceae and *Plantago*) and burning events) is evident in the pollen record from *circa* 450 cal BCE, accompanied by agricultural plants and animals in the pollen, *sed*aDNA and biomarker records (Figures 17.9, 17.11 & 17.14). Organic matter content (LOI550) and C:N ratios increase during this period and peak *circa* 400 cal BCE (Figure 17.13). This increase in terrestrial organic matter is likely derived from the crannog, based on its proximity to the coring location.

### 17.1.7.4 Decline of activity and disuse/ abandonment of the crannog *circa* 170 cal BCE–18 cal CE

The phase of intensive crannog use ends at *circa* 170 cal BCE, reflected in the abrupt reduction in evidence of animals from *sed*aDNA and lipid biomarkers (Figure 17.11) and is followed by a large peak in charcoal which likely relates to a large-scale burning event on the crannog. This burning event could be accidental or represent deliberate destruction of the structure on the mound. The step change in titanium ratios, indicating an increased in-wash of inorganic material into the lake, indicates disuse/ abandonment/ erosion of the crannog by *circa* 18 cal CE (Figure 17.4).

### 17.1.7.5 Post-crannog human activity *circa* 18 cal CE – present day

Long-term reduction in woodland and a steady increase in wet woodland (*Alnus*) toward present day. Cereal-type pollen (*Hordeum* and *Secale cereale*) persists in the landscape throughout the phase. Little evidence of erosion into the loch suggesting terrestrial landscape management with little to no activity within the loch itself.

### 17.1.7.6 Contextualising the chronologies of the Lochs of Myrton settlements

The chronology of BLoM is well-defined based on dendrochronology, with evidence of tree-felling in the region *circa* 622–586 BCE and the main settlement phase dated to between 437 BC and 223 BCE. Unfortunately, no dendrochronology dates are currently determined for WLoM, which means that age estimates for the WLoM crannog have associated radiocarbon age uncertainties of *circa* 350 years around the time of settlement construction (Table 17.4). Despite these WLoM age uncertainties, the human activity associated with the WLoM crannog has a median age of *circa* 620–170 cal BCE. The WLoM crannog and the BLoM settlement therefore have overlapping

chronologies, indicating that at least some episodes of construction and use of the settlements were likely contemporaneous.

## 17.1.8 Impact of human activity on lake ecosystems at the Lochs of Myrton

In this section, we consider the impact of human activities on the BLoM and WLoM loch environments and examine human activity as a driver of ecological change over time. The major changes in the sediments, as indicated through proxies of human activity and direct dating of the archaeology associated with the BLoM and WLoM catchments, are used as boundaries to define phases to consider possible impact on the lake systems (Table 17.4).

### 17.1.8.1 Ecological impact of human activity at the BLoM

Evidence for human activity in the BLoM core is restricted to the presence of faecal sterols (Chapter 17.1.6.2), as there are no clear stratigraphical or other geochemical evidence of human activity in the BLoM core (Figures 17.3 & 17.15). There is also no clear evidence of ecological responses to human impact. Overall, the BLoM aquatic ecological proxies (diatoms and chironomids) indicate a shallow, macrophyte-rich system with little to no changes that could be linked to human activity during the main settlement period of BLoM (*circa* 437–223 cal BCE) or at any other point in the record (Figure 17.15). The primary changes in BLoM chironomid and diatom assemblages are in response to the terrestrialisation of the loch environment (discussed in detail in Chapter 17.1.4).

The lack of evidence of human impact in the BLoM core is surprising since the BLoM settlement is extensive and persists for centuries. The reasons behind the lack of human impact signals in the BLoM core remain unclear. The dominance of the terrestrialisation signal has the potential to swamp other drivers of change in the diatom and chironomid assemblages. Alternatively, and perhaps more likely, the lack of a human activity signal in the BLoM could relate to the coring location: the BLoM core was obtained *circa* 40 m upstream from the BLoM settlement (Chapter 17.1.4.1), reducing the likelihood of human activity and impact signals accumulating in the sediment at this location.

### 17.1.8.2 Impact of human activity on the aquatic ecosystem of the WLoM

#### Overview of WLoM palaeoecology assemblages

A summary diagram of geochemical indicators and the broad pollen zones are presented in Figure 17.14. The diatom assemblages in the WLoM can be divided into planktonic, tychoplanktonic and periphytic diatoms and the overall shifts through time of these groups are

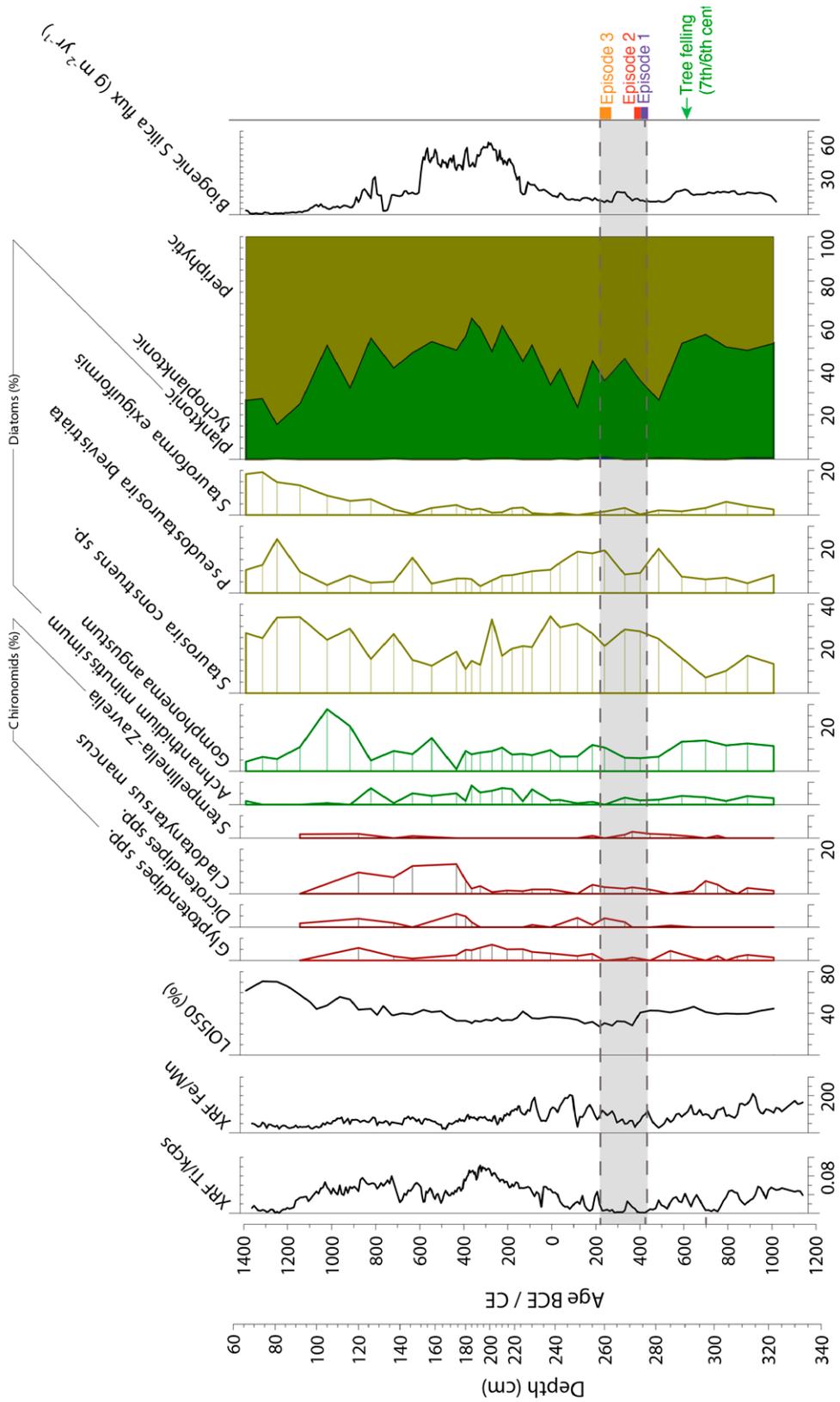


Figure 17.15. Selected geochemical and ecological proxies at BLoM. Diatom and chironomid data are presented as percentage abundance. The grey band indicates the phase of BLoM site occupation.

summarised in Figure 17.16. The diatom assemblage profile from the shallow/ littoral part of the lake suggests that nutrient inputs have caused shifts in diatoms from taxa in the mesotrophic to eutrophic spectrum. The chironomids support this interpretation, as they suggest similar environmental conditions with the assemblages dominated by taxa indicative of a shallow, macrophyte-rich water body with clear indications of meso-eutrophic conditions and high levels of productivity and organic matter throughout the record. In the section below we will consider the variations in lake ecology within the framework of the five phases of activity outlined in Chapter 17.1.7 to consider the nature of impact of human activity within the hydrological system.

### Phase 1: Early, low-level human activity (prior to 620 cal BCE)

Only the diatoms were analysed during this initial period (from *circa* 1100 cal BCE) and suggest relatively high nutrient levels with peaks in eutrophic taxa such as *Cyclostephanos dubius* and *Aulacoseira granulata*. These taxa are also linked to disturbed sediments and mixing within the system. The peaks in diatoms are accompanied by high values of titanium, seen in the geochemical profile, that may indicate increased catchment erosion and inputs of both inorganic and organic material (Davies et al 2015) and reduced water clarity through disturbed and suspended sediments. These higher values correspond with some minor shifts in the pollen record, which might be indicative of low-level human activity within the WLoM catchment (Figure 17.14). The indications of increased catchment erosion and elevated-nutrient levels in the lake at this time are notable and provide impetus to explore Late Bronze–early Iron Age human activity within the WLoM catchment in more detail in future studies.

After *circa* 1000 cal BCE, the eutrophic signal decreases and the diatoms indicate a slight reduction in the nutrient levels and an increase in water clarity (less suspension of sediments) with a peak in taxa such as *Cyclotella ocellata*. The chironomid taxa suggest a similar environment, with low levels of mesotrophic-eutrophic taxa around *circa* 800 cal BCE. Biogenic silica (BSi) flux, a measure of in-lake/ autochthonous productivity, is low and unchanging throughout this period suggesting stability in the productivity in the lake. Overall, this period is characterised by relative stability in the lake ecology with suspended sediment settling and increased water clarity from *circa* 1100 to 600 cal BCE.

### Phase 2: Initial signals of intensive human activity (*circa* 620–460 cal BCE)

Following the period of relative stability associated with Phase 1, both the palaeoecological and geochemical proxies show a change in the lake ecosystem with shifts in some indicator species occurring around the same time as the start of the evidence for anthropogenic activity on-site at *circa* 620 cal BCE. The main changes in this phase suggest

disturbance and changing sediment source area with increases in coarse material and reductions in water clarity. The most prominent change in the diatom taxa is a peak in *Pseudostaurosira brevistriata*, which is allied with a rapid and large increase in the BSi from low background levels, and a reduction in the chironomid taxa *Stempellinella-Zavrelia*-type at *circa* 600 cal BCE. *Pseudostaurosira brevistriata* is associated with disturbance and sediment mixing and can be indicative of a change in substrate source (Round et al 1990) and the sharp increase in BSi can be attributed to increased abundance/ productivity within the diatom community, associated with elevated nutrient conditions (Patrick & Reimer 1966). These changes coincide with an increase in eutrophic taxa within the chironomid assemblages such as *Glyptotendipes* spp. Soon after the initial shift in indicator species, there is an increase in *Microtendipes pedellus*-type which is typically associated with coarse sediments and dynamic environments (Gouw-Bouman et al 2019). The increase in *M. pedellus*-type therefore fits well with the overall picture presented by the other indicator species of increasing contributions of new substrates creating a disturbed environment at this time. Following this, a narrow peak in the diatom taxa *A. granulata* suggests another rise in the nutrient levels and the BSi values remain high until the final *circa* 50 years of this phase, also indicating high productivity/ abundance in the primary producers (predominantly diatoms).

### Phase 3: Intensive human activity on the crannog (*circa* 460–175 cal BCE)

Almost all the impact indicators, both geochemical and palaeoecological, show clear signals of change in this phase and evidence a highly variable system with a definitive ‘stratigraphy’ but one that is dominated by high nutrients and an abundance of emergent plant macrophyte stands. At the initiation of this phase (*circa* 460–350 cal BCE), there are rapid and high magnitude changes in the impact proxies. The first shift occurs in the diatoms where *C. dubius* and *A. granulata* peak and dominate the assemblages, indicating high nutrient availability at this stage. The chironomids in the initial part of this phase lag behind the diatoms in terms of peak abundances of nutrient-associated taxa. The delayed shifts in chironomid taxa suggest an increase in organic matter inputs (a decline in *M. pedellus*-type and a dominance of *Glyptotendipes* spp. and *Cricotopus intersectus*-type). These inferences are supported by a sharp increase in organic matter content (LOI550), and low values for titanium (representing minerogenic material). The rise in these chironomid taxa also indicates an increase in emergent aquatic macrophytes in this phase as both taxa commonly feed on aquatic plants (Brooks et al 2007). Interestingly, in this initial part of this phase the shifts in aquatic productivity indicators (diatoms and BSi) appear asynchronous, with a peak in BSi preceding high nutrient

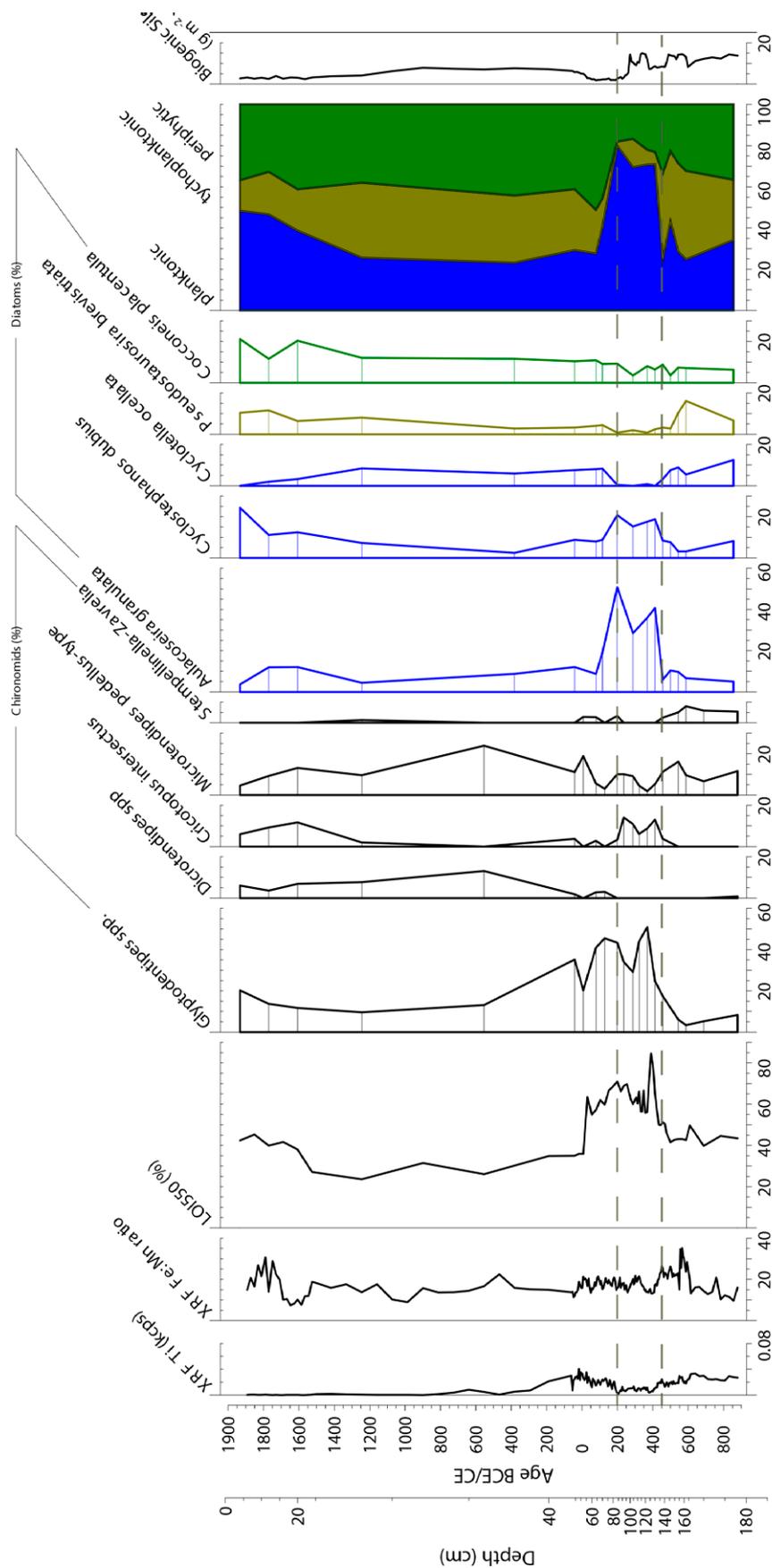


Figure 17.16. Diatom and chironomid taxa and geochemical indicators from the WLoM lake core. The overall diatom groups (planktonic, tychoplanktonic and periphytic) are summarised alongside biogenic silica (BSi). Black dashed lines indicate the human activity boundaries defined through <sup>14</sup>C dating of the WLoM crannog material and evidence of activity signals identified from the lake core (Table 17.4).

indicators. As the BSi in the sediment can be dissolved particles as well intact diatoms and sponge spicules, there is the possibility that dissolution of diatom valves has led to a muted response in the diatom assemblages. Similarly, when the BSi is low but the diatoms indicate high nutrient levels, it could be that most of the biogenic silica has been reabsorbed by the diatom blooms before it was able to reach the sediment floor (Ryves et al 2008). However, the absence of a high amount of semi-dissolved diatom valves and the presence of *C. ocellata* would suggest silica depletion is unlikely. *C. ocellata* has a relatively fine silica structure and would be quick to dissolve. Around *circa* 350–250 cal BCE, BSi briefly increases to similar levels as previous peaks and appears to be driven by dominant planktonic diatom community. Alongside the ecological proxies, other indicators highlight intensive anthropogenic activity during this phase. The majority of sedimentary organic matter is derived from the terrestrial environment, given the large woody debris found in the sediments and the C:N ratios of 20–25 (Meyers & Terranes 2001), along with slightly higher  $\delta^{15}\text{N}$  values, which suggest input from animal waste (Woodward et al 2012).

Around *circa* 270 cal BCE the BSi shows a rapid reduction and reaches levels similar to those seen in Phase 1 by *circa* 200 cal BCE. Despite this reduction in BSi, abundance of the diatom taxa *A. granulata* reaches the highest values for the whole core. Whilst it is difficult to characterise the exact timing of leads and lags between the different proxies due to resolution and radiocarbon uncertainties, the impact indicators do highlight real differences in shifts within this phase suggested by multiple peaks in different taxa which likely reflects multiple sub-phases of drivers and/or activity intensity within this main occupation phase. Overall, the changes in geochemical evidence and both diatoms and chironomids are large and appear to start with, or soon after, clear evidence of human activity.

#### **Phase 4: Post intensive human activity on the crannog (*circa* 170 cal BCE–18 cal CE)**

After *circa* 200 cal BCE, the aquatic ecology sees a large shift in the abundant taxa and the indicators reflect the reduction in overall activity within the system at this time. After *circa* 200 cal BCE, the diatom assemblages return to a similar composition to those in Phase 1; however, as before, the changes in chironomids lag behind the diatoms and assemblages show a second peak in taxa representing eutrophic conditions, such as *Glyptotendipes* spp., from *circa* 200 to 100 cal BCE before a steady decline. At the same time, titanium begins to increase rapidly (from *circa* 200–50 cal BCE) and returns to levels seen in Phase 1, suggesting an increase in inorganic in-wash of material. Most likely, this is material eroding from the crannog, but it could also be derived from increased run-off from the slopes around the lake. The high level of inorganic matter

influx is also reflected in the decreasing LOI550 and the increase of coarse, inorganic sediment could explain the increase in *M. pedellus*-type.

#### **Phase 5: Post-crannog period (*circa* 20 cal CE onwards)**

Later in the record (*circa* 600 cal CE) the chironomids show a change in assemblages but do not return to the same assemblage composition as Phase 1. Rather, there is an increase in different taxa associated with macrophytes and high nutrient levels such as *Dicrotendipes* spp. starting at *circa* 500 cal CE. This could reflect a stabilisation of the lake system or a succession in aquatic plant communities allowing different chironomid taxa to colonise. Toward the surface of the core (*circa* 1800 cal CE onwards) some taxa that increased within the crannog phase (*C. dubius*, *A. granulata* and *Cricotopus* spp.) reappear, as well as the disturbance indicators from Phase 2 tycho planktonic taxa (*P. brevistriata* and *P. pseudoconstruens*). The shifts in taxa coincide with an increase in  $\delta^{15}\text{N}$ , higher C:N and LOI550 from *circa* 1500 cal CE onwards. These later changes might be reflecting more recent intensification in anthropogenic activity (late medieval to modern) and increased nutrients from new sources (agricultural fertilizers) which could explain the differences in composition of the lake ecology.

#### **17.1.8.3 Contextualising human-driven lake ecosystem change at WLoM**

The use of geochemical and palaeoecological indicators to understand the impact of prehistoric human activity in aquatic systems is a relatively recent development, especially using chironomid assemblages, and comparable records are sparse. We reviewed available records that cover a similar time period to place the findings at WLoM within the wider context of crannog and human-influenced lakes in pre- and early- historic periods. We discuss the WLoM record within the context of the most directly comparable records below and highlight the replicability and value of these methods for the archaeological story across many time periods.

#### **Lough Yoan**

Comparable studies which utilise traditional palaeoenvironmental proxies (ie pollen, chironomids and diatoms) within what are conventionally archaeological settings have been undertaken on some medieval crannogs in Ireland and Northern Ireland; however, only one study also incorporates novel biological remains (sediment ancient DNA metabarcoding and steroid lipid biomarkers). The study by Brown et al (2021) looked at a set of medieval crannogs in Lough Yoan, Co. Fermanagh, Northern Ireland, and whilst the crannogs of WLoM and Lough Yoan are separated by space and time, the results

indicate a consistent pattern with clear indications of human activity and impact within the lake ecosystem.

A basal timber from the northern crannog in Lough Yoan was radiocarbon-dated to *circa* 827 ± 44 cal CE. Sediment cores retrieved from the 'biogeochemical halo' of the crannog showed initial sedimentological changes in the lake sediment core, with increases in worked wood fragments and charcoal that coincide with the archaeological dates. The sedimentary unit covering the 'crannog phase' is over 1 m and represents a short period of time of only a few hundred years. Mammal *sed*aDNA indicated major increases in reads and repeats at the start of the crannog with increases in cattle, sheep, goat, horse and pig. The mammal *sed*aDNA signal is reinforced by bile acid lipid biomarkers, which indicate an increase in faecal matter from human and livestock sources. At the same time there is a reduction in woodland taxa (birch, alder oak and hazel) seen in the pollen and *sed*aDNA record, as well as prominent increases in bracken (*Pteridium*). The *sed*aDNA provided information about aquatic plants with increases in bulrushes, mare's tale and watermilfoils, suggesting lake shallowing and eutrophication.

The diatom assemblages in Lough Yoan show a clear and rapid response to the human activity and indicate increases in nutrient input into the lake and a signal of eutrophication. Increases in eutrophic and mixing tolerant taxa such *C. dubius* and *A. granulata* alongside a large increase in BSi are consistent with the patterns seen in WLoM and are likely indicative of diatom blooming at the time of crannog occupation. A nutrient transfer function reconstruction undertaken at Lough Yoan suggests a rapid increase in the diatom inferred total phosphorus in line with shifts in human activity. The chironomid assemblages in Lough Yoan also indicate increases in lake productivity and nutrients at the onset of increased human activity, as well as highlighting an increase in macrophyte associated taxa. Not only are the patterns in shifts of the diatom and chironomid taxa comparable across Lough Yoan and WLoM but the indicator taxa that change are very similar.

Alongside the diatom and chironomid assemblage changes, at *circa* 930 cal CE in Lough Yoan there is an increase in titanium signalling increased erosion and reduction in anthropogenic material until the site is abandoned *circa* 1200 cal CE, as indicated with lake sediments returning to gyttja. There is evidence of reoccupation around *circa* 1490 until 1530 cal CE as indicated by elevated titanium and increased reads and repeats of cattle and sheep *sed*aDNA.

### Ballywillin Crannog

The medieval Ballywillin crannog found in Lough Kinale, Co. Longford, Ireland is one of a few other published sites where researchers have taken a similar approach of using palaeoecological proxies from a sedimentary core

to look at signals of human activity and impact (O'Brien et al 2005; Selby et al 2005); however, the focus was on palaeoecological proxies as opposed to geochemical or evidence of activity signals in the sediments. Whilst Ballywillin crannog is later in date (12th century CE), it provides a similar environmental setting and research approach with which to compare the results from the WLoM core. The sedimentary units and the age-model from the core taken at Ballywillin indicates that the sequence covers a shorter period of time and the authors highlight age reversals and chronological uncertainties surrounding the later time period (post-*circa* 1340 cal CE) covered by the core. The overall picture from the diatom and chironomid assemblages recorded in the sediment core at Loch Kinale indicates a similar trend to that seen in WLoM; a period of increased nutrients and macrophyte-associated taxa aligning with activity on the crannog (12th century). The crannog phase in Lough Kinale also appears to result in increased disturbance and suspended substrates, similar to the pattern seen in the WLoM core. The individual chironomid taxa from Lough Kinale and WLoM appear similar both in overall composition and in the specific taxa that are changing in response to human activity. Specifically connected to the crannog phase, O'Brien et al (2005) note an increase in *Glyptotendipes* spp and a number of *Cricotopus* taxa which fit well with the changes seen in WLoM.

Whilst the overall ecological inferences made from the diatom assemblages in Loch Kinale follow a similar pattern to WLoM, the specific shifts in taxa within the diatom assemblages differ from those in WLoM. The record in Ballywillin is one of predominantly littoral diatom taxa and indicates an increase in eutrophic taxa in relation to the development of the crannog which fits well with the assemblage from WLoM. The specific indicator taxa selected at WLoM highlight different abundances in Loch Kinale which is not unsurprising given the differences in space and time; however, the relative similarities in both the chironomid and diatom signals are interesting and highlight a promising research avenue for future wetland archaeological research.

### Cults Loch crannog

Cults Loch is an Iron Age crannog located approximately 30 km from the WLoM site that included diatom and some geochemical analysis as part of the post-excavation programme. Analysis of the diatom assemblages and sediment core XRF of Cults Loch was completed by Fonville et al (2018) and published as part of the Cults Loch excavation (Cavers & Crone 2018). As with the diatom results at Ballywillin crannog, initial examination suggests the diatom assemblages at Cults Loch are quite different to WLoM and none of the taxa utilised as indicator taxa in WLoM are dominant in the Cults Loch record. However, as was the case at Ballywillin, the diatoms suggest increase

in acid-loving taxa during the first crannog phase – a pattern that is reflected in the chironomids at WLoM with increases in chironomids that prefer highly organic sediments such as *Glyptotendipes* spp. At WLoM, clear disturbance signals are seen both in the sedimentary signals and in the diatoms and chironomids at the start of phase 2.

#### 17.1.8.4 Summary of crannog-related human impact on lake ecosystem

The results from comparable sites, albeit low in number, indicate a similar overall picture of disturbance and increases in nutrients into the loch system as a result of human activity relating to crannog construction/ use. Whilst there are clear differences across the sites, the similarity in relative trends highlights the impact of human activity through disturbance/ suspended sediments, increasing nutrients and organic matter inputs and these shifts are clearly reflected in the lake ecological components. The analysis of lake ecological proxies such as diatoms and chironomids allows a greater understanding of the nature of past human activity and we can begin to establish relative scales of impact, and how these impacts might play a role in shaping prehistoric wetland societies and practices. Given the number of crannog sites across Scotland and the magnitude of change in the lake ecology as a result of human disturbance leading to increased nutrients in the lake ecosystem, it is likely that the impact on wetland communities was widespread and larger than first thought.

#### 17.1.9 Conclusions

The palaeoenvironmental sedimentary analyses from the Lochs of Myrton presented in this chapter have characterised the bio-physical environmental conditions associated with the Iron Age wetland settlements. The hydrological reconstructions of BLoM show that the BLoM settlement was constructed at the edge of a lake environment surrounded by fen vegetation, which terrestrialised over time. The first tree-felling date used within the BLoM construction (622–586 BCE) corresponds with the start of a change to more terrestrial conditions around the location of the settlement, so the lowered water level may have helped to facilitate construction by ensuring the area was dry enough to build on. The hydrological conditions of the chosen settlement location ensured that there was access to shallow open and flowing water supplies.

The dates of the BLoM settlement correspond with a reduction in woodland in the WLoM catchment, likely representing the demand for wood as construction material as well as the need for agricultural land. The pollen data also indicate that a large proportion of Loch of Myrton catchment was wet meadows. Fluctuations in

*Corylus* pollen during the BLoM settlement period provides support for woodland management (eg coppicing) and use of the material as building supplies along with a supply of *Quercus* wood. Other tree species present at the time of the BLoM settlement include *Betula*, *Fraxinus*, *Pinus* and *Ulmus*.

The WLoM pollen record provides evidence of *Hordeum* dating back to at least 3000 cal yrs BCE. The cereal pollen types identified from the Lochs of Myrton over the settlement phases were *Hordeum*, *Secale cereale* and *Avena*. Cereal prevalence in both WLoM and BLoM pollen records increased over the settlement period and persisted beyond the Iron Age. Other edible plant species around the Lochs of Myrton include *Maleae*, *Prunus*, *Urtica*, *Vaccinium* and *Rumex*.

The high amount of cattle *sedadNA* identified from the WLoM sedimentary record suggests that the open meadow landscape was used for grazing. The strong cattle signal detected from the *sedadNA* and faecal lipid biomarkers extracted from WLoM lake core also indicates that cattle were present on the crannog. The lipid biomarker signals could be delivered to the lake either through the excrement of living cattle or during the process of slaughter. Therefore, it is unclear whether cattle were kept on the crannog for protection purposes and/ or slaughter and/ or carcass storage and/ or processing, although evidence from other crannogs favours slaughter (Brown et al 2021) and storage would not be viable without some form of curing (such as smoking), for which there is no evidence. The difference in the *Plantago* and Poaceae record, whereby both increase markedly over the crannog levels at WLoM but not during the settlement phase (Episodes 1–3) at BLoM, supports the contention that this may be due to the contribution from ruminants' stomach contents and faeces that has also been hypothesised for other crannog sites (Brown et al 2021) and fits with the biomarker data here. There is no conclusive *sedadNA* or faecal lipid biomarker data to support the presence of sheep/ goats or pigs at WLoM, which differs from the mixed faunal assemblage at BLoM settlement. The cattle *sedadNA* signal and faecal lipid biomarker flux are pronounced from *circa* 500 cal BCE in the WLoM sediment record, providing direct evidence of anthropogenic activity in the catchment at this time.

The disturbance and increased nutrients in the lake system associated with WLoM crannog activity drove clear changes in the palaeoecology (diatoms and chironomids) and geochemical proxies (eg BSi), thereby substantially altering the lake ecosystem. The geochemical (BSi, C:N, organic matter content, titanium) and biological (diatoms, chironomids, pollen) proxies identified different phases in the intensity of crannog use, with the most intense human activity phases generating the greatest changes in the impact proxies. The diatoms reflect a more instantaneous response to shifts in nutrients, likely due to their lower trophic level and more direct

utilisation of nutrients as opposed to chironomids which are secondary indicators in this instance. The lag in chironomid response demonstrates the longevity of the impacts to the lake ecosystem which are sustained after a reduction in intensity of human activity. The combination of ecological and geochemical proxies therefore provides a powerful tool for understanding the impact of human activity on lake ecosystems but further research is required to quantify the scale of this early human impact in lakes.

The chronology of the construction and use of the WLoM crannog has been refined in this chapter using archaeological dates of structural crannog timbers and contexts and human activity signals from the lake core. The median modelled age of the WLoM crannog construction and use is *circa* 620–170 cal BCE. Despite the uncertainties associated with the WLoM dates they fully overlap with the BLoM dendrochronology dates of the *tpq* (622 BCE) and the main settlement phase (437–223 BCE). The construction and use of the BLoM settlement and the WLoM crannog were therefore most likely contemporaneous, which provides new contextual insight into how crannogs in SW Scotland were placed within the wider Iron Age settlement landscape.

## 17.2 The on-site evidence for the environment of the settlements

*Anne Crone & Graeme Covers*

In the previous section proxies derived from sedimentary cores have been used to reconstruct the environmental conditions around the settlements at BLoM and WLoM. All the materials used to construct the BLoM settlement were brought onto the island and must therefore also reflect the local vegetation and resources available to the inhabitants. Critically, the on-site evidence is more precisely dated and can be used to calibrate the proxy evidence. In this section the on-site evidence from the wood, macroplants, insects and soils is explored to enhance and develop our understanding of the contemporary landscape.

### 17.2.1 The island

The position chosen for the settlement was a slightly raised area of peat on the southern edge of the shallow loch. MM analysis of the peat underlying several of the structures indicates that it was moderately humified so the surface had sat above the water table for some time before construction; the area would probably have appeared as a low-lying island connected to the shore by a narrow natural causeway. The area was dry enough to support some scrub woodland; *in situ* roots and stumps were found under ST1 and root masses of hazel were found under ST3 and ST4. The insect assemblages from the peat under ST3 confirms the existence of damp shaded ground and woodland prior

to its construction, with some insects specifically associated with alder and willow.

Unsurprisingly, many components of the insect and macroplant assemblages reflect the presence of the wet, marshy environment immediately around the settlement. Many of the insects indicate the presence of running water nearby, probably in the palaeochannel of the Monreith Burn which originally ran around the N and W of the site (Figure 1.3). Context [611] represents sediment that accumulated just outside the palisades on the SW perimeter of the island and the assemblages from this context provide glimpses of the environment of this liminal zone (see below). Sedges and rushes grew around the edges together with the weeds which favour relatively undisturbed damp waste ground. Occupation debris including old flooring, fuel, food and possibly faecal waste were dumped in this zone. Insect fauna and weed assemblages in other samples also indicated the presence of areas of disturbed ground with ruderal vegetation, and nutrient-rich ground where nettles and docks would grow; such habitats are likely to have been on and around the edges of the island.

### 17.2.2 The wider landscape

As well as the wet and boggy habitats immediately around the island a range of other habitats in the wider landscape are indicated, including arable fields, grassland, moorland and woodland.

BLoM lies in the middle of a swathe of Class 3 land, capable of moderate to high yields of a range of crops (Soil Survey of Scotland 1981) and in the Iron Age the occupants took full advantage of its qualities, cultivating emmer and hulled barley, as well as smaller quantities of spelt, bread/club wheat, naked barley and oat. Common arable weeds such as fat hen, common chickweed and corn spurrey were brought in with these crops; these weeds tend to favour sandier to nitrogen-rich soils (Stace 2010) so the fields may have been positioned over pockets of lighter sandier soil in the area (Chapter 11.5.8.1). The fields may have been set amongst areas of grassland; weeds such as bromes, heath-grass and buttercup could have grown on the settlement but they also reflect a grassland habitat. The insect fauna also indicates the presence of poor-quality permanent grassland on drier land, probably on light soils where there would have been a diversity of flowering plants and a high proportion of weeds.

Surfaces throughout the settlement, both inside and outside the houses, were constructed using a varying combination of five main plant components; bracken, wood, sedge, rush and turves. The sedges and rushes would have been readily available around the loch, even on the island itself as context [611] shows (see below). The bracken and turves reflect resources that would have had to be brought from further afield. Moorland habitats are represented in both the insect and macroplant

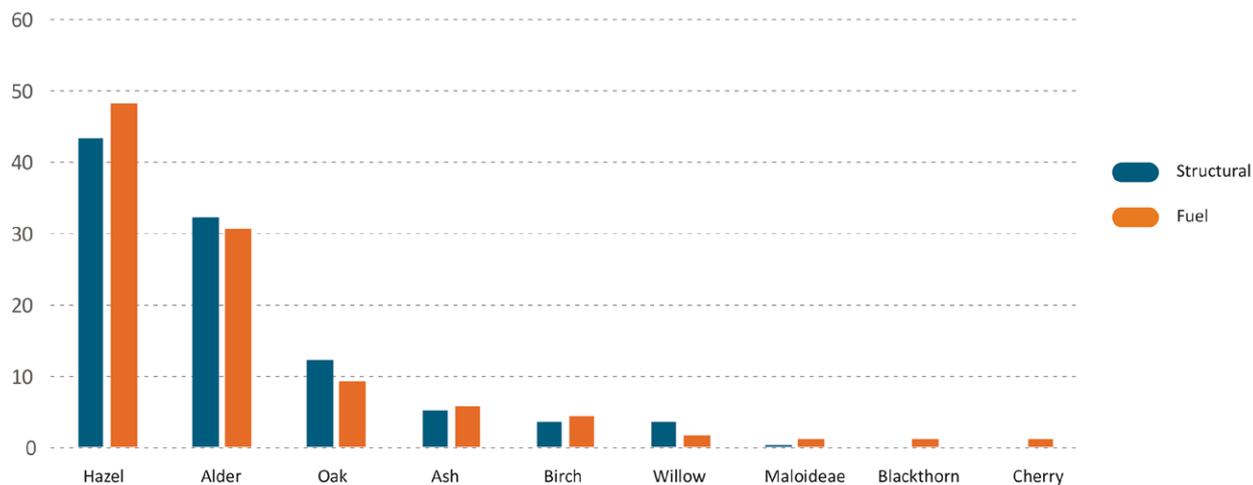


Figure 17.17. Use of wood species for structures and fuel (%).

assemblages, the fauna and flora probably imported onto the site in the peaty turves which were used for both flooring and fuel. There are extensive areas of moorland some 7–8 km N of the settlement but it seems more likely that the occupants would have cut their turves closer to home on the patches of rough grazing just inland from the site, on the Drumtroddan and Drumscallan Hills for instance. This may also have been the source of the bracken used so extensively on the site. It is possible that bracken was a managed resource, given the quantities required to regularly refresh the floor surfaces. Regular cutting reduces the yield of fronds (Winchester 2006: 10) so some control of its cutting would have been necessary to ensure a regular supply. It is possible that the uplands near the site might have been a patchwork of small areas being cut under rotation.

### 17.2.3 The wooded landscape

The recording of multiple variables of the wood assemblage, ie species, diameter, age and growth-patterns, facilitates a more nuanced reconstruction of the woodland resources available to the occupants. The wood assemblage in particular gives physical expression to the percentages in the pollen diagrams (Chapter 17.1.5).

Throughout the occupation of the settlement hazel, alder and oak were the favoured species for building and for fuel, with smaller quantities of ash, birch and willow (Figure 17.17). Trace amounts of Maloideae, cherry and blackthorn were found in the fuel residues whilst Maloideae and yew were used to make some of the artefacts (Chapter 15.4.7.1).

#### 17.2.3.1 Hazel

Hazel was by far the most commonly used species, accounting for 43% of the structural assemblage and 48%

of the fuel assemblage. It was found primarily as withies and small stakes used in the wickerwork constructions, the woven walls and hurdle screens used as flooring and internal partitions. No attempt was made to quantify the age and diameter of the smaller withies to determine whether woodland management was practised. Recent studies suggest that a minimum sample size of 100 per context is required to detect woodland management (Out et al 2020) and these quantities were not available at BLoM. The premise here is that the large quantities of long, thin, branch-free stems used in the wickerwork represent a coppiced crop, and by implication there must therefore have been extensive areas of coppiced woodland nearby. This might have been a mixed coppice; hazel accounted for 63% of all the wickerwork, alder 25%, with smaller quantities of ash, willow, oak and birch (Figure 17.18).

The larger hazel roundwood, which was generally used as stakes, was between 20 to 56 years (av 30 yrs) in age and between 35 and 95 mm in diameter (av 60 mm), may have come from unmanaged or abandoned coppice (Figure 17.19). BLoM also produced huge quantities of hazelnuts, particularly in Episode 2, for example [743], the mound of hazelnuts found outside ST3, and these are less likely to have all come from the coppiced woodland. Coppicing is mainly undertaken for the wood crop, to encourage the growth of slender stems, and in the process discourages flowering and nut formation. Hazel coppice can produce crops of nuts if left to grow old enough but then the nuts are often too high up to crop easily, and experience suggests that larger more reliable crops will have come from the management of hazel trees (Pryor 2012). There may therefore also have been hazel trees in the vicinity, possibly growing on the edges of the woodland or a clearing where they would have received more light, or as wood pasture. The hazel used as fuel might have come from

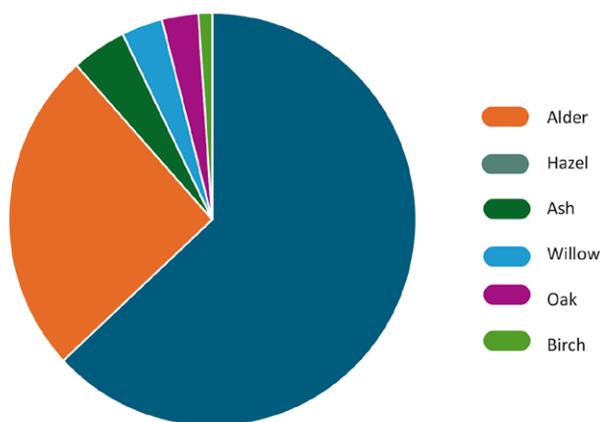


Figure 17.18. Species composition of wickerwork (%).

coppiced wood, coppice debris, and from the pruning of nut trees.

There is very little change in the age and size structure of the hazel assemblage from Episode 1 to Episode 2, the main difference being that some older wood was cropped in Episode 1 (Figure 17.19). Again, this suggests that the hazel woodland was being managed to supply the wood in the type and quantity that the settlement needed.

#### 17.2.3.2 Alder

Alder was the next most abundant species used in the settlement, accounting for 32% of the structural assemblage and 30% of the fuel assemblage (Figure 17.17). Some of the alder was from a coppiced crop – as described above it was the second commonest species used for wickerwork structures – but the bulk of the alder (62%) was in the form of medium to large logs used wherever horizontal surfaces were required, in the trackway, the surfaces around and inside the houses, and for posts within the superstructure of the houses and the palisades. Much of the alder came from large mature trees; of the 105 alders dendrochronologically analysed 32% were over 100 years of age and trees of 186 years and 212 years were recorded from the foundations of ST1 and the trackway respectively. These are unusually old trees for alder; nowadays alders over 150 years are considered ancient (ATI 2021). Alders generally grow to between 60–80 years of age (McVean 1953) but in other studies where ring counts have been undertaken living alders between 100–120 years have been recorded (McVean 1953; van der Maarten et al 2015). A dendrochronological study of alders growing along the shores of Loch Tay recorded stems of up to 72 years in age (Crone 2014).

Some 77% of the analysed alder came from Episode 1 and all the timbers over 70 years of age (61% of the analysed assemblage) came from this episode

(Figure 17.20). There is considerable variation in the diameters of these older (ie over 70 years of age) timbers, from 0.10 to 0.32 m (Figure 17.21) but it is likely that most of them represent single-stemmed maiden trees. In the Loch Tay study all the older examples came from single-stemmed trees, for example (Crone 2014: fig 2). The BLoM assemblage also displayed few of the features more characteristic of a multi-stemmed coppice-like structure, ie asymmetric stems and multiple piths (Crone 2014: 31). Furthermore, it was possible to construct two large coherent chronologies with strong internal correlations (Chapter 7.3.2) suggesting that the wood within each chronology was probably coming from the same source. Thus, there may have been several areas of ancient alder carr nearby supporting the maiden trees which were able to provide the settlement with the large, straight-grained logs used in the trackway, the palisade and the foundations of the roundhouses. The compressed outer rings displayed by much of the alder (Chapter 7.1.1) suggests that the carr may have been densely covered, causing competition and stress in the alders. In Episode 2 the alders used in ST3 are only 31 years of age on average and much smaller, at 95 mm in average diameter (Figure 17.20). This suggests that the carr had been exhausted in building the primary settlement, leaving only smaller trees available for use in Episode 2. It is also possible that, if the roots of the older trees had not been grubbed out, they became the source of at least some of the coppiced alder used on the settlement in Episode 2. However, the use of alder as a fuel also decreases significantly, from 51% in Episode 1 to only 22% in Episode 2, suggesting that local sources of alder were not so easily available any longer (see Chapter 17.3 below).

#### 17.2.3.3 Oak

Oak accounted for 12% of the structural assemblage and 9% of the fuel assemblage, making it the third most abundant species on the settlement, but these relatively small proportions belie its actual importance in building the settlement. Oak roundwood was used as posts in the Episode 1 houses and large tangentially-cleft oak planks were used in the outer walls of these houses, as facades on either sides of the entrance. It was rarely used as horizontal components but along the trackway the threshold timbers, which defined entry points through palisades and fences, were always of oak, possibly because these were areas which sustained a lot of traffic and subsequent wear and tear. Very little oak was found in the Episode 2 structures and some of that was re-used. In Episode 3 oak was used extensively in the defensive structures, as large roundwood posts in the entrance structures and palisades and as tangentially cleft oak planks forming the outermost palisade on either side of the entrance. On the whole, it would appear that oak was reserved for very specific functions where strength and robustness were required, or possibly in the case of

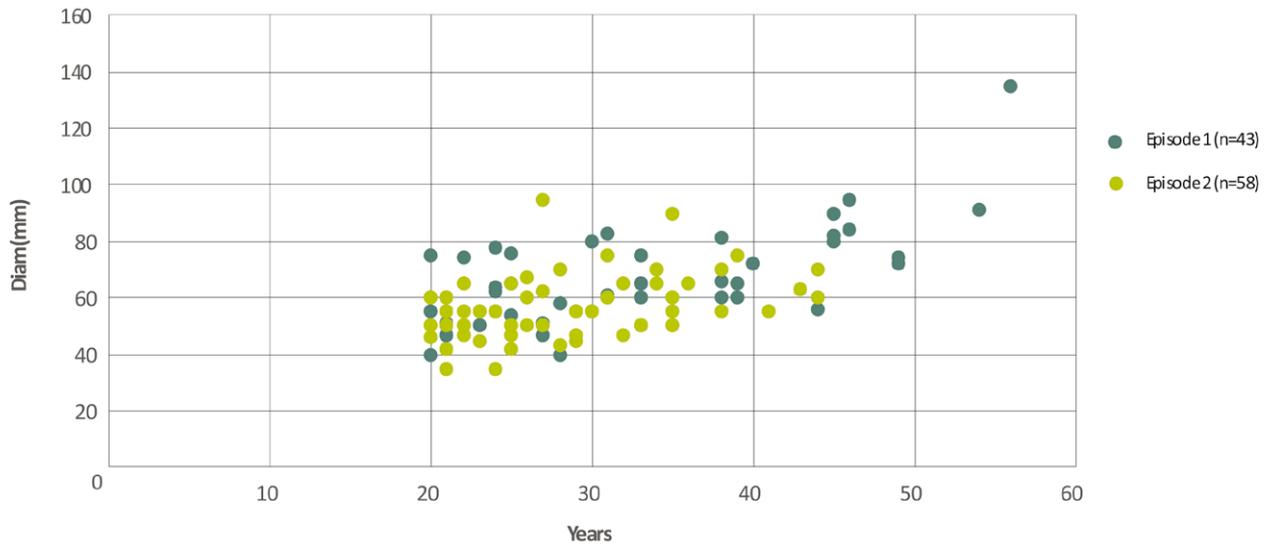


Figure 17.19. Hazel – age/ size relationships in Episodes 1 and 2.

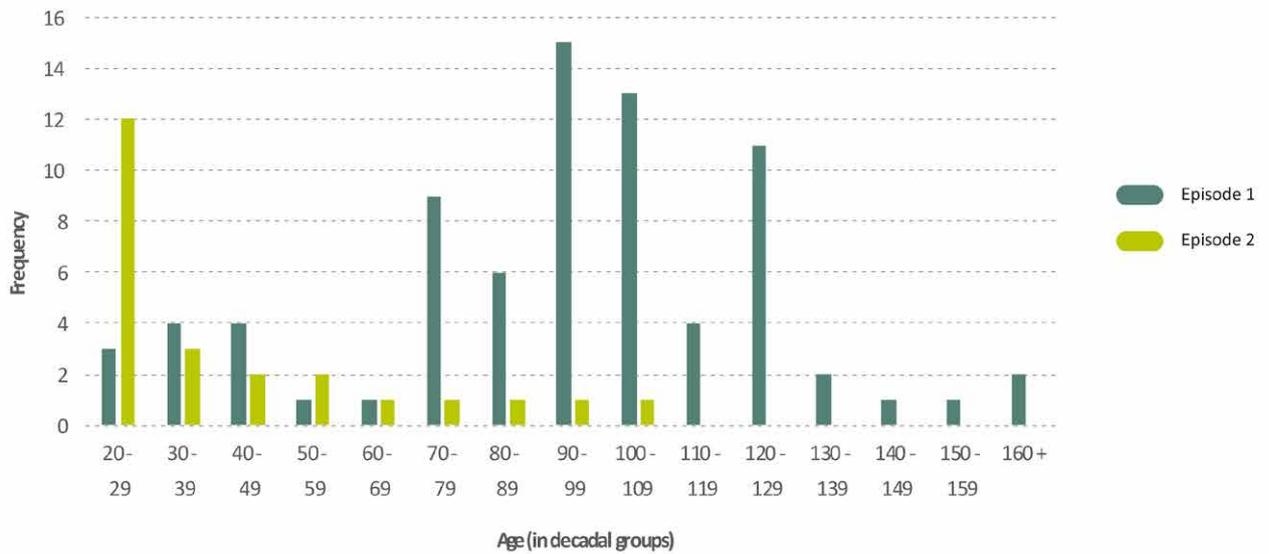


Figure 17.20. Alder; age structure in Episodes 1 & 2.

the plank facades flanking the entrance onto the site and into some of the houses, for purposes of aesthetic display.

Two woodland types are indicated by the age and size of the oak timbers (Table 17.5 & Figure 17.22).

The posts were from relatively young, medium-sized roundwood trunks; where minimum diameters could be recorded the posts used in ST2 were 194 mm on average, whilst those used in the Episode 3 defences were 207 mm on average. Whilst their size does not change greatly from Episode 1 to Episode 3 the average age of the trees is generally younger by Episode 3, reducing from 97 yrs

to 67 years. The oak roundwood posts could have come from an open woodland of maiden trees from which timber had been regularly extracted, hence the relatively young ages of the trees.

In contrast, the oaks converted to make the vertical planks used in Episodes 1 and 3 were significantly larger and older trees. The tangentially cleft planks yielded only partial ring-patterns but some of them had as many as 384 surviving growth-rings and it is estimated that the parent trees will have been around 500 years of age, with estimated diameters of up to 1.63 m (although many

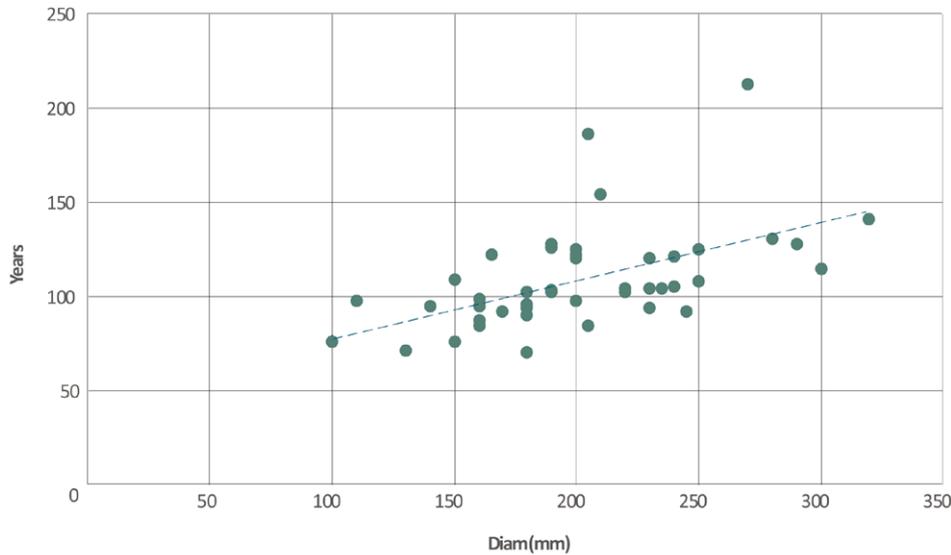


Figure 17.21. Age/size relationships in the Episode 1 alder aged 70+ years

		n	range	Av age	Av diameter
<b>Episode 1</b>	posts	21	32-148	97	194 mm
	planks	20	114-374	221.5	0.57 (n = 7)
<b>Episode 3</b>	posts	18	27-118	67	207 mm
	planks	11	93-384	221	0.86 (n = 6)

Table 17.5. Oak in Episodes 1 and 3; comparison of size and age.

of the older trees were smaller –Table 14.1). These trees represent a very ancient woodland which must have been protected from exploitation, allowing the trees to grow to great ages. There may also have been several different stands of this ancient woodland; there were distinctive growth patterns amongst the planks used in the wall of ST2 which suggested different sources (Chapter 7.2.2.2).

Nearly two centuries had passed between their felling in 437–5 BCE in Episode 1 to their felling in 243 BCE in Episode 3 and yet there is very little change in the range and average age of the ancient oaks over that period (Table 17.5 & Figure 17.22), suggesting that this woodland was managed to ensure that there was a continuous supply of oaks of this size. This, in turn implies that the woodland was owned or controlled. It is significant that during Episode 2 very little oak was employed on the settlement and the only example of this ancient oak was a single plank in the entranceway (Chapter 7.2.3.3). This bears upon the status of the settlement during this episode, suggesting as it does that the occupants might not have had the same access to this controlled resource (Chapter 18.3.2.6).

It seems probable that these oak woodlands were not that close to the settlement because very little oak

was used as fuel (Figure 17.17). The brush, the branches and twigs trimmed off the trunk would have provided a useful source of fuel unless it required an unequal amount of energy to transport it to the settlement.

#### 17.2.3.4 Other species

Ash and willow were all more minor components of the assemblage, reflecting their minor role in the landscape too (Figure 14.1). Only three of the analysed ash timbers were over 100 years of age, a post in the Episode 1 entrance area and two of the surviving posts in the post-ring of the Episode 2 ST3. The outermost growth rings of these older ashes were very compressed, suggesting growth within a shady woodland rather than a more open environment (Dobrowolska et al 2011: 136). The ash was used mostly as stakes or posts so long clean lengths would have been required. It had come from relatively small trunks; apart from the three older trees the assemblage was between 20 and 78 years of age and 40 to 160 mm in diameter, with little relationship between age and girth (Figure 17.23). Suitable timber of such mixed age and diameter could have come from both standard trees and mature coppice stands. Ash also accounted for 4% of the wickerwork at BLoM so it was present in younger coppice

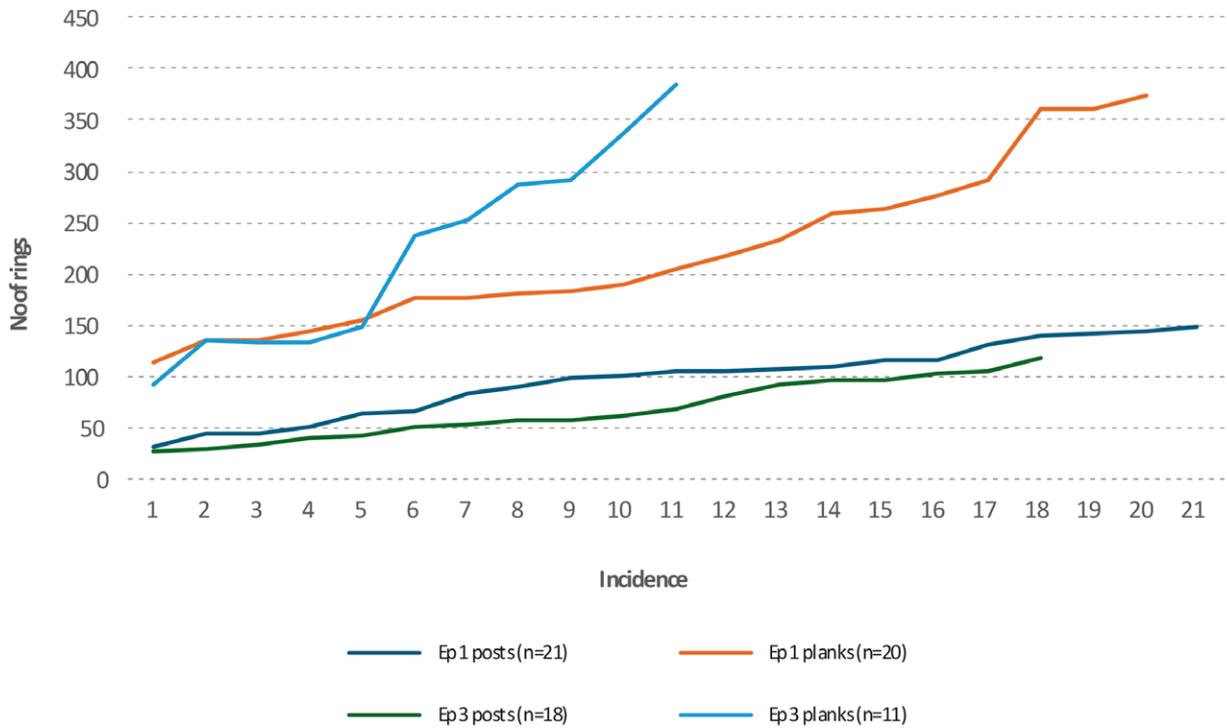


Figure 17.22. Oak; comparison of the age structure of the Episodes 1 and 3 posts and planks.

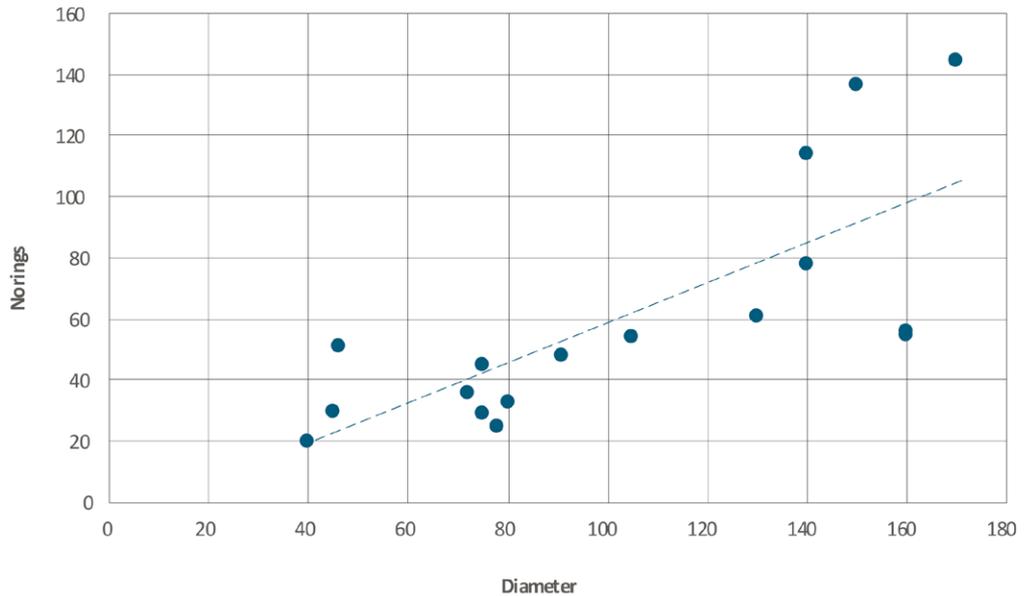


Figure 17.23. Ash; age/ diameter relationships.

stands too. Overall, the BLoM evidence suggests that ash was scattered throughout the surrounding landscape, in mixed broadleaf woodland and coppice, a distribution pattern still seen today in modern European populations (Dobrowolska et al 2011: 133). Ash appears to have been used more extensively at WLoM (although it was a much smaller, wood assemblage – Chapter 16.2.1.3), so there may

have been patches of woodland closer to WLoM where ash was more dominant within the mixed woodland.

Willow was rarely used on the settlement, possibly because there was very little available in the local environment (Chapter 17.1.5). However, the concentrated deposit of willow leaves found in and around the bowl in the Episode 1 midden raises the possibility that willow

may have been reserved for specific purposes, possibly medicinal (Chapter 11.5.7.2). Where it was used it was as withies and small stakes, so it may have been scattered throughout the coppiced woodland.

Birch was also a small component of the assemblage yet it was more visible in the landscape (Chapter 17.1.5). One possible explanation is that it was reserved for specific purposes, such as the harvesting of bark, for instance (Chapter 15.4.7.1)

## 17.2.4 Ecofact summary

### 17.2.4.1 [611]

#### Macroplant

Assemblage [611] represents debris that has accumulated outside the palisades, in the mixing zone where the loch laps around the island; the debris could have accumulated over the three episodes of occupation. A large assemblage of waterlogged and some carbonised plant remains were recovered which could therefore represent many different depositional events.

A large proportion of the waterlogged assemblage was formed of plants typically interpreted as building materials, but the near absence of any plant stems, coupled with the large numbers of sedge nutlets identified as grey sedge, glaucous sedge, common sedge, rush and club-rush, is more suggestive of plants that grew in the vicinity rather than from old floor coverings disposed of in this area. Furthermore, there was no evidence that grey or common sedge were routinely used as components within building materials in any other part of the settlement. A single glaucous sedge nutlet had been charred. Fragments of bracken, wood and leaves were observed, and these could perhaps represent small accumulations of re-deposited building material.

The waterlogged food remains were a small mixture of wheat caryopses, glume fragments, hazelnut shell, raspberry and blackberry seeds. The presence of both raspberry and blackberry seeds could be an indicator that faecal matter was deposited in this area. Additional finds included a small quantity of loose sphagnum leaves. If faecal matter was discarded in this area it is possible the moss was used as toilet paper.

The charred macroplant assemblage was dominated by 120 cereal remains identified as emmer/ spelt (80%), barley (12%), bread/ club wheat (2%), emmer (2%), spelt (2%) and cereal (2%). The other finds were a single hazelnut shell fragment and some burnt peat. This is evidence that domestic food and fuel waste were deliberately disposed of at the edge of the settlement.

The waterlogged weeds were varied and included species typically found in waste ground which favours damp acidic nitrogen rich soils, ie nettles, water pepper,

docks, fat hen, buttercup, broad-leaved pondweed and creeping cinquefoils. These weeds probably grew in this location alongside the sedge and rush indicating that this part of the site was relatively undisturbed apart from the occasional disposal of small quantities of domestic debris and possible cess.

#### Insects

Insect remains were abundant and generally well preserved. Recording was by scanning. There were some indications that occupation waste had contributed to this deposit, probably including a limited amount of litter from within buildings, but the main implications were for a natural accumulation on wet ground in the open air. Aquatic beetles were well represented and included an *Oulimnius* species that was not closely identified. *Brachypterus* occurs on nettles and *Isochnus* on willow (*Salix*), whilst grassland, probably lying further away on drier ground, was indicated by *Phyllopertha horticola* and *Dascillus cervinus*, both of which have turf-feeding larvae. The abundance and variety of scarabaeoid dung beetles suggests that grazing animals were a significant presence locally.

## 17.3 Summary

In Chapter 17.1 the proxy evidence from sediment cores for the environment of the lake settlements at BLoM and WLoM was presented, whilst in Chapter 17.2 the environmental evidence from the physical remains on BLoM was explored. In this summary section we try to show how a combination of these multiple strands of evidence have complemented each other to produce a more nuanced understanding of the environment of the lake settlements at BLoM and WLoM and how it changed over the period of their occupation.

### 17.3.1 Woodlands and wood use

The palynological vegetation reconstructions support the local presence of a mixed woodland, dominated by hazel, birch, oak and alder. Ash and willow were present in small quantities, whilst small quantities of pine and elm were also available near WLoM. All these species, except for pine and elm, were used as building material and fuel within the BLoM settlement. Hazel, alder and oak were the dominant types of wood used, with *circa* 75% of all used wood originating from hazel and alder. During the main BLoM settlement period, the proportion of hazel, alder and oak located within the WLoM catchment declined, with evidence of forest clearance and burning events. Conversely, oak, alder and hazel increased proximal to BLoM. The pollen vegetation reconstruction therefore suggests that wood was selected from locations within the WLoM catchment for use within the BLoM settlement, whilst forest cover around BLoM was maintained. We have speculated that the woodland that supplied the large ancient oaks may have been some distance from

BLoM, so perhaps it lay within the WLoM catchment. The significant reduction seen in the use of alder as fuel, from Episode 1 to Episode 2 is not reflected in the alder pollen from BLoM which increases during the occupation of the settlement. This is puzzling; alder growing close to the settlement would surely have been selected for fuel, the premise for this being the *Principle of Least Effort*, ie that people will always collect fuel closest to their settlement and will always collect species in direct proportion to their occurrence in the landscape (Shackleton & Prins 1992). The answer may lie in the decrease in the size and age of the structural alder from Episode 1 to Episode 2 which suggests that the alder woods may have been exhausted by the building demands of the first settlement. It is therefore possible that the occupants were avoiding using the alder woods around BLoM to allow them to regenerate. As with the tree-ring evidence for control of the ancient oak woodlands over the two centuries between Episode 1 and Episode 3 (Chapter 17.2.3.3) the alder assemblage also hints at control and management of a woodland resource.

The contrast between the pollen evidence and the wood assemblages suggests selective use of wood resources within the BLoM settlement, possibly due to cultural choices. For instance, the proportion of birch cover in the landscape increases from *circa* 500 cal BCE during the settlement timeframe but, despite its availability, very little birch was used in the BLoM settlement. And although ash and willow appear to have been available in similar, albeit much small quantities, ash was used a little more extensively. The concentrated deposit of willow leaves in and around the bowl in the ditch terminal (Chapter 11.5.7.2) hints at other, more specialised uses for which the willow was perhaps reserved.

The wood selection for the construction of the BLoM settlement and the WLoM crannog differed: whilst hazel, alder and oak dominated structures at BLoM, proportionately more ash was used within WLoM (Chapter 16.2.1.3). Palynological evidence shows that ash was present prior to, during and after the settlement periods at both WLoM and BLoM, albeit in relatively low abundances compared with other woodland species including hazel and oak. The abundance of ash pollen increased prior to the WLoM settlement but declined and remained reduced throughout the settlement period. These findings suggest that the increased use of ash in the primary construction of WLoM caused its decline and it never recovered.

There are multiple lines of evidence for Iron Age woodland management within the catchments of the Lochs of Myrton. The WLoM pollen record contain pronounced increases in hazel pollen toward the middle of BLoM Episode 1, whilst alder pollen decreases. Both shifts in pollen may be indicative of coppicing practices as hazel pollen is thought to rapidly increase in early years

after coppicing whilst alder pollen is subdued (Waller et al 2012). On-site evidence from the BLoM wickerwork also supports coppicing since long, thin, branch-free hazel stems were used in structural wickerwork alongside smaller amounts of alder, as well as some ash, willow, oak and birch. Coppicing does, however, discourage hazel flowering and nut formation and copious amounts of hazelnuts were found on-site, indicative of small-scale industrial processing. These results therefore suggest that the landscape was characterised by a mix of well managed and coppiced woodlands as well as more mature stands used for different purposes within the BLoM settlement. The presence of a mosaic woodland is supported by the age range of wood indicated by dendrochronology which extended from maiden trees to ancient woodland.

### 17.3.2 Arable agriculture

Palynological records from BLoM and WLoM show that barley and rye have been growing in the landscape surrounding the Lochs of Myrton since the Bronze Age. Barley dominated the cultivated landscape around WLoM and BLoM during their Iron Age occupation, often accompanied by smaller abundances of rye and transient occurrences of oat/ wheat/ spelt species. Evidence from the on-site macroplant analyses supports crop exploitation, small-scale processing and cooking at the BLoM settlement, with emmer identified as the principal cultivator exploited alongside hulled barley. The barley processed on-site could therefore have been easily accessible as it was persistently growing within the catchment of the lochs, unlike emmer. Despite the low levels of rye within the surrounding landscape, there is no evidence of its exploitation on-site at BLoM and its occurrence in the pollen record at this time might represent a weed plant as opposed to a crop plant (Behre 1992).

The lower taxonomic resolution of the available palynological data prevents discrimination between the presence of oat, wheat and spelt species. The pollen data does however show that their presence in the landscape is more limited than barley and rye: they are not detected within the BLoM catchment, although single grain occurrences are present within the WLoM catchment in the early stages of the settlement period. These findings therefore suggest that the availability of wheat species in the landscape was more likely restricted, temporarily variable and/or located further from the BLoM settlement than barley and rye, despite emmer dominating the on-site cultivated assemblage. Robertson (Chapter 11) has suggested that some of the other wheat species, the spelt and bread/ club wheat, may have been imported as trade items and it is possible that the emmer arrived on the site through this route too. However, it seems more likely, given the dominance of emmer at BLoM, that it was cultivated locally but on the better-quality arable lands further from the site.

### 17.3.3 Animal exploitation

Cattle, sheep and pig remains were recovered from BLoM, primarily found as the burnt remains of food debris in and around the hearths, although unburnt butchered remains were also found in the Episode 1 midden deposits. The only mammal signal from the WLoM *sed*aDNA record originated from cattle and the burnt bone assemblage from the small trench on WLoM included a fragment of a cattle molar. The strong cattle *sed*aDNA signal suggests that cattle were present on the WLoM crannog and possibly butchered there. There is, however, no evidence from the *sed*aDNA data or faunal remains to support the presence of sheep or pig associated with the WLoM crannog. These findings support a similar use of cattle at both the BLoM and WLoM settlements, but differing uses or exploitations of sheep and pig.

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# Reflections

The excavations at BLoM have revealed one of the best-preserved Iron Age settlements in Britain, the remarkable levels of preservation there enabling us to advance our knowledge base in a number of key themes. These include chronology, the construction, occupation and abandonment of roundhouses, and the spatial organisation and dynamics of enclosed settlements and their defences. In this concluding chapter, these advances are summarised and the contribution of BLoM explored. Finally, we speculate on the role and significance of wetland settlements in the regional landscape, on the motivations behind living out on the water and on the issue of terminology for Scotland's wetland sites.

## 18.1 Advances in chronological resolution in the Iron Age

### 18.1.1 Introduction

Dendrochronological studies at BLoM have resulted in the construction of an oak master chronology *BLoMx42* which is 555 years in length and is dated to 797–243 BCE. Felling events have been identified in 438–435 BCE, 278 and 276 BCE, 245–243 BCE and 223 BCE, thus providing a detailed chronological framework for the development of the site. There are few other prehistoric sites in the British Isles which can currently demonstrate this degree of chronological resolution (see below).

In Chapter 18.1.2 we look at the contribution that the work at BLoM has made to the chronology of later prehistoric wetland settlement in Scotland. In Chapter 18.1.3 the results are examined in the context of dendrochronological coverage for the Iron Age throughout the British Isles. These sections necessarily focus on the dendrochronology of oak, the only species used in British prehistory capable of providing calendar dates. However, at BLoM analyses of the ash, alder and hazel assemblages have also provided useful site-specific chronological evidence, demonstrating relationships between structures including contemporaneity and duration of structures. The use of non-oak species to provide this type of evidence is referred to as tree-ring analysis as opposed to dendrochronology (Morgan 1988: 5; Daly 2014: 9) and is less straightforward than the use of oak. In Chapter 18.1.4 the results of the non-oak analyses from BLoM are assessed in terms of their contribution to tree-ring studies.

### 18.1.2 The chronology of later prehistoric wetland settlement in Scotland

Prior to the successful application of dendrochronological and wiggle-match dating techniques, the chronological framework for wetland settlement in Scotland inevitably relied on radiocarbon dates, in most cases one or two assays per site (Crone 1993, 2012), and with a few exceptions like SW Scotland and Loch Tay (Cook et al forthcoming) this still remains the case. There are now radiocarbon dates for 71 wetland settlements (Crone 2012; Stratigos & Noble 2017; Garrow & Sturt 2019; Henderson et al 2021) and of these 43 (61%) fall between *circa* 800 BCE and 200 CE, suggesting that the most intensive period of wetland settlement was during the Iron Age. However, this long timespan is partially caused by

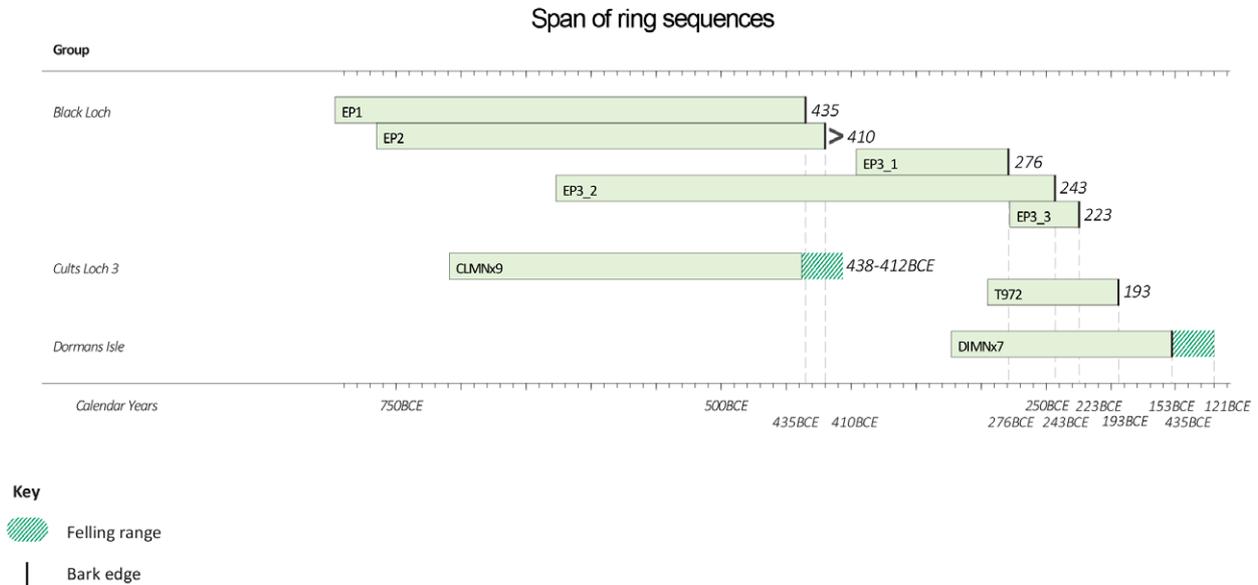


Figure 18.1. Bar diagram showing the chronological relationships between all dendro-dated Iron Age wetland sites in SW Scotland.

the presence in the radiocarbon calibration curve of the Halstatt Plateau between 800 and 400 BCE which has the effect of ‘smearing’ the probabilities of any radiocarbon dates which fall within that interval, and also another wiggle between 400 and 200 BCE which also has the same effect (Hamilton et al 2015). Thus, the chronology of later prehistoric wetland settlement has remained largely ill-defined until the recent application of dendrochronology to several sites in SW Scotland (Figure 18.1) as well as the wiggle-match dating of crannogs in the Clyde (Jacobsson et al 2017) and Loch Tay (Cook et al forthcoming).

The first later prehistoric crannog to be dendro-dated was Dorman’s Island in Whitefield Loch, only 17 km from BLoM (Cavers et al 2011). Radiocarbon dates indicated building and occupation sometime in the last four centuries BCE, while re-used Roman glass identified activity probably in the 1st/2nd centuries CE (*ibid*). However, dendro-dating of oak timbers used to construct a floor surface show that they were probably felled sometime between 153 BCE and 121 BCE (Figure 18.1). Thus, instead of activity smeared across as much as six centuries, the precision of the dendro-date makes it clear that the construction of the wooden floor in the latter half of the 2nd century BCE and the deposition of Roman glass were distinct events. Similarly at Cults Loch 3 crannog, Castle Kennedy, 10 of the 11 radiocarbon dates spanned the Halstatt Plateau (Cavers & Crone 2018: Illus 48), but the dendrochronological results show that most of the oak used in the construction of the crannog was felled sometime in the decades between 438 BCE and 412 BCE (*ibid*: Illus 50; Figure 18.1). Furthermore, modelling of all the chronological data, including WMD dates from short-lived non-oak timbers, suggests that this phase of occupation lasted only 30 years at

most (Jacobsson et al 2018: 55). There is no further evidence of activity on the crannog until the 2nd century BCE when a single felling date in 193 BCE suggests a phase of reoccupation. These results, together with a WMD date of 520–465 BCE for the felling of a post from Oakbank crannog (Cook et al 2010) and bimodal patterning in the distribution of radiocarbon dates across the 1st millennium BCE (Crone 2012: Fig 6.2), prompted the theory that two ‘event’ horizons were emerging from the later prehistoric fog, one in the 5th century BCE when both Oakbank and Cults Loch 3 crannogs were built and one in the 2nd century BCE when Dorman’s Island was in use and Cults Loch 3 was refurbished (Crone 2012: 161). Furthermore, it was argued that these reflected discrete pulses of building activity in wetlands separated by hiatuses in which there was no apparent activity (*ibid*).

The results from BLoM reinforce the 5th century BCE horizon which, we would argue, is when building in wetlands begins in SW Scotland. It also reinforces the thesis that there were hiatuses, at BLoM for at least a century from the end of Episode 2 *circa* 370 BCE to the beginning of Episode 3 in 278 BCE when the settlement is reoccupied. However, there is evidence of building activity at BLoM for over 50 years throughout the 3rd century BCE, from 278 BCE to 223 BCE, and this makes the postulated 2nd century ‘event’ horizon less distinct, suggesting that there was perhaps more of a continuum of building activity in wetlands throughout the 3rd and 2nd centuries BCE. Many of the apparent hiatuses identified in the earlier datasets, between the 2nd to 5th centuries CE, and the 8th to 11th centuries CE (Crone 1993) are becoming less distinct (Crone 2012; Stratigos & Noble 2017) so it is possible that the later prehistoric hiatuses are more apparent than real.

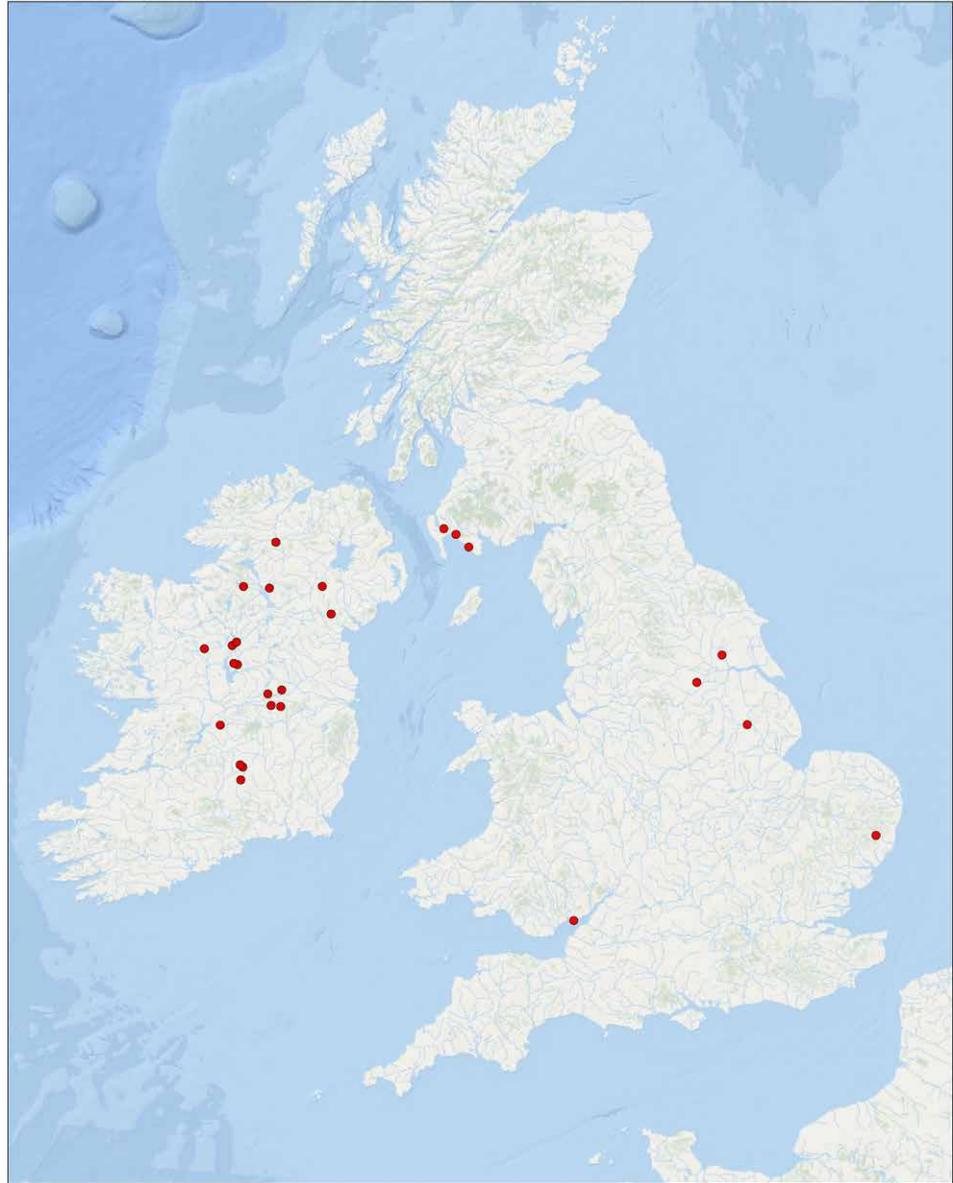


Figure 18.2. Distribution map showing all dendro-dated Iron Age sites in Britain & Ireland.

Regionally the BLoM oak master chronology contributes another robust building block to tree-ring coverage in SW Scotland, adding to those from Cults Loch and Dorman's Island and extending coverage in the region (Figure 18.1). Future dendrochronological studies in the region will benefit from the existence of these datasets, making it more straightforward to date other 1st millennium BCE material.

### 18.1.3 Iron Age dendrochronology in the British Isles

SW Scotland has benefitted from its geographical proximity and climatic similarity to Ireland, where there is increasingly plentiful data covering the 1st millennium BCE (David Brown pers comm; Figure 18.2). There are now 22 dendro-dated sites in Ireland, primarily trackways

such as Corlea 1 (148 BCE) and Derraghanmore (167 BCE) (Baillie & Brown 1996), but also two dug-out boats and structural remains including the crannog of Island MacHugh (258 BCE – Murray et al forthcoming), Navan Fort (95 BCE) and the earthworks at the Dorsey (Baillie & Brown 2009, 2013). The Irish chronologies have been key to the dating of the SW Scottish tree-ring data.

None of the dated Irish sites display the chronological complexity seen at BLoM. At the only comparable settlement site, Island MacHugh, there are only five dendro-dated timbers from the Iron Age activity and only one produced a felling date (Murray et al forthcoming), while at the Corlea 1 trackway, which has produced one of the larger assemblages of dated timbers, all the oak was felled in 148/7BCE and there was no dendrochronological evidence

of refurbishment or rebuilding (Baillie & Brown 1996). On the other hand, the accumulation of so many datapoints throughout 1st millennium BCE Ireland has led to the development of meta-narratives about environmental events and their impact on prehistoric settlement (Baillie & Brown 2009, 2013 and see below).

There are surprisingly few dendro-dated Iron Age sites from mainland Britain (Figure 18.2). Just four structures and one logboat have been dated; the timber causeway at Fiskerton, Lincolnshire (Field & Parker-Pearson 2003), the 'marsh-fort' at Sutton Common, Yorkshire (Nayling 2007), the settlement at Goldcliff on the Severn Estuary (Hillam 2000), the post alignment at Beccles, Suffolk (Geary et al 2011) and the Hasholme logboat, Yorkshire (Millett et al 1987).

Apart from the Beccles post alignment, which was a single-phase construction dated to 75 BCE (Geary et al 2011), all the other datapoints indicate activity from the late 5th century BCE and into the early 3rd century BCE. The Fiskerton causeway has the earliest dates with construction beginning in 456 BCE and is therefore roughly contemporary with BLoM. There were multiple felling episodes from then until a final repair sometime between 321–291 BCE (Hillam 2003) (which may be linked to a series of midwinter lunar eclipses – Field & Parker-Pearson 2003: 136–148). At Sutton Common there were felling dates in 372 BCE and 362 BCE (Nayling 2007) and at Goldcliff Building 1 was built between 382–342 BCE, Trackway 1108 between 336–318 BCE and Building 6 in 273 BCE (Hillam 2000). The tree used to make the Hasholme logboat was either felled or died between 322–277 BCE (Millett & McGrail 1987). Attempts to dendro-date the better-known Iron Age wetland settlement at Glastonbury failed because the ring-sequences were too short but modelling of the wiggle-match dated sequences indicates that the settlement was probably established 185–155 cal BCE and the final constructions took place 75–45 cal BCE (Model 2 – Marshall et al 2020).

This admittedly small dataset reflects building activity in wetland environments throughout the 2nd half of the 1st millennium BCE. This small group of British dendro-dated sites is nothing like the distinctive clusters identified by Baillie & Brown in the Irish record (2009: Fig. 1, 2013: Fig. 2) but it does appear to reflect a new trend from *circa* 500 BCE if the apparent gap in dendro-dated wetland sites before that is considered. There are currently no archaeological sites in mainland Britain which have produced dendro dates indicating building activity between the 9th century BCE (Tyers et al 2024) and the mid-5th century BCE; this leaves a gap of some four centuries in which there is no evidence of dendro-dated building activity. Baillie & Brown (2009: Fig. 1, 2013: Fig. 2) have highlighted significant gaps in the Irish tree-ring record which, in combination with other sources of evidence (ice cores, documentary sources,

etc) they have interpreted as suggesting that global environmental events may have had an impact on building activity in Irish wetlands during the 1st millennia BCE and CE. This environmentally deterministic interpretation has been critiqued by Plunkett et al (2013) who conclude that, while the combined evidence does indicate distinct phases of building activity in the Irish peatlands this is not consistently correlated with changes in climate from wet/cool to dry/warm conditions and that wider cultural trends, which may have varied from phase to phase, were probably the prime motivators for changing levels of activity in these wetland environments.

#### 18.1.4 Non-oak dendrochronology

The dendrochronological analysis of alder, ash and hazel at BLoM has proved valuable in demonstrating contemporaneity between structures and identifying durations. There has been relatively little use of these species in dendrochronology in the British Isles (see below), partly because of the perceived problems and issues associated with the analysis of these species, but also because there has often been plenty of oak in the assemblage which can be relied on to provide precise calendar dates, so analysis of other species has not been pursued. For example, of the 143 oaks and 27 alders used as piling in the Fiskerton causeway (see above) only the oak was fully analysed (Hillam 2003: 26–29). However, in Europe ash and alder, and to a much lesser extent hazel, have been routinely analysed and even calendrically dated by comparison with the reference chronologies of other species (Billamboz 2003, 2008). These studies have been successful primarily because of the volume of timbers available for analysis; for instance at the Neolithic lake villages of Hornstaad-Hornle in SW Germany there were 1731 ash piles suitable for analysis (Billamboz 2008: Fig. 3). Although only *circa* 350 could be confidently grouped (*ibid*: Fig. 3 – dating type B) this still represents a substantive chronology with increased probability levels and the potential to provide valuable site-specific interpretations.

All species have differing environmental requirements and growth responses and are consequently analysed separately in the first instance (Schweingruber 1989: 125). However, certain species can be successfully correlated together, which can be very valuable particularly if a non-oak species can be correlated with absolutely dated oak sequences (ie Groves & Hillam 1988; Hillam et al 1990; Billamboz 2008). This approach was also taken at BLoM but none of the species chronologies correlated with each other.

##### 18.1.4.1 Alder

Alder has proved to be the most commonly used species in the construction of most excavated Scottish crannogs and so it has been vital to establish its functionality for dendrochronological analysis (Crone 2014, forthcoming

a). Studies have shown that, despite its drawbacks, which include short sequence lengths, obscure ring-boundaries and compressed growth, alder chronologies can be constructed and can provide a valuable contribution to the chronological framework of the site (Crone 2000, 2014; Barratt et al 2019). However, the issue of compressed outer growth-rings and the consequent difficulties in establishing felling dates has hampered interpretation particularly in the identification of closely spaced building phases. The size and nature of the assemblage at BLoM has enabled us to tackle this issue.

Some 103 alder timbers were analysed. Sequences under 20 years of age had been excluded from the analysed material but the oldest timber present was 212 years of age and 55% were over 80 years of age (Table 7.7). These are very mature alders (see Chapter 17.2.3.2 for discussion); although older trees are known, alder generally lives for 60–80 years in the British Isles (McVean 1953) and the age structures of other archaeological assemblages tends to reflect that, with only small proportions over 80 years of age. In other studies older sequences have proved problematic, the growth-pattern tending to become erratic in the longer sequences, possibly because of factors like suppressed growth as the tree ages and is overcrowded (Crone 1988: 158; Barratt et al 2019). However, at BLoM the number and length of the sequences has contributed to the successful grouping of 45 sequences, in two major groups with strong internal consistency. Apart from a group of three young alder posts from ST2 and five alders from ST3 the grouped alders were between 72 and 139 years of age, with an average age of 98 years. As has been concluded for the Buiston crannog alder assemblage (Crone 2014), this probably reflects growing conditions and the morphology of the parent trees (Chapter 17.2.3.2).

Confidence in the veracity of alder chronologies is often undermined by the short sequence lengths available and the consequent lack of overlap and statistical correlation but at BLoM this has not been an issue, the length of the grouped sequences producing significant and consistent correlations between many of the sequences (Tables 7.8 & 7.9). This has brought into focus the issue of missing outer rings even when the bark edge is present, an issue described in more detail in Chapter 7.1.1. At BLoM sample length and internal chronological consistency has enabled us to develop an approach in which end-dates are interpreted in terms of broad felling bands of up to a decade for building events.

#### 18.1.4.2 Hazel

In all, 106 hazel timbers were analysed; these all retained the bark edge and varied in age from 20 (an arbitrary cutoff age – see above) to 58 years with an average age of 29.5 years (Table 7.10). Of these 39 could be grouped, some 37% of the total. The approach taken with the hazel accords with

Billamboz' type B dendro-dating (2008: 147) in which external support for the correlations was provided by the contextual evidence, ie it was assumed that all the stakes in a wickerwork wall would have been felled at the same time. The grouping was undertaken mainly through visual correlation; however, many of the visual correlations also produced significant statistical correlations (Tables 7.11 & 7.12). Structure chronologies were built for ST1, 59 years long and incorporating nine sequences, ST2, 59 years long and incorporating 16 sequences, and for ST3, 39 years long and incorporating 12 sequences. These chronologies have provided valuable site-specific evidence, demonstrating that ST1 and ST2 were built in the same year and that ST3 was probably occupied for only *circa* 16 years. As with the alder, the spread of end-dates observed in a single-phase construction wickerwork wall must reflect cessation of growth and so felling bands have been employed to interpret the end-dates.

Even if left to grow as a tree, hazel rarely grows for more than 80 years (Woodland Trust 2025) so the potential for dendrochronological study will always be limited. Nonetheless, it is frequently found on wetland archaeological sites mainly in its coppiced form, its ring-pattern is relatively easy to measure and consequently it has been the subject of numerous tree-ring studies, to establish its functionality for chronological analysis (ie Bartholin 1978: 217; Morgan 1988; Crone 1988; Billamboz 2008) and to develop models for woodland management practices (Morgan 1983; Crone 1987; Out et al 2018, 2020, 2022).

Perhaps the largest such chronological study has been that of the Sweet Track in the Somerset Levels where hazel comprised 44% of the total wood samples (Morgan 1984). The hazel assemblage there was younger than the BLoM assemblage; although there were a few sequences up to 60 years of age the average age was 20 years and the majority lay between 10 and 26 years of age (*ibid*: Fig 65). Only sequences over 20 years were measured; of the 94 measured sequences 62 could be grouped, 66% of the total assemblage. Chronologies for different sections of the Sweet Track were constructed with good visual and statistical correlations between the components, showing that the hazel used at the N and S ends of the track had probably come from different woodlands (*ibid*: 54). In contrast, at Moynagh Lough only 20 samples of hazel were sampled and these were spread across four contexts; consequently only groups of two to four sequences could be identified, which contributed little to the overall understanding of the site development (Crone 1988).

The conclusion must be that, for the successful analysis of hazel the key factor is sample size; there must be sufficiently large assemblages from single contexts which will allow for the selection of the longest sequences with bark edge. The cessation of growth following a

decrease in ring-width in the outermost rings of hazel was noted by Morgan (1983) who concluded that it made the relative dating of hazel unreliable. The work at BLoM has demonstrated that with a large enough dataset from single-phase constructions it is possible to develop felling bands which are useful for chronological interpretation.

#### 18.1.4.3 Ash

Although the ring-pattern of ash is generally thought to be complacent, ie too insensitive to changes in its environment to register major fluctuations in growth (Elling 1966; Calton & Fletcher 1978), it has been used successfully in many dendrochronological studies. Ash is the second commonest species used in the Neolithic pile dwellings of SW Germany (Billamboz 2008: Fig 1) where its analysis has been used to identify phases of building in the settlements as well as reconstruct the contemporary history of the surrounding woodland (*ibid*).

In Britain the largest study of ash was undertaken on the Sweet Track in the Somerset Levels (Morgan 1988). Split ash planks had been used in its construction, varying in age from 30–123 years. A chronology 167 years in length and incorporating 20 sequences was constructed in which three episodes of felling were identified. The ash chronology correlated very well against a dated oak chronology from the track, thus dating the felling episodes to 3838 BCE, 3807/6 BCE and 3800 BCE (Hillam et al 1990). The pile dwelling settlement at Must Farm, Cambridgeshire was constructed with young oak and ash, 20–40 years old and 20–60 years old respectively (Tyers et al 2024). Fifty ash samples were analysed and a chronology 61 years long and incorporating 46 timbers was constructed. As at the Sweet Track the ash chronology correlated well with the oak showing that all the ash and oak had been felled in the same year, thus demonstrating that the Palisade and Structures 1–5 were coeval. WMD dating of one of the grouped ash timbers provided an estimate for the formation of the outermost ring in 865–840 cal BCE (95% probability) (*ibid*).

In Ireland an ash chronology from Viking Dublin was also successfully correlated with an oak chronology from that city (Daly 1998). Here only samples over 60 years were analysed and of those 26 (46% of the total analysed) were incorporated into a chronology 156 years in length which was dated to 1078 CE by correlation with the oak chronology.

With only 28 analysed sequences, the ash assemblage from BLoM is significantly smaller than the assemblages described above, although it displays a similar age structure to that from Must Farm, with 82% under 60 years of age and every timber retaining its bark edge. At BLoM the ash has provided valuable information on the contemporaneity of ST1 and ST2 and the chronological relationship between ST3 and the Episode 1 trackway. The key to the successful

analysis of ash would appear to lie in the presence of a core group of sequences between 40–60 years of age and plentiful bark edge.

## 18.2 Roundhouse construction and use

### 18.2.1 Introduction

The exceptionally well-preserved evidence often encountered on wetland sites is made more relevant if it can be integrated into broader archaeological discourses, if we can reconcile this evidence with our understanding of the more common settlement remains on dryland sites (Menotti 2012). Roundhouses are a ubiquitous feature of the later prehistoric landscape in Britain, but they survive primarily as two-dimensional ground plans from which we must extrapolate the building upwards, furnish and inhabit it. The aim of this section is to summarise the evidence for the construction and use of the roundhouses at BLoM and explore how this might enhance our understanding of their dryland equivalents.

### 18.2.2 Design and construction

Although six house stances have been investigated there are only three for which there is, to varying and incomplete extents, a floor plan and evidence for the superstructure – ST1, ST2 and ST3. The metrics of these houses are shown in Table 18.1 and the primary features are summarised below.

In comparison with the ground plans of other Iron Age houses the BLoM houses would be described as of ring-groove construction with an inner post-ring (Harding 2009: 71) and they all fit comfortably within the size range for double-ringed houses with wooden walls (Pope 2003: Fig 4.20). At 12.8 m ST2 lies at the upper end of the range but is comparable with other roundhouses in the region while ST3 is somewhat smaller (Table 18.2).

#### 18.2.2.1 Outer walls

The outer walls were all of stake-and-wattle construction. The stakes were closely spaced (0.3 m on average) and the wickerwork was woven *in situ* around the stakes; there is no evidence of prefabricated wickerwork panels being used. The outer walls of ST1 and ST2 were double-skinned, while that of ST3 was single-skinned. In the best-preserved stretch of walling in ST2 the stakes of the inner skin were on average 81 mm in diameter, while those in the outer skin were smaller, at only 54 mm average diameter. The stakes had all decayed down to the surface of the peat but the depth to which they had been inserted varied hugely. In ST5 only seven stakes were recorded in the short length of the outer wall that was uncovered but they varied in depth from 100 mm to 710 mm. Depths were recorded along segments of the double-skinned wall of ST2; in the outer skin they varied from 200 mm to 860 mm, the short 200 mm stake sitting between stakes inserted to

	Diam	Outer wall	Post-ring	Optimum	Actual	Internal area*	Post-ring	Post-ring	Inner ring	Inner ring	Entrance
<i>BLoM</i>			diam	diam	ratio		posts**	diam	posts**	diam	
ST1	11.7	double	7.2	7.64	1:0.688	92 sq m	3	av .16 m	?		
ST2	12.8	double	8.8	9.05	1:0.667	113 sq m	6	av .18 m	5	av .2 m	Y
ST3	9.6	single	4.5	6.72	1:0.474	72.4 sq m	3	av .15 m	/		Y

Table 18.1. The BLoM roundhouses; metrics. \*Calculated within inner skin of double wall. \*\*Exposed or surviving posts.

	Diam	Outer wall	Post-ring	Post-ring	Entrance
			diam	posts**	
<b>Cults Loch 5</b>					
RHA	14	single	7.2	8	Y
RHB	13.5	single	7	8	x2
<b>Rispain</b>					
Building 1	13.5	single	10.5	10	x2
<b>Carronbridge</b>					
Building 1	13	single	?		x2
Building 6	10.1–11.6	single			
<b>Airds Quarry</b>	12–12.5	single		16	
<b>Hayknowes Farm</b>	11	single	6.8	7	x2

Table 18.2. Metrics for other Iron Age roundhouses in SW Scotland. \*\*Exposed or surviving posts.

depths of 770 mm on one side and 860 mm on the other, while in the outer skin they appeared to increase in depth along the segment measured, from 450 mm to 1110 mm. This evidence suggests that stakes of variable length were used and were inserted into the ground until their tops were level at the required wall height. The stakes were all pencil-tipped, perhaps indicating that they were hammered or pushed into the peat rather than bedded in a slot or groove, which might also explain the varying depths. This approach has also been observed at other sites where the timbers have survived *in situ* (Therkorn 1983: 356). Thus, very little can probably be read into recorded stake depths and their implications for above ground structures (*contra* Romankiewicz & Mann 2017: 6).

There was no evidence for daub cladding on the exteriors of any of the wickerwork walls. A pinkish-grey clay was used as packing and lining around the hearths (Chapter 15.2.4) and this would surely have been very visible against the organic matrix had it been used as daub. At the equally well-preserved wetland settlement at Must Farm, Cambridgeshire there was also no evidence for the use of daub on the outer walls of the roundhouses, although clay had been used within the buildings (Knight & Robinson Zeki 2024: 91). In the reconstruction of a roundhouse at Castell Henllys, Mytum & Meek (2020: 4) noted that the daubing process left a distinctive trampled humic layer around the exterior of the house, something also not observed at BLoM (although this might be less likely to be

identifiable at BLoM). This accords with Pope's (2003: 383) conclusion that wattle-and-daub walls are very uncommon in roundhouse construction in northern Britain. The only evidence for insulation consisted of redeposited peat and brushwood within the cavity of the double-skinned walls in ST2. Double-skinned cavity walls are not a common feature in Iron Age roundhouses, or perhaps more correctly, they are difficult to confidently identify (Harding 2023: 59). Traces of double-skinned walls have been found at the rear of several unenclosed platform settlements of Bronze Age date, at Lintshie Gutter (Terry 1995: 382, 385) and at Midlock Water, Clyde Valley (Cox & Marshall 2023: 63). At the former, daub was found in association with the double wall and at the latter a halo of loose stones was interpreted as the wall material. At BLoM the change from double-skinned in Episode 1 to single-skinned in Episode 2 may reflect a change in the status/ function of the settlement. Double-skinned walls would be more insulated and preferable for domestic occupation, ie in ST1 and ST2 while ST3, more likely a workshop and possibly not a permanent habitation, was single-skinned.

In ST2 lengths of the outer wall had also been constructed using vertical oak planks. Plank walls flanked either side of the entrance for a distance of 1.6 m and there was also a 2 m long stretch of plank walling along its W edge, at the point where the roundhouse abutted the line of the trackway. Traces of plank walling were also found in a similar position along the wall of ST5 but not enough of the

footprint of ST1 had been exposed to determine whether plank walling had also been used in its construction. The planks had been inserted into slots cut into the peat, although the cuts were no longer visible; the only evidence that they had been cut was packing material found in front of the buried external faces of the planks in ST2. The planks on either side of the ST2 entrance had been inserted to a regular depth of *circa* 1 m below the ground surface so on the accepted rule-of-thumb for posts, that a third to a half of their height should be below ground, the planks could have supported above ground heights of between 1 to 2 m.

Plank-built walls have been recorded in other Iron Age roundhouses (Pope 2003: 170). Out of 70 excavated houses at Danebury only one, CS1, had plank-built walls, the planks up to 0.4 m wide and radially-split, as shown by the distinct wedge shape of the soil-filled voids (Cunliffe 2013b). Cunliffe (*ibid*) has reconstructed it as a continuous ring of planks but the plan suggests that the planks were only detected in segments, as at BLoM. Harding (2009: 71) also identified the traces of planks in the Pimperne roundhouse. In the roundhouse in Homestead 1 at Bannockburn, there were clear impressions of a continuous plank-built inner wall 0.15–0.25 m thick, the planks overlapping (Rideout 1996: 208, 259) while the charred remains of radially-split oak timbers in the terminal post-holes on either side of the entrance into House 2 at Dryburn Bridge (Dunwell 2007: 54) may also represent planks. It seems likely that, as Harding (2009: 71) suggested, planking was regularly used in wall construction but is seldom detectable; the BLoM evidence suggests that it might have been reserved for ‘special’ circumstances, as does the Danebury example. However, while the oak planks forming the façade on either side of the entrance into ST2 might have been used in this position for aesthetic purposes the planking at the closest point to the track suggests it was there as protection for the building at a point prone to damage by passing traffic.

#### 18.2.2.2 Post-rings

ST2 has the more fully exposed post-ring but there were enough surviving elements in both ST1 and ST3 to indicate that both these houses also incorporated post-rings in their design. ST2 displays odd-post axial symmetry; it was built with a N/S aligned axis which bisects the central hearth and the entrance and is remarkably symmetrical around a point which lies at the very centre of the Phase 1 hearth. It was not possible to determine whether the other houses had been laid out in the same way because too few of the post-ring posts had survived. However, the majority of post-ring roundhouses in Pope’s survey (2003: 383) employed radial or axial symmetry in their layout, with axial symmetry more favoured in northern Britain (*ibid*: 123). As the knowledge therefore already existed amongst the BLoM builders, and it conformed to wider patterns of construction, it seems likely that it was deployed in the

layout of the other roundhouses, at least in Episode 1. As well as indicating the existence of a conscious design process Guilbert (1982), who first recognised the phenomenon, thought that it might also indicate the presence of cross-beams in the roof which in turn could suggest the existence of an upper floor (Pope 2003: 118), a feature that is also hinted at by the second post-ring in ST2.

There would have been 13 posts along the projected post-ring in ST2, set at mainly 1.9 m intervals. The posts were 0.18 m in average diameter and were all concave-based, apart from the two posts on either side of the entrance which were pencil-tipped (it is assumed that the designs exposed in the W half would have been replicated in the E half). Harding (2023: 231) has suggested that earthfast doorposts may not simply reflect building requirements for stability but also a symbolic need to embed the foundations, ‘...a physical assertion of the right to place’. In ST2 the pencil-tipped posts at the entrance were probably more functional, as they secured the ring-beam into the foundation timbers of the entrance way and thus provided resistance to the lateral thrust of the ring-beam where it spans the entrance space. There was no evidence for the replacement of any posts in ST2; concave posts could have been replaced without leaving any archaeological trace but the dendrochronological evidence from ST2 shows that all the posts were felled in the same year.

Only three post-ring posts survived in the excavated portion of ST1, a mixture of two pencil-tipped and one concave-based posts set at 2–3 m intervals. One post had been replaced by inserting another directly alongside it (Figure 3.53). Although most of the circuit of the projected post-ring in ST3 was uncovered only three widely scattered posts were found *in situ* (Figure 4.16), again a mixture of one pencil-tipped and two concave-based. One of the posts had also been replaced, the original post chopped off, leaving the concave base *in situ*. Despite this evidence for maintenance of the post-ring it did not stay in use throughout the occupation of the house; late in the use of ST3 a working platform was built over the SE circuit of the post-ring so it had lost its structural function by then.

The post-ring is considered to be the main weight-bearing element in roundhouse design, its position in relation to the outer wall determined by the need to distribute the weight of the (conical) roof evenly between it and the outer wall (Harding 2009: 57). The optimum ratio for placement of the post-ring within the outer wall is 1:0.707, to ensure equal distribution of the roof weight across the span of the rafters (Pope 2003: 116). The actual ratios for the BLoM houses have been calculated (Table 18.1 above) showing that in ST1 and ST2 the post-rings have been placed at the near optimum position for the support of a conical roof (but see below for alternatives). The post-ring in ST3 lies significantly closer to the centre leaving a much wider peripheral area, possibly a deliberate design to free

up working space (see below). A similar arrangement is seen in the Bronze Age Must Farm roundhouses which display a small central zone and wider periphery; this could relate to the need to provide support to the raised floor but, as the authors suggest, it also means that the periphery had to be the location of most activity in the house (Knight & Robinson Zeki 2024: 100–101).

It is the use of both flat- and concave-based posts to support the superstructure of these houses which is perhaps one of the more important insights to come out of the BLoM excavations. One could argue that these were adaptations to building in difficult conditions on an unstable substrate but nonetheless their existence calls into question the interpretation of roundhouses without post-holes, or with very irregular scatters of post-holes; the gaps could have been filled with non-earth-fast posts which would have been easier to replace. Reynolds (1979: 42) argued that a circular house would not necessarily have needed any posts other than a central one and he went on to demonstrate this experimentally. He concluded that earth-fast posts were only needed in the construction phase, to provide stability while the roof was being erected (Reynolds 1998). This raises the question as to how the builders at BLoM constructed the house without earth-fast posts. Mytum & Meek (2020: 17) provide a possible solution suggesting the prefabrication of elements which could be rapidly assembled; for instance the tops of the posts in the post-ring could have borne slots into which tenons of the ring-beam timbers were slotted. At Must Farm there were tusk tenons at the top of each post, over which the mortised ends of the ring-beams were slotted, one stacked on top of the other (Knight & Robinson Zeki 2024: 84).

Whether it was needed structurally or not, the post-ring in ST2 clearly remained an important element of the internal design as all the posts were still *in situ*. It was important in defining the annular division within the house, with hurdle screens in sillbeams between each post (see below), but it may also have been integral to supporting an upper loft space (see below).

### 18.2.2.3 Inner post-rings

Some 2 m inside the post-ring of ST2 was another circuit of posts which would have formed a five-sided polygon with sides 3 m long, arranged tightly around the hearth (Figure 3.17). The posts were 0.2m in average diameter and displayed a mixture of base designs; the two facing the entrance were flat-based, while the double posts behind the hearth, through which the axial line would have passed, were pencil-tipped and the post to the side of the hearth was concave-based. A single large oak post with concave base may represent a similar inner post-ring in ST1.

What was the purpose of this inner post-ring? Harding (2009: 56–57) has noted several examples of roundhouses with central settings of four posts and suggests that their



Figure 18.3. Cut-away reconstruction through ST2 showing the post-rings supporting an upper floor and the inner post-ring supporting a clerestory.

purpose may have been to support a mezzanine floor. Second internal post-rings are relatively rare in prehistoric dwellings, accounting for only 3% of the dataset (Pope 2003: 105, 383) but Pope (*ibid*: 384) goes on to suggest that most roundhouses over 7 m in diameter would have had attic/loft spaces. She argues (*ibid*: 119) that the observed practice of overbuilding (or over-engineering), ie using post-rings in houses less than 10 m in diameter which do not need them to support the roof, implies that the posts were probably used in the support of an upper floor. The two internal post-rings in the BLoM houses could have easily supported a quite substantial floor straddling the ring-beams and creating a spacious loft-like space (Figure 18.3). The inner post-ring posts are slightly larger than those in the outer post-ring, possibly because they needed to be taller. An alternative possibility for their function is that they supported a clerestory, a section of raised roof over the central hearth with open sides (Figure 18.3). At Clachtoll Broch, Assynt the excavators suggested a similar solution to explain the secondary wooden structures (Douglas 2022). As in the broch a clerestory would have provided much needed light and ventilation in a building with a single entrance.

The cluster of posts at the back of the inner post-ring in ST2 through which the axial line passes is also seen in the Phase 2 house at Llywn-du Bach, where there are three posts in a similar position (Bersu & Griffiths 1949: 186, Fig 7). The clusters imply either replacement or strengthening, suggesting that this position on the post-ring was subject to greater stress. Bersu & Griffiths (1949: 187) proposed that this arrangement of the roof supports, ie symmetrical about an axis aligned through hearth and entrance, may mean that the roof had a ridge aligned along the main axis, which sloped down at the back of the house, discussed further below.



Figure 18.4. The roundhouse at Whithorn under construction, bundles of reeds for thatch lying up against the oak façade. The thick overhanging eaves project out 0.85 m from the walls.

#### 18.2.2.4 The roof structure

No evidence for the roof structure survived in any of the houses, suggesting that they had been dismantled prior to abandonment (see below), but the layout of the weight-bearing components, the walls and post-rings all have a bearing on the design of the roof. The assumption in the reconstruction of prehistoric roundhouses is that they were surmounted by a conical roof, and certainly where roof timbers have survived, as at Must Farm, Cambridgeshire (Knight & Robinson Zeki 2024) and Birnie, Morayshire (Romankiewicz 2018) the radially positioned rafters confirm a conical roof. The pitch of prehistoric roundhouses is generally assumed to be at 45° but this is predicated by the type of roofing material used, the 45° pitch best suited to straw thatch (Harding 2009: 58–59), which was probably not used extensively, if at all at BLoM (see below). At Must Farm the houses were roofed in turf and, together with the placement of the smaller post-ring, a lower pitch has been proposed (Knight & Robinson Zeki 2024: Fig 3.14, 103). However, as Harding (2023: 70) points out, lowering the roof line also reduces the monumental impact of the building, something which may have been a concern to the occupants.

The spatial relationship between ST2, ST5 and the trackway which runs between them also has implications for the span and design of the roofs. As the trackway is 3 m wide where it passes between the two houses the eaves cannot have projected much beyond the wall-line, because this would have restricted the movement of traffic. The eaves certainly cannot have lain close to the ground, as is posited in many reconstructions based on the position of drip gullies (ie Mytum & Meek 2020: Fig 4). In the ST2 reconstruction at Whithorn, topped with a 45° pitched conical roof, the eaves including the overhanging

reed thatch, project 0.85 m from the walls which would have restricted the passageway to 1.3 m between the houses (Figure 18.4). The sleeper beams in the ST2 entrance project 0.7 m from the wallface; if this defines the projection of the eaves (see below) then the passageway would have been 1.6 m wide. An alternative solution is that the walls were higher, taking the eaves above the heads of the passersby. We have speculated above that the plank walls could have been between 1–2 m high and the presence of a forked stake 1.6 m in length lying as though it has collapsed outwards from the outer wall may also have a bearing on the original height of the wall (Figure 3.42).

The ridged roof proposed at Llywn-du Bach (above) to explain the cluster of posts at the back of the inner post-ring would also have had additional benefits for the roof structure, ie shorter rafters and lower pitch, with less need for projecting eaves which would compromise the passageway between the houses. However, apart from identifying the obvious constraints, further speculation on the roof structure is fruitless without surviving rafters.

As there is no surviving evidence for the roof structure we can only speculate about the nature of its coverings. There is paleoenvironmental evidence showing that the cereal crops were either pulled up by their roots or cut low to the ground, processes which would have resulted in the gathering of straw (Chapter 11.5.2.5). Despite this, there were only traces of straw found at BLoM. There are many ways in which the straw could have been used, ie as bedding, winter fodder for livestock, to make rope etc, evidence for which could have been removed during the frequent cleaning episodes. It could also have been used for thatching, as could the same plant materials that were used so ubiquitously for flooring, ie rushes, sedges and bracken.

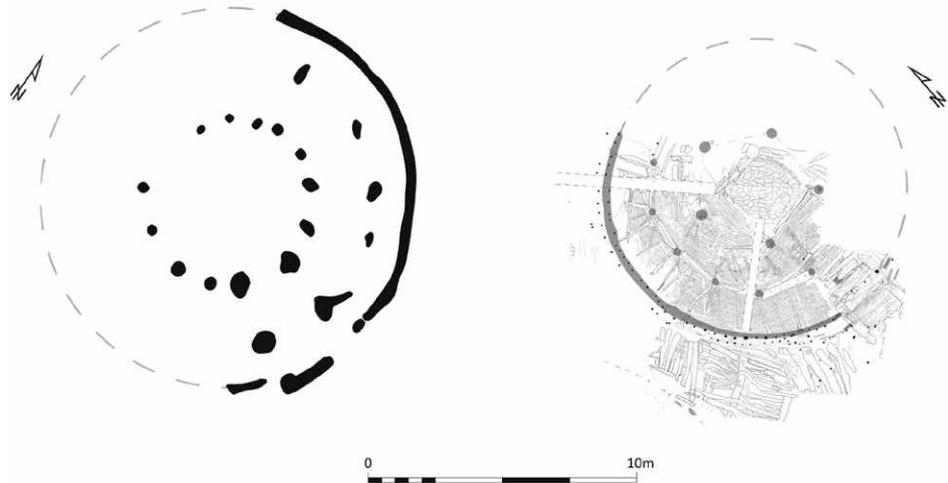


Figure 18.5. Comparison between BLoM ST2 and Cults 5 (House A) showing similar entrance structures.

### 18.2.2.5 Entrances

The entrances into ST2 and ST3 were both *circa* 1.7 m wide, almost exactly the average width of 1.69 m recorded in northern timber-built roundhouses (Pope 2003: 192). However, the similarity between the entrances of the two houses ends with their width. The entrance into ST3 is marked simply by two logs across the threshold with no evidence for substantial uprights on either side to act as door jambs. It is possible that the entrance structure was dismantled for re-use elsewhere but there is no earth-fast evidence for its design. In contrast the entrance into ST2 displays a complex carpentered design, creating a lined hallway between the outer walls and a surfaced walkway as far into the interior as the post-ring. The effect created is of a formal, almost processional entrance into the house. This arrangement is seen inside the entrance areas of many dryland roundhouses, at nearby House A at Cults Loch 5 for instance (Cavers & Crone 2018: Illus 122) (Figure 18.5).

In the Phase 1 settlement at Broxmouth House A displays a similar configuration in the entrance, with a wall slot connecting the inner and outer post-holes (Armit & McKenzie 2013: 31–32), thus forming a vestibule of sorts. In the Late Iron Age village at Broxmouth both Houses 2 and 3 had entrance corridors created by lines of post-holes; the authors suggest that these ‘internal porches’ might have created a visually impressive entrance without compromising the structural integrity of the building but would also have reduced light penetrating the interior from the doorway (*ibid*: 182). The *in situ* timberwork in the ST2 entrance helps to make manifest these internal porches. Here the ends of the sleeper beams projected some 0.7 m beyond the circuit of the outer wallface so there may have been a porch structure, but it would probably not have projected beyond the ends of the eaves.

The orientation of roundhouses, ie the direction in which their entrances face, has been a matter of some debate, feeding into the development of a sun-based

cosmological model which has recently been critiqued and dismissed (Pope 2007). At BLoM there was an obvious practical reason for the alignment of the house entrances; they were aligned to face towards the trackway, the main routeway through the settlement, the alignment of which was, in turn determined by the position of the natural causeway off the island to the S. Thus, ST2 was S-facing, ST3 was W-facing and ST1 was also probably S-facing. A similar arrangement can be seen in the Phase 6 settlement at Broxmouth (Armit & McKenzie 2013: 116, Illus 7.1). All the houses lie on either side of the interior roadway and open onto it, so there are both W- and SW-facing, E- and SE-facing entrances; there was apparently no cosmological patterning (*ibid*: 182).

The orientation of the entrances, and particularly the presence of the internal porch into ST2, means that the interiors of the houses would have been quite dark. As none of the house footprints were fully exposed, one possibility is that the houses had second entrances, as has been posited for ST3 (Chapter 4.2.13.2). Double entrances are seen in other roundhouses in the region, ie Cults Loch 5 (Cavers & Crone 2018), Rispaing Camp (Haggarty & Haggarty 1982), Carronbridge (Johnston 1994) and Hayknowes Farm (Gregory 2001), one entrance usually lying opposite the other, but these are all later in date than the BLoM roundhouses.

### 18.2.3 Internal divisions and use of space within buildings

The buildings at BLoM display both radial and annular division. The post-ring and conjoining wickerwork screens in ST2 would have created a substantial physical barrier dividing the central area around the hearth from the outer annulus and this division is reflected in the sub-floor structures and floor coverings which do not appear to vary within each zone. In both ST1 and ST3 their post-rings must also have created the effect of an annular division but there

is no evidence for a physical partition between the inner and outer zones. Instead, there is more evidence for radial division, mainly seen in differences in sub-floor structures, floor coverings and the distribution of domestic debris.

ST3 is the only house in which a physical radial division consisting of a line of stakes was found, but the abrupt changes in sub-floor construction around the house must surely signal the presence of other physical divisions. The stakeline RD1 appears to have been a major division throughout the lifetime of the house, but the other postulated divisions appear during different phases. The concentric arcs of stakes that appear around the hearth in Phases 6 and 7 indicate that temporary divisions were a feature of life within the house and that the hearth was often screened off from the outer area. However, these divisions only appear in the S half of the house; one constant in ST3 was the absence of any evidence for sub-floors or divisions in the N half and this is also reflected in the absence of domestic debris in this half of the house. Thus, the division between a S half in which all activity, cooking and crafting, took place and a quiet, private space in the N half is very distinct. This division of the house into two halves was also noted in ST1, with most evidence for domestic activity taking place to the SW of the hearth, the caveat here being that only a small proportion of the house was exposed.

Pope (2007) observed a division between front and back, the back being the more private area, but in ST1 and ST3 there was more of a division between left and right of the main entrance. This raises the question of access to these inner zones. In ST2 access from the entrance into the central zone was straightforward, ie directly from the entrance, but the hurdle screens between the posts would have created a continuous barrier to the outer area, at least on the W side of the house. There is no obvious barrier from the inner entrance into the outer annulus but there is also no evidence of the trampled dirt and debris in that corner of the house that one might expect if entry was directly from the outside. It seems most likely that there was a gap through the hurdle screens in the unexcavated areas of the house, so that access to these private areas was controlled from within. In ST3 the entrance lay in the NW quadrant and would therefore have opened directly into the quiet space in the N half. It is possible that there was a screen to the left of the entrance forming a barrier from the outer wall to the post-ring and thus directing traffic to the right into the S half. In the later phases of the house the area to the right of the entrance was always floored with inorganic materials, clays and gravels, perhaps because of the increased wear and tear in this part of the house. On the wetland settlement at Hyndford, Lanarkshire where the footprints of the roundhouses had been fully exposed it was possible to see that the central hearths were enclosed within concentric stake-built screens and access into these

central zones was offset from the main entrance, with screens and matting guiding movement into the interior (O'Connell 2021).

Large-scale studies of Iron Age roundhouses, such as that undertaken by Pope (2003), have observed a trend in the configuration of the layout of the internal space of these structures and how they change over the span of the Iron Age. This demonstrates a development from a concentric arrangement of space, usually encircling a central hearth, towards radial divisions of space with the hearth creating a central hub (Pope 2003). This pattern is mirrored at BLoM with the Episode 1 structures displaying a concentric configuration of internal space whilst the floors of the Episode 2 roundhouses are radially divided. This shift in the configuration of internal space could be due to a change in the demography of the community (see Chapter 18.3.2.6) but could be the result of a variation in the intended use of the structures (as indicated by the associated objects) rather than solely temporal mechanisms. Pope (2003: 384) concluded that the use of space in roundhouses was not culturally prescribed and was relatively variable across the current dataset and the evidence from BLoM bears this out.

## 18.2.4 Refurbishment/ replacement

### 18.2.4.1 In Episode 1

Apart from the replacement of a single post in ST1 there is no evidence that the superstructure of ST1 or ST2 was ever refurbished, yet elements of the houses were replaced three times. In ST2 these include the floors, the hearths and the entrance structure, while in ST1 only evidence for the hearth replacement survives, although it seems probable that as in ST2 the other elements were also replaced. Refurbishing the floors and sub-floor structures would probably have been necessary, given their propensity to become squalid with wear and tear, but the hearths and entrance structures that were replaced were perfectly functional, so why replace them? The builders did not demolish the earlier structures but simply built directly on top of them. One possible explanation is that the buildings were sinking into the peat and the rebuilding was undertaken to bring the surfaces level. However, in the hearth stacks it is only the primary hearth which has sunk into the peat; the later hearths sit level with their floor deposits (Figures 3.18 & 3.57).

If practical considerations do not appear to fully explain the replacement of these key structural elements the cultural biographical approach, in which the house is seen as a space where the life cycles of the inhabitants were expressed in transformations made to the structure (Bruck 1999a; Gerritsen 1999), may offer some understanding. As at BLoM, many of the Phase 2 houses at Broxmouth display multiple rebuilding episodes where the original fabric (of wall and floor) was left intact. Büster (2021: 668) has argued that the rebuilding took place at key moments in its occupancy, such

as the death or birth of a household member, and that the retention of earlier elements in the existing structure served as memorials or epitaphs to the previous generations who had lived there. However, at Broxmouth the houses were occupied, possibly intermittently, for two centuries, an estimate based on radiocarbon dates, whereas at BLoM the houses were occupied for no more than a single generation so it is unlikely, on the dendrochronological evidence, that in their use-life they became ancestral shrines. Nonetheless, the concept of rebuilding or refreshing to mark an important event in the household is a familiar and useful one. It could have been a birth, death, marriage or some other culturally specified event but it seems significant that in both ST1 and ST2 the rebuilding occurred twice after the initial construction. If the settlement was used seasonally the hearths, floors and entrances may have been 'refreshed' upon a return to the settlement, possibly to demonstrate renewed, or even new, ownership. These rebuilding events would have required an investment of labour and resources to acquire new materials, particularly the slabs and boulders used in the hearths, and the quantities of wood for the floors. It is noticeable, however, that in ST2 the later phases of the entrance were much more shoddily built than the original, while the hearths were also reduced in size, so the rebuilds, whatever their purpose, may have been tokenistic.

#### 18.2.4.2 In Episode 2

The replacement of structural elements in ST3 is on an altogether different scale; there was nothing of the more formal replacement of key elements seen in the Episode 1 houses. At least eight phases of building activity were recorded, all associated with changes to the central area, where a stack of hearths and work surfaces had been built up. In contrast with the Episode 1 hearths these were not always built directly over each other, several of them lying off-centre and they also varied in design, size and construction, suggesting different functions. Nor was the replacement of a hearth or work surface always accompanied by a new sub-floor, as happened in ST2. The superstructure in ST3 was a more lightweight design with walls of slender stakes and wickerwork, sections of which were also replaced during the occupation of the house. The overall impression in ST3 is of *ad hoc* adaptations to the house as and when they were required, possibly because of decay or necessitated by changes in function. Such changes and adaptations are also more suggestive of seasonal occupation.

### 18.3 The structure of the settlement: internal arrangements

#### 18.3.1 Spatial considerations

The footprint of the excavated area at BLoM comprised *circa* 390 m<sup>2</sup>, which constitutes *circa* 17% of the estimated area of the settlement based on extrapolation of the outer

palisade lines. Consequently, any definition of the full extent and character of built activity zones across the site should be taken as tentative, since the greater part of the settlement remains unexplored. Nevertheless, there are important patterns in the evidence recovered that relate to differentiation of internal space during the life of the settlement and how this evolved over the course of the phases of occupation.

Evidence for spatial differentiation of activity within Iron Age settlements is rare, particularly in pre-Roman contexts and in Scotland, where preservation conditions and the generally impoverished non-organic artefact record make the identification of functional zones very difficult. This has typically led to the simplistic assumption that earlier Iron Age settlements were relatively undifferentiated and the consequent stereotype of Iron Age roundhouses as multifunctional domestic spaces but which may also encompass animal byres, craft and food production areas and workshops, a simplification reinforced by the conventional use of the term 'roundhouse' to cover all Iron Age buildings (see discussion by Harding 2009: 27). In only a small number of investigations has the evidence recovered been considered adequate to make assessment of internal differentiation feasible, such as in Foster's analysis of the layout of broch village complexes in the N, where the functional model was based largely on layout and differentiation in access arrangements (Foster 1989), and through analysis of the evidence from the small number of large-scale excavations at defended Iron Age settlements (eg Büster 2012; Armit & MacKenzie 2013). Even where excavations have provided sufficient reliable information on the number and character of buildings within enclosed settlements, the lack of chronological precision in dating individual structures precludes a confident interpretation of the functional layout of the settlement. These limitations in the available data have severely hampered the capacity for modelling the occupant social groups of later prehistoric settlements in Scotland, reducing this to simplistic comparisons of building size or potential architectural complexity as a proxy for status or function.

The chronological resolution provided by the analysis of the BLoM settlement, therefore, provides an opportunity for the assessment of the organisation of the occupant group rarely presented by lowland Iron Age settlements. The potential for assessment of spatial organisation as a means of modelling the occupant groups of northern British enclosed sites was explored by Ferrell (1995), who noted that a high degree of functional differentiation should be expected in small but highly integrated social groups, typically characterised as the extended family, where the desire to isolate and enclose the settlement may indicate a strong sense of corporate identity (Ferrell 1995: 134). Although both types were undoubtedly occupied concurrently in both periods, this stands in contrast to

dispersed, unenclosed and apparently disordered upland communities of the late Bronze Age and may indicate an intensified concern with the definition of group identity by the middle of the 1st millennium BCE. Ferrell uses the built-to-unbuilt (BUB) ratio as an index of unitary integration, contrasting the densely-packed curvilinear settlements of the NE English uplands with the rectilinear settlements of the lowlands, which can have extremely low BUB ratios and may only enclose one or two roundhouses. In Ferrell's reading of the later 1st millennium BCE, this feature of the latter sites indicates an overriding concern with ownership, perhaps implying a more developed economic system involving interdependence of productive sites across regional zones (*ibid*).

Allowing for the caveat of the relatively limited excavation sample, the Black Loch settlement seems to have had a very high BUB ratio, certainly in the region of 1:3 – based on footprint extrapolation of the six known buildings – and perhaps as high as 1:2, if further structures were present. This is at the higher end of the range of enclosed settlements in the northern mainland, but is perhaps typical of the SW, where defended enclosures rarely exceed 1 Ha in size and are generally smaller (Cowley 2000: 171; Cavers 2008). By definition, wetland and islet settlements are limited in area and constrain the available space for building, but this must have been compatible with the choice to build in water in the first place.

The arrangement of buildings around the central trackway presumably reflects simple practicality, limiting the wet terrain that needed to be traversed on foot when walking between buildings. As discussed above, projection of the eaves position of ST2 and ST5 (and probably also ST1) suggests that these primary buildings must have been close to touching, and that the space between was probably limited. In both Episode 1 (ST2) and Episode 2 (ST3), the building entrances faced directly onto the access track, at or close to the nearest point, suggesting that this too was an issue of practicality, and it is worth noting the probability that this must have overridden any cosmological concerns relating to roundhouse entrance position. At some Hebridean island duns, it seems common for the entrance to the building to have been located at the opposite side of the island from the primary causeway (Harding 2000: 313), a strategy that might have heightened the impression of impregnability at those sites. Again, this might suggest that at BLoM certain practical concerns were accommodated or balanced with defensibility in different ways. Space on enclosed wetland sites was probably always at a premium, as the roundhouses tightly packed into the palisaded enclosure at Must Farm also illustrate (Knight & Robinson Zeki 2024: Figure 3.10).

### 18.3.2 Identification of function

Interpretation of the BLoM buildings is a complex challenge and it is essential to consider the origin and taphonomy of the materials and objects that provide the evidence for activities. Insect remains and faecal sterols have been central to the characterisation of the internal deposits but, as acknowledged throughout, the importation of material as flooring, bedding, fodder and fuel complicates the interpretation of both sources of evidence. Only in those phases of buildings where multiple corroborating sources of evidence are available can we have confidence in the functional interpretation, but in all cases there remains some doubt over the full range of functions of any particular structure. This is further complicated by the abundant evidence for wholesale clearance and replacement of the internal furnishings, which may have accompanied a change in function or followed a period of dilapidation and subsequent repair.

The presence of a hearth is often taken as an indicator of domesticity but, as with the presence or absence of other typical domestic indicators (implements for food preparation or other domestic tasks), their presence need not be conclusive, in the same way that we should not expect exceptional objects that hint at ritual activities to rule out the primary function of the building as a house (Harding 2009: 28). With the exception of ST6, which contained at least two ovens and was in any case only partially excavated, all of the BLoM buildings contained a hearth, with most showing evidence of multiple phases of refurbishment. Interpretation of the artefact distribution as a source of evidence for activity zones is similarly compromised by the generally low numbers of objects recovered, and the multi-purpose nature of many (eg cobble tools). Coupled with the likelihood that regular raking/ shovelling out of floor surfaces took place and that most possessions were taken when the site was abandoned, the material culture from the settlement is of decidedly limited use in clarifying functional zones, with the exception of the midden and in ST3 where most of the objects were found.

#### 18.3.2.1 Domestic areas

It is highly probable that the three principal structures contained within the Episode 1 palisade were primarily domestic buildings. ST1 and ST2 both contained substantial hearths, dominating the central space within the interior of each, and excavation of the associated debris produced evidence for cooking and other food processing in the form of burnt bone and charred cereals. The evidence from the insect remains, plant macrofossils and soil micromorphology is consistent with patterns that would be expected in a building lived in by humans, with the house fauna insects and trampled plant litter surfaces consistent with regular human footfall. In both ST1 and ST2 the hearth was arranged in the centre of the building and laid onto the

primary sub-floor surface, indicating that it was integral to the original design. There can be little doubt that ST1 and ST2 were lived in.

The question of additional or secondary function is more difficult to address, however. Evidence from faecal sterol analysis confirms the presence of human occupants and, in common with the insect assemblage, provides evidence for animal dung including from ruminants and pigs, but it is not certain that at least some of this does not derive from the use of dung as fuel. On balance, however, the biomarker evidence points to the small-scale co-habitation of humans and animals within ST2 (Mackay et al 2020: 12–13). The stabling of herd animals within Iron Age houses is less reliably demonstrable than is often implied, and previous interpretations have drawn on the structural or morphological characteristics of buildings such as ring-ditched houses as support for the house-byre model (Jobey & Tait 1966; Kendrick 1982), though numerous other possibilities have since been offered (Dunwell 2007: 105). In ring-ditched houses, the sunken outer annuli may have functioned as soakaways or may have been the product of repeated mucking out of byre stalls. The evidence for separation of animals from the outer area and the inner activity surfaces surrounding the hearth in ST2 was more equivocal, and is complicated by the possible storage of dung as fuel which provided a strong ruminant signal near the hearth, but it is very likely that, at times, animals were kept inside the building (Mackay et al 2020: 11). As such, the geographical restriction of ring-ditched houses to the S and E of Scotland commented on by Harding (2009: 78) need not be taken as reliable evidence of a greater reliance on a predominantly pastoral economy in these areas.

### 18.3.2.2 Food preparation

One area of the BLoM settlement that seems markedly distinct from the other buildings investigated is in the SW quadrant, where in Episode 2 a building that contained clay ovens was built (ST6). Whereas all of the other buildings at BLoM contained stone/ clay-based hearths that were evidently the focal point of the structure, no hearth was identified in the investigated areas of ST6. Again, on the basis of combined macroplant, insect and soil micromorphological evidence, there can be little question that the area surrounding the ovens was indoors, raising the possibility that ST6 was dedicated to food preparation. Clay ovens rarely survive on native Iron Age settlements, but where they have been encountered in good condition they have been found within roundhouses, as at Maiden Castle (Sharples 1991: 84–89) and Danebury (Poole 1984), so that it might be reasonable to expect that ST6 was also circular in plan. Poole considered that the juxtaposition of hearths and ovens in the southern British hillforts might relate to the convenience of being able to shovel embers into and out of the oven and onto the hearth (Poole 2002:

371), so that they could be kept alight and the heat source maintained. In such an arrangement the presence of the hearth might not be reliably taken as an indicator of domesticity, as it might elsewhere, and so even if hearths were present in ST6 it is still possible that the preparation of food was the principal function of this building.

The contents of the oven debris layers were similar to those from hearths in ST1, ST2 and ST3, but with some significant differences. In common with the other buildings, burnt bone fragments, charred hazelnuts and cereal were recovered from the ovens, but the ovens also produced large quantities of marine (limpet) shell and evidence for animal fat from microstratigraphy of burning layers, leaving little doubt that the ovens were related to cooking rather than to any industrial process. For what it is worth, the position of the building, close to the periphery of the settlement in Episode 2 is comparable to the location of the majority of buildings containing ovens at the 5ha hillfort of Danebury, Hampshire (Cunliffe 1984a).

McLaren (Chapter 15.1.3.1) has commented on the concentration of querns, rubbing stones and fragments thereof from ST1 in Episode 1, which might indicate that grain processing took place in this structure in that earlier episode. Too little of ST1 and ST5 were investigated to allow this differentiation in function to be confidently proposed in Episode 1, but the possibility exists that a similar functional differentiation, perhaps involving the specification of areas for grain processing or food production, existed in this earlier iteration of the settlement.

### 18.3.2.3 Animal housing/ stabling

The probability that animals were at least occasionally kept in some of the buildings has been discussed above. ST4 provides the clearest evidence from the site for the stabling of cattle within a structure, in the form of trampled surfaces and coprolites in association with deposits containing bovine lice. This evidence came from the earliest deposits in the house and it is possible that the building changed in function over the course of its use, as a hearth was built inside it before it was abandoned. Noting the caveats outlined above, that hearths need not always equate to domesticity, ST4 provides clear evidence that animals were kept indoors, and it is possible that this was its dedicated purpose, at least in its early stages of use.

### 18.3.2.4 Craft activities

ST3 is conspicuous in the BLoM sequence, in various ways. The building was quite different in character to the substantial oak-faced ST2 and, although it was floored and furnished in a very similar way, significantly lower energy costs had been invested in its construction, in comparison with ST2 (Chapter 14.7). The objects recovered from ST3 strongly suggest that this building was the location for several crafts, or at least that it was occupied by those

engaged in craft activities. The interpretation of the turned spindle-like object SF237 will likely remain open to debate, but it is very possible it was related to spinning, weaving or a related textile-production process (Chapter 15.4.4.1); the fragmentary bone comb and spindle whorl from the building might accord with this activity. Alone, these objects would perhaps not distinguish ST3 from the majority of Iron Age buildings in Scotland and they could easily be accommodated within an assemblage classed as 'domestic', but the presence of a turning waster and, particularly, crucibles and a tuyère suggest that the occupants of ST3 were engaged in skilled crafts that were probably not a routine part of every household. Again, it is impossible to be confident that these objects were not simply brought into the house from elsewhere, but nevertheless the number and character of the artefacts retrieved from ST3 stands in contrast to the other buildings investigated. If these activities were not carried out in the house, it is probable that they were carried out nearby and controlled by the occupants of this building. McLaren (Chapter 15.10.4.2) has considered the possibility that ST3 may have been used for different craft activities over its lifetime, and that it is even possible that specialised metalworking tasks were carried out by visiting smiths, further evidence for the specialisation of production within the settlement.

However the ST3 artefact assemblage is interpreted, it is highly likely that it indicates a difference in the arrangement of specialised tasks within the settlement between Episodes 1 and 2. In the earlier occupation of ST1 and ST2, evidence for craft activity was limited to grain processing (rubbers, grinders and querns) and spinning (spindle whorls), implying a more exclusively domestic use of the buildings. ST3 is notable for the range of objects relating to different crafts, and it seems inescapable that the primary function of the building was production, even if it was also lived in. It cannot be demonstrated that equivalent specialised structures were not present at (or near BLoM) in Episode 1 but, if so, it is likely that they were located outside the primary palisade.

#### 18.3.2.5 Non-built space and partitions

It is important to note that we have little understanding of activities or structures that might have been located in other areas of the settlement, particularly in the spaces around ST1, ST2 and ST5, where in Episode 1 there was probably little room for further substantial buildings. This in itself raises questions, since if the Episode 1 BLoM settlement had activity-specific buildings such as workshops or cooking areas, it is unclear where these might have been located. Perhaps ST1, ST2 and ST5 all functioned as hybrid houses, kitchens and workshops, or perhaps there were more functional and prosaic structures located on the nearby shore. The contrast with Episode 2 seems evident in either scenario, however.

#### 18.3.2.6 A change in settlement status between Episodes 1 and 2

There are strands of evidence which hint that the settlement might have experienced a change in status between Episodes 1 and 2. This may simply have been a change in the function of the settlement, perhaps, as described above, becoming more of a locus for food production and crafting activities, but it may also have been accompanied by a change in the occupants.

Much of the evidence for this change resides in the differences between ST2 and ST3. The differences in constructional technique between ST2 and ST3 have been highlighted earlier in this chapter, ST3 displaying a more ramshackle build than the stouter ST2, with *ad hoc* renovations as opposed to the more formal replacement of key features seen in ST2. These differences are emphasised when the energy costs of building the two structures are compared, ST2 requiring 11 times more energy output than ST3 (Chapter 14.7.3). As the footprint of ST2 was only 1.5 times that of ST3 (Table 18.1) it becomes obvious that the amount of investment in ST2 was disproportionate to the gain in floor area. The difference in energy input relates to the lavish use of large oak trees in the construction of ST2 and the complete absence of oak in ST3. There are several possible explanations for this difference; the Episode 2 occupants may not have had access to the oak woodlands implying perhaps that they did not have the social/economic heft of the Episode 1 occupants, or there was a difference in the perceived value of ST3, possibly that, as a workshop it did not warrant the high energy costs involved in felling and carrying large oaks to the settlement.

The faunal remains also hint at possible economic differences, the Episode 1 occupants discarding meat-poor body parts whereas the Episode 2 occupants consumed them (Chapter 12.1.5.3). However, there is no clear evidence to determine whether it was the same community changing the function of the settlement or a different social group occupying the settlement after its abandonment.

#### 18.3.3 Discussion

Accepting the acknowledged limitations in both the extent of the excavations at BLoM and the uncertainty introduced by the poorly-preserved Episode 2 structures in the very northern areas of the settlement, there is nonetheless compelling and important evidence for the differentiation of activities across the settlement. The extent to which these were separate from living areas is unclear, and not easily resolved; ST3 has clear evidence for food preparation as well as the craft activities described above, so it was also perhaps a domestic habitation, but it is more difficult to demonstrate that ST4 and ST6 were not occupied as dwellings in addition to their identifiable function. Despite these caveats, the BLoM evidence is a rare indication of functional differentiation in an earlier Iron Age settlement.

Current interpretations of the earlier Iron Age in northern Britain tend to emphasise the relative homogeneity in settlement arrangements, a period that Armit has termed the ‘anarchic’, competitive Iron Age in lowland Scotland and which apparently stands in contrast to the settlement hierarchy in evidence in both the preceding late Bronze Age and the ensuing late Iron Age (Armit 2020: 199). This model has often been applied in the interpretation of Iron Age settlements where only limited evidence for the function of the curvilinear buildings is recovered, leading to the premise that, not only were all early Iron Age round buildings houses, but that food production, craft activities, stabling and ritual all took place within living quarters and that these respective spheres of daily life were not spatially divisible in early Iron Age society. Hingley’s highly influential discussion of the significance of the ‘substantial roundhouse’ in understanding the structure of later 1st millennium communities rightly drew attention to the naivety with which earlier studies of the Iron Age had sought to impose hierarchical and militaristic interpretations on the archaeological evidence, without sympathy for pre-Christian world views (Hingley 1992). Hingley (1992: 40) contrasted the interpretation of the substantial northern British roundhouse as the residence of a powerful elite with the house as a symbol of cohesion and identity of the occupant group. It is generally recognised that there is good evidence for changes in the structure of earlier and later Iron Age societies, particularly detectable in the Atlantic North where isolated broch settlements commonly evolved into nucleated villages by the early 1st millennium CE, which have been interpreted as evidence for the development of localised elites (cf Foster 1989; Hingley 1992: 19; Waddington 2014).

The BLoM evidence illustrates the deficiencies in such analyses when dealing with undifferentiated structures in settlements with comparatively poor levels of preservation. The evidence discussed in this chapter is largely organic, comprising insect remains, the character of organic floors, unburnt plant macrofossils and lipid biomarkers, none of which survive well outside of limited contexts on dry land sites. Even the artefacts that help identify ST3 as a possible workshop would rarely have survived in plough-truncated and desiccated soils. The likelihood exists, therefore, that the indications of functional differentiation in Episode 2 at Black Loch provide an insight into the reality of social and functional configuration in mid-late 1st millennium BCE settlements.

This characterisation of the occupant community at BLoM need not contradict current interpretations of Iron Age society but instead offers nuance to the simplistic impression of an undifferentiated and homogenous settlement record in the later 1st millennium BCE. The occupant group had gone to considerable lengths to isolate themselves physically – and perhaps symbolically – by occupying a restricted islet

location, implying a sense of local independence but also necessitating an internal cohesion and unity. Simply on the basis of the space available it is improbable that the settlement contained multiple dedicated food preparation buildings, multiple workshops and multiple byres. As such, it is perhaps appropriate to envisage that access to each must have been communal or at least shared by all of the occupants, even if controlled by internal administrative rules. Viewed in this way, earlier Iron Age settlements like BLoM convey a strong impression of agrarian-subsistence economy, without the demarcation and complexity of proto-urban villages but nevertheless structured and perhaps more functionally differentiated than many models allow.

Of course, we must accept the possibility that further buildings related to the wider Black Loch settlement were located on the shore, and the implication that the occupant group could have been larger than the wetland settlement suggests. This cannot easily be tested, and the area adjacent to the wetland site is now in woodland, but if the focus of the wider settlement changed from the wetland to the shore, particularly during the century-long hiatus between Episodes 2 and 3, this might be reflected in the changing character of the structures located on the wetland site and even the apparent abandonment of the northern areas of the site. The ‘pairing’ of crannogs and ringforts in the landscape of early medieval Ireland has been noted, where the wetland sites may have functioned as ‘boltholes’ or secondary residences of royal families (Warner 1994), but this has never been convincingly demonstrated in Scotland or in an earlier Iron Age context more generally in the British Isles.

## **18.4 Defensive perimeters and the dynamics of enclosed settlements**

Perhaps the most significant aspect of the BLoM settlement is the way in which it closely parallels the format and developmental sequence observed on other enclosed and defended settlements found in southern Scotland. The insights provided by the preservation and chronological resolution of BLoM therefore contribute to a new appreciation of the dynamics of later prehistoric settlement at a level that is difficult to resolve on the basis of the dry land record. The following sections consider the development of the BLoM settlement in relation to the patterns observable in the wider settlement record of SW Scotland, and how our understanding of this sequence contributes to an appreciation of the dataset more generally.

### **18.4.1 BLoM as a palisaded enclosure**

While it is tempting to focus on the buildings for their spectacular preservation, the timber stockades that define the perimeter of the BLoM settlement in its primary and tertiary episodes are equally important to the interpretation of the settlement and in properly contextualising it within

the broader later prehistoric settlement continuum of the northern British Isles. For reasons related to the development of Iron Age studies in Britain over the course of the 20th century, the survey and classification of fortifications and enclosures, particularly their form and developmental sequences, has been the basis upon which discussions of the chronology and configuration of Iron Age society in lowland Scotland has been founded. Palisades themselves, however, are a diverse site type, demonstrably built from at least the Bronze Age to the medieval period and clearly for a variety of purposes, and as their numbers have increased in the historic environment records for SW Scotland through intensive aerial reconnaissance (Cowley & Brophy 2001: 62), the apparent diversity in date, form and function has also increased. Varied examples from Bronze Age (Toolis 2005), early Iron Age (Nisbet 1996; eg Alexander 2000) as well as medieval contexts (Johnson et al 2003) illustrate the dangers in assuming that all timber stockades belong to the same horizon or were built for the same reason.

The appearance of palisades within the developmental sequence of Iron Age fortifications in the Scottish Borders prompted the suggestion that the stockade was often the primary event in the establishment of an enclosed settlement, introduced by the 'Hownam' sequence set out by Margaret Piggott on the basis of the results of her excavations at Hownam Rings in Roxburghshire (Piggott 1947). The subsequent rejection of that simplistic scheme – whereby small forts in SE Scotland were considered to move through phases comprising palisaded enclosure followed by ditch and rampart construction, multivallation and eventually unenclosed occupation over derelict fortifications – need not have relied on a reassessment of Hownam itself (Armit 1999), since palisades are found demonstrably overlying and within substantial fortifications, even on unexcavated upland sites within the Borders. Examples such as Springfield Hill (Canmore 65116), Hopes (Canmore 56165) and Corsehope Rings (Halliday 2013) demonstrate that in southern Scotland palisades were constructed within rampart fortifications and often on top of them, and where palisade slots are observable in upland fortifications, it is perhaps reasonable to infer that they were functional in the last phases of activity at that site, since organic structures such as these might be expected to be overwritten by the erosive effect of rebuilding, use and repair. The picture is further complicated by the difficulty involved in discerning between single stockades repaired and replaced, double palisades designed as a unit (eg Hayhope Knowe – Piggott, 1951) and post revetments forming components of a composite rampart (Ralston 1995: 64–65), particularly in unexcavated, cropmark or plough-truncated sites. Where double palisade circuits are closely concentric – and particularly where they incorporate 'kinks' or irregular curves – the implication is

that they were designed together, but this is not always beyond dispute.

Leaving aside the procedural difficulties involved in reliably dating the construction of palisade trenches on the basis of charred organics found in their fills (Sharples 2011), and the relatively small number of palisades that have been reliably dated at all (Hunter et al 2022: 255), there are nevertheless notable patterns in the data and it is very clear that palisades were a standard feature of earlier Iron Age settlements across the N of England and southern Scotland. Stockades seem frequently to have been a primary construction in the establishment of early Iron Age settlements and have been identified in the earliest phases of the most securely stratified sites, eg Broxmouth and Braehead, where the primary enclosure stockades were evidently erected around the middle of the 1st millennium BCE, most likely in the 6th or 5th century BCE (Armit & MacKenzie 2013: 27–28; Ellis 2007: 247). While the extent and significance of unenclosed settlement in the earlier Iron Age should not be overlooked, it is a recurrent and increasingly reliable pattern that the establishment of early Iron Age (EIA) settlements involved the enclosure of the site with a timber palisade (ScARF 2012: 80). In the majority of excavated examples, the chronology of this primary enclosure phase cannot be established with much more certainty than this EIA horizon, owing to the inaccuracies of radiocarbon calibration on the 'Hallstatt plateau', but the late 5th century BCE date for the BLoM Episode 1 palisade is in keeping with the chronological bracket within which these early enclosures fall. Not all sites which began with palisades were occupied (or reoccupied) long enough to develop complex and monumental earthworks, but it seems that those locations which were long-lived or repeatedly used and became univallate or multivallate fortifications began with a primary palisaded enclosure. Those simpler fortifications in the 'Settlement' class defined by RCAHMS, eg Boonies and Woodend, where palisades are missing, may be exceptions to this (*cf* Banks 2000: 273), but these seem to belong to the last two centuries BCE or later and neither of these examples provided convincing evidence for earlier phases.

Similarly, in morphological terms the BLoM enclosure would be unremarkable among the palisaded enclosures found across lowland Scotland in dryland locations. They are variously circular or oval but occasionally describe rather irregular formats which may reflect the simple accommodation of topography, as in the early phases of enclosure at Braehead; rectilinear examples are evidently middle or later Iron Age where they have been reliably dated and are presumably variants of the rectilinear earthworks of that period (RCAHMS 1997: 154–155). Barring a few anomalous exceptions – such as the very large but undated enclosure at Harthill (Canmore 66820) – virtually all enclose

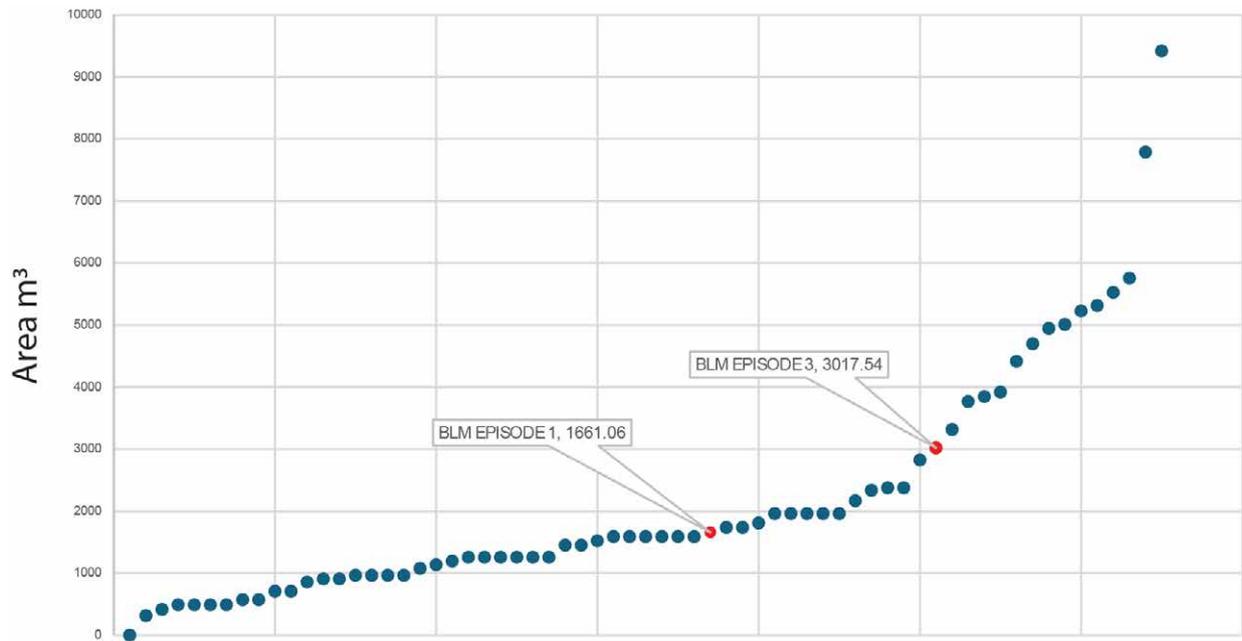


Figure 18.6. Areas of enclosed settlements in SW Scotland, with BLoM in Episodes 1 and 3 highlighted.

areas of 0.5 Ha or less, with 0.2 to 0.3 Ha most typical. The full circuits of the Episode 1 and Episode 3 palisades at BLoM were never traced, but on the basis of projection from the observed portions, it is likely that the settlement enclosed around 0.17 Ha (Episode 1) and 0.3 Ha (Episode 3), ie comfortably within the typical range in both episodes (Figures 18.6 & 18.7).

As might be expected from the considerable variability in form and date, the details of the construction method used in the erection of palisades also varied significantly. Where dryland palisades are sufficiently well-preserved to allow identification, it seems that the spacing of posts was typically in the region of 0.2 m apart; at Broxmouth the packing material and impressions in the subsoil suggested this spacing between posts *circa* 0.2 m in diameter (Armit & MacKenzie 2013: 27), probably paralleled by the earlier palisades at Braehead (Ellis 2007: 252), while at Hayhope Knowe the spacing was closer to 0.4 m between posts (Piggott 1951: 56) (Figure 18.8). Where the posts are spaced, rather than abutting, the implication is that there must have been some form of fencing between, but this is very difficult to demonstrate. The wider spacing of posts within the double palisades at Hayhope, Hownam, Huckhoe (Jobey 1959), the Leven (Atkinson 2000), Gibb's Hill (outer) and others might lend weight to their interpretation as box-type fortifications rather than simple fences (*cf* RCAHMS 1997: 126), but the distinction does not seem to have chronological significance and both forms are found in the primary, EIA phases of enclosed settlements. At Braehead, the format of the palisade apparently changed

between phases of occupation, suggesting that different construction styles were used even where the functional intention was the same. In effect, the intention of settlement palisades seems to have been to define the extent of the primary settlement, to control access into the interior and, perhaps, to contain livestock.

The Episode 1 palisade at BLoM was the most substantial stockade on the site, involving the use of timbers up to 0.4 m in diameter and incorporating a substantial gate, evidenced by the jointed oak posts either side of the oak threshold timber. The enclosure was therefore clearly intended to impress, and while it may have functioned as a stock enclosure there can be little doubt that it was also intended to convey exclusivity, if not defensive strength. It is probable that this impression of strength was enhanced by the presence of the outer, Episode 1 ditch, which was presumably waterfilled. By Episode 3, the enclosure works had become more complex, with the secondary palisade incorporating oak planking in the area around entrance and trackway. Again, the motivation here seems most likely to have been aesthetic, with the oak façade accentuating the sense of strength to the external observer. The interpretation that appearance – rather than functional or structural necessity – was the driving impetus here is supported by the oak façade, which was presumably ‘expensive’ and more labour intensive to construct, was only employed around the entrance and facing the shore. Untrimmed roundwood posts, ‘cheaper’ because they required no conversion, were probably used around the remainder of the circuit. Planking may have been a more common

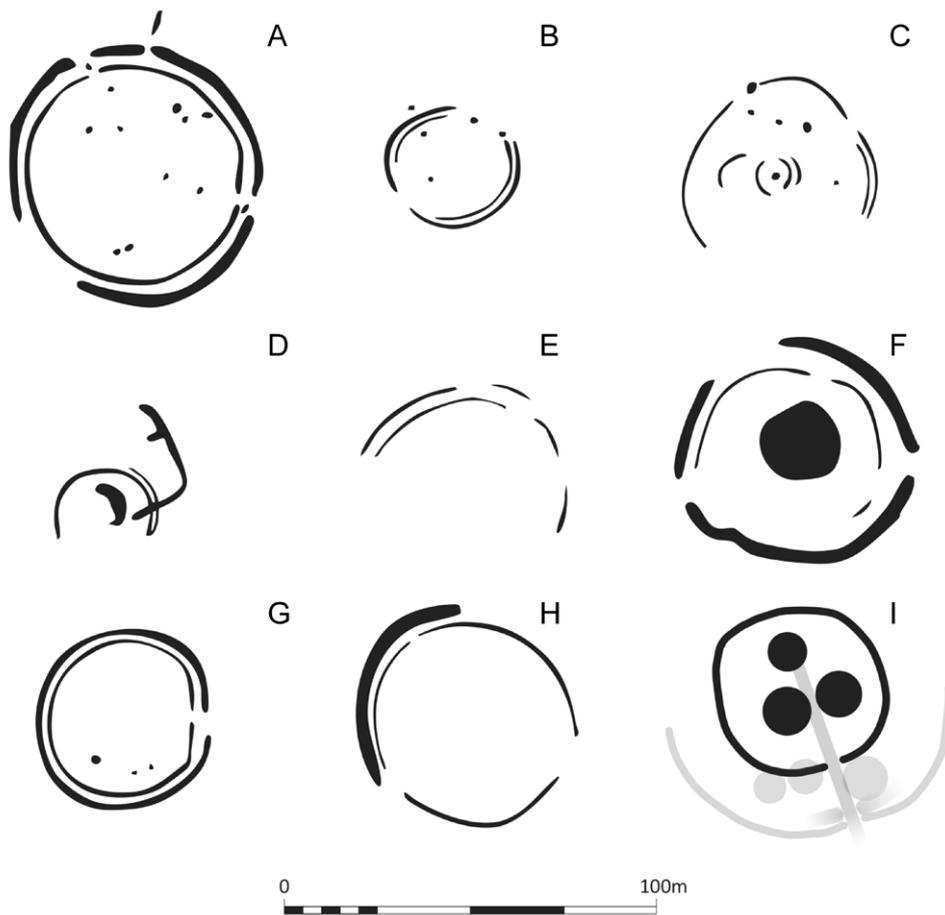


Figure 18.7. Enclosures in the cropmark record of SW Scotland in relation to BLoM. A: Sheucan. B: Drumflower. C: Drumflower II. D: Fox Plantation. E: Portnachtry. F: Tonnachrae. G: Tonnachrae VI. H: Tonnachrae VIII. I: BLoM Episode 1.

feature of palisaded enclosures than is often discussed, and evidence for the use of split oak planks was recovered at Braehead, Mar Hall (Cavers et al 2012) and Broxmouth, albeit in the form of very small charcoal fragments. At the latter site, planking was evidently employed in the primary phase of palisade construction (Armit & MacKenzie 2013: 27) as well as lining the entrance to the W gateway of the Phase 2 fort (*ibid* 59–61). At Cults Loch 3, split oaks of very similar character to those found at BLoM were encountered close to the perimeter of the crannog and were interpreted at the time as collapsed horizontal planking (Cavers & Crone 2018: 31); in retrospect it perhaps seems more likely that this planking was vertically set in the manner of the BLoM and Broxmouth facades, and the fact that those encountered at Cults Loch 3 were not *in situ* might suggest that the valuable oaks were pulled out for re-use when the site was abandoned.

#### 18.4.2 Secondary phases and settlement evolution

It is a curious feature of the latter phases of Iron Age enclosures that secondary roundhouses seem often to be built directly over the palisade trenches of earlier phases of enclosure as well as over infilled ditches, a pattern

so recurrent that it is tempting to wonder whether the deliberate disruption of earlier arrangements was not a consideration for the occupants. It seems that, more often than not, the primary palisade was quickly outgrown by the settlement and later structures built that did not respect the original layout, with roundhouses frequently built over the footprint of earlier houses and enclosures. The pattern is readily identifiable in the excavated examples, eg at Broxmouth, Braehead, Dryburn Bridge, Cults Loch 5, and at a recently excavated settlement at Weirston Road, Ayrshire, where at least six phases of intersecting palisade construction are evident on the same footprint (Wood & Paton 2025). Gibbs Hill (Canmore 67716), Cleuchfoot (Canmore 67745) and Broomhillbank Hill (Canmore 66971) provide evidence from surface survey of a similar sequence in the upland enclosures (RCAHMS 1997: 120–126), while the aerial photographic record provides numerous examples of sequential enclosures, albeit that the relationship in age cannot be established, as at Enoch (Canmore 62596, (RCAHMS 1983: 12, No.109)), Garphar (Canmore 80241; Cowley & Brophy 2001: 65) and several others (Figure 18.9).

There are several ways to interpret this pattern. It is possible that the original enclosure became too small or unfit for purpose as the settlement grew over time, necessitating

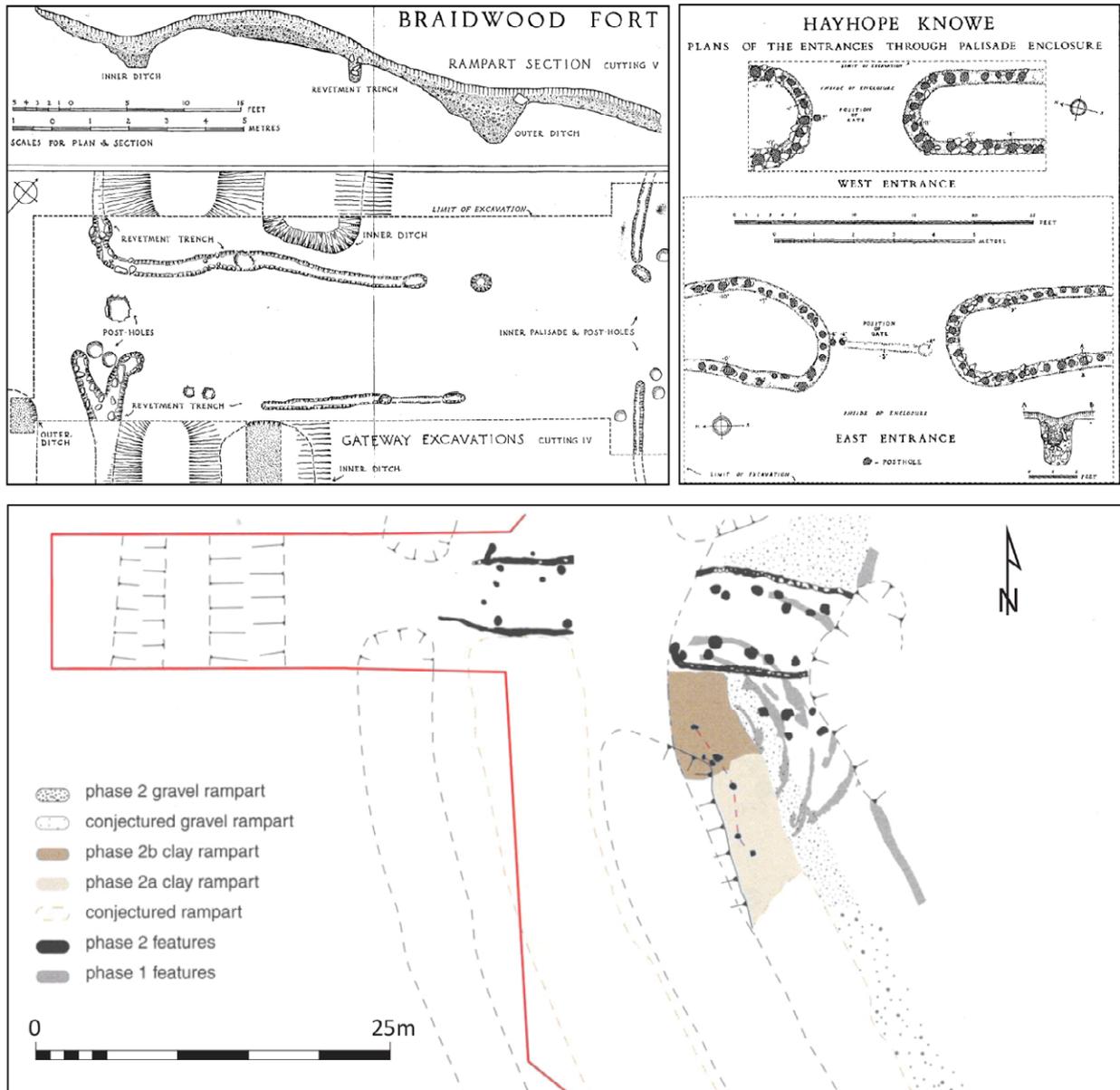


Figure 18.8. Entrances to lowland Scottish palisades at Braidwood (Piggott 1957), Hayhope Knowe (Piggott 1951) and Broxmouth (below, Armit & MacKenzie 2013), comparable in layout to BLoM.

the removal of sections of palisade to accommodate the expansion and construction of new buildings or activity areas. Alternatively, the superimposition of new buildings and enclosures over earlier enclosures might imply that a period of disuse had occurred, long enough to allow the timber elements of the earlier structures to have decayed to the extent that refurbishment could disregard the existing layout. A third possibility is that some combination of these two scenarios occurred, whereby the eventual dilapidation of enclosure and building timbers brought about a rebuild of the occupied settlement, involving the dismantling of the existing structures and establishment of the successive

layout. In this last scenario, it seems probable that salvageable timbers would be re-used wherever possible, with consequent implications for the dating of structural elements within those rebuilt structures. Where we see the direct intersection of palisades in successive phases, it might be reasonable to infer that the earlier enclosure had become so dilapidated that the timbers were rotted beyond salvage if they survived at all, and that the new enclosure was erected from scratch, but this has never been demonstrated either way through excavation. It is a limitation of the dataset that most of our information for lowland Scotland comes from negative features cut into

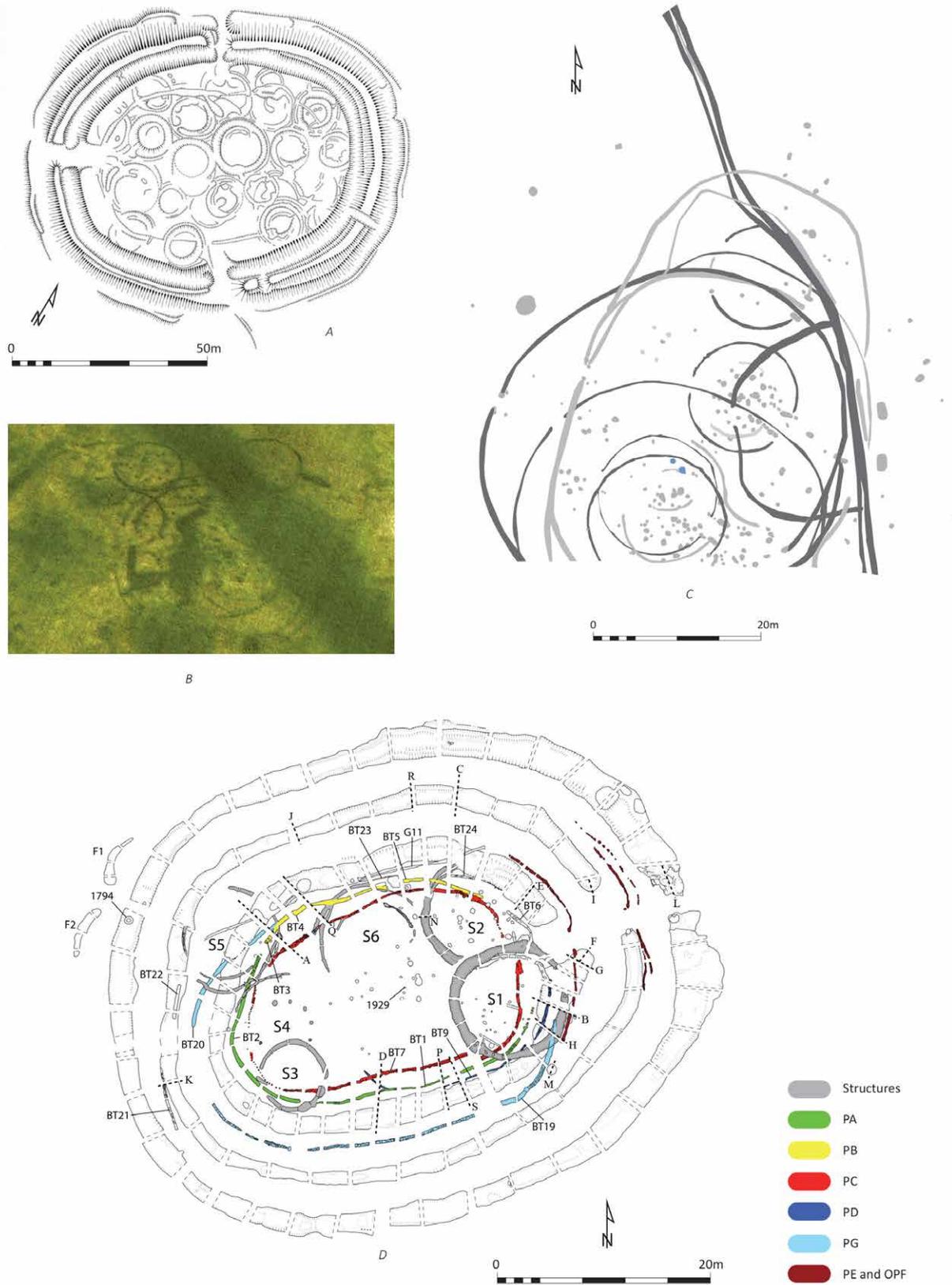


Figure 18.9. Dynamic settlements in the lowland Scottish Iron Age, examples of successive palisades and roundhouses. A: Braidwood (Piggott 1960). B: Garphar (image © HES). C: Weirston Road (Wood & Paton 2025). D: Braehead (Ellis 2007).

gravelly subsoil, where it is frequently difficult to discern reliably which feature cuts which, though some excavators have suggested that the removal of earlier posts during secondary rebuilds could have taken place (eg Jobey 1959: 226). The patterns observed by RCAHMS in the uplands of Dumfriesshire, where ideal soil conditions often mean that timber palisade slots from multiple phases are visible in the modern turf profile (RCAHMS 1997: 121) would perhaps suggest that the remnants of earlier structures were visible but deliberately disregarded or modified when the secondary rebuild took place, if this was compatible with the new layout. At BLoM, this is demonstrable, since the posts of the Episode 1 palisade remained in place beneath the floor of ST4 to the SW of the trackway, whereas they were removed to the NE of the track, leaving the infilled slot beneath ST3. In this case, there can be no doubt that the dismantling and removal of a standing structure was consciously undertaken and the rebuild intended as a deliberate alteration of the existing arrangements. There is also no evidence that the Episode 1 palisade timbers were re-used in the new buildings; the palisade timbers were large alder roundwood posts and nothing of that size was recorded in any of the excavated roundhouses. It is, of course, possible that they had been re-used in the post-rings which, in ST3 at least, had been dismantled and no longer survived (Chapter 4.2.3.1), or that they were re-used elsewhere on the unexcavated portions of the Episode 2 perimeter.

The identification of the timescales over which this evolution takes place is of key importance to the interpretation of the behaviour that produces the pattern. At sites like Enoch, the construction of the intersecting palisades and ditches must have meant that the earlier enclosure was no longer standing, but the scale of the construction on a very similar footprint must mean that the location was still important, identifiable as a settlement locus and worthy of re-establishing a defensive enclosure from scratch. In several areas around the Luce isthmus where the cropmark record is particularly rich, very similar palisades are located in close proximity, as at Barsolus (Canmore 79041), Tonnachrae (Canmore 313603) and Balgreggan (Canmore 311694), implying that a similar process of succession may have taken place at similar locales, even where the same footprint was not used. This raises important questions over the perceived purpose of the primary palisade, since it seems that their rapid abandonment or replacement was common; at Culduthel, the excavators proposed that the enigmatic solitary palisade was a primary, early Iron Age enclosure which was very quickly allowed to become ruinous and was left to decay while the settlement grew outside its footprint (Hatherley & Murray, 2021: 28–29). The chronology of this sequence may be recurrent: where identifiable, the primary palisades of enclosed settlements often belong to the middle

of the 1st millennium BCE, typically *circa* 600 to 400 BCE, but occupation, or possibly reoccupation, is also dated to the middle Iron Age. In the SW this latter stage often manifests as ring-groove houses of double-entranced type, often found overlying primary palisades and ditches and frequently extending into the unenclosed spaces around the original settlement, as at Enoch, Cairnhill (Canmore 40906) and Kirkland (Canmore 65267). Where double-entranced ring-groove houses have been securely dated they belong to the 1st or 2nd century BCE/CE.

The important point to draw from this overview of timber enclosure dynamics is that, by the middle third of the 1st millennium BCE, lowland Scotland had evidently coalesced around an arrangement of nodal locations where individual phases of construction and occupation may have been relatively short-lived, but where the location was highly durable and persistent over several centuries (Cavers & Crone 2019). A recurrent problem, however, is the identification of a mechanism for the pattern or repeated abandonment and re-establishment. The BLoM evidence presents a range of possibilities that contribute to the debate, but difficulties remain. Much of the evidence points toward intermittent, and very possibly seasonal use of the settlement, but if this is the correct reading of the evidence it remains anachronistic that fairly major enclosing works should be constructed around such flimsy and fleeting settlements, and it feels unsafe to extrapolate this pattern too far.

#### 18.4.3 Defences

As discussed above, the enclosing works that define the BLoM settlement are closely comparable to those that define Iron Age settlements across the country, and their design and layout would not be out of place on a terrestrial settlement enclosure. Thus, the format, construction and development of the palisades at BLoM provide valuable insight into their dryland counterparts. As with many dryland settlements, however, the question arises as to what extent these may have been intended to serve as defences. This appears more straightforward where a settlement has been constructed on the top of a hill with multiple ramparts and ditches, and by convention is termed a fort, but wherever settlements occur in less prominent locations with but a single line of enclosure, the intentions behind their construction are less easily defined. This is certainly the case with the construction and arrangement of the Episode 3 enclosures, which might stretch the definition of ‘defences’ in any conventional sense. In Episode 3.2, for example, an enclosing bank (Rampart 2) was constructed around the new threshold to the site from dumped earth, sands, clays and ash deposits. This bank was revetted with stone around the terminals, but it is unlikely that this stonework rose much higher than knee-height while the bank itself, at under 2 m in width, was hardly monumental.

This points toward motivations other than defence in the stimulus to build, and yet the constraints of marshes or open water in controlling the approaches provides an alternative perspective to the concepts of protection and defence. In some European wetland contexts, palisades and other enclosing works have been considered likely to be breakwaters (eg Ralston 2006: 46) and it is not impossible that the enclosures around BLoM were designed simply to delimit dry areas from wet, keeping livestock from the water's edge and perhaps even providing some resistance to the periodic flooding identified in soil micromorphology. However, in most comparable later prehistoric European settlements, breakwaters are typically built in multiple rows of spaced piles quite unlike those at BLoM (eg Kaczmarek & Szczurek 2015), and this seems unlikely to have been the primary intention here. The following sections consider the features of the BLoM enclosures, their function within the settlement and the possible implications for the intentions of the builders.

#### 18.4.3.1 Palisades and fences

As discussed earlier in this chapter, the form of the various enclosing palisades around the settlement changed through time, sometimes using substantial posts and in later stages making use of vertically set split-oak planking. In the case of the latter, during Episode 3.2 the motivation may have been mainly aesthetic, since it seems that the oak planks were only used around the entrance trackway where they would have made the most impression. When the plank palisade was erected, in or soon after 243 BCE, perhaps one of the final refurbishments of the enclosure, the Episode 2 bank would have been standing along with the remnants of several other palisades and fences, so that the main motivation is unlikely to have been to define the settlement space – since it was already defined – and if defence had been the main concern, it might have been easier to refurbish or enhance the existing earthworks. Indeed, given the likelihood that the earlier enclosures were at least 100 years old by the time of the construction of the plank palisade, the function of the planks may have been to effectively 're-face' the settlement during a new phase of construction, masking the decaying fences and revetted bank behind.

The numerous fences and slight palisades excavated in Trenches 7 and 18 seem similarly unlikely to have been primarily defensive in nature; most were lightweight and supported woven hurdling. While some of these fences may have been designed to retain encircling banks of dump rampart in a manner known in contemporary Galloway settlements (as may have been the case at McNaughton's Fort – Scott-Elliott et al 1966), most seem to have been designed simply to enclose and demarcate the space within and would have provided little defensive protection. On some dryland palisaded enclosures, excavators have

speculated that the enclosing fences might have been primarily for the purposes of livestock corralling (see discussion by Toolis 2005; Cavers et al 2012), and this might be a reasonable interpretation of these structures at BLoM. The incorporation of the wicker fencing into more substantial box rampart arrangements (Ralston 2006: 47) around the entrance to the settlement is possible, but seems unlikely on the basis of the evidence recovered from the surviving banks. Nevertheless, it is important once again to acknowledge that there are hints that the superstructures of the BLoM buildings and enclosures were more sophisticated than the impression given by the below-ground remains, and a more complex encircling work cannot be ruled out.

Other fences associated with the approach to the settlement were surely only designed to demarcate spaces, particularly those that run perpendicular to the log trackway. As discussed in Chapter 3.1.4.2, these seem most easily explained as dividing fences useful in movement of animals around the site, but there are parallels with crannogs, particularly Oakbank in Loch Tay, where a similar cross fence was located midway along the timber causeway leading to the site, and would probably have served little function other than to restrict the view of the settlement from the shore (Dixon 2004; Harding 2007: 268). Again, demarcation and isolation of areas of the settlement by restricting the view from the exterior cannot be ruled out as an explanation for some of the fences constructed at BLoM.

#### 18.4.3.2 The entrance, track thresholds and gates

The Episodes 2 and 3 entrances to the settlement, explored in Trench 7, display the chaotic arrangement of posts, fences and lining walls that is sometimes encountered in the areas surrounding Iron Age enclosure entrances, the area of any fortification that often witnesses the most modification, repair and refurbishment. At the very least, it is likely that the entrance area at BLoM was elaborated with the strengthening and supporting mechanisms for a substantial gate. No direct evidence for how this was constructed survives, but one large dish-shaped timber (Figure 18.10), 770/1, the terminal post in Palisade 3, could feasibly be interpreted as a gate-post socket of Maiden Castle or Silchester type, datable to the 4th or 3rd century BCE (Pope et al 2020: 385); the BLoM example belongs to Episode 3 and has a *tpq* of 262 BCE. While it cannot be demonstrated that this timber is indeed a gatepost, and not the fortuitous result of rotting in the manner discussed by Chapman and Van de Noort (2007: 36), it is possible that this socket timber was inserted to accommodate a gatepost immediately in front of the much earlier threshold timber, implying that the former was a refurbishment of the latter and therefore that the position of the outermost gate was similar in both episodes.



Figure 18.10. Post [770/1], a possible gate socket timber in the Episode 3.2 entrance at BLoM (indicated by white arrow). The post can also be seen in plan on Figure 6.6.

Another significant implication of reconstructing such a substantial gate in this position is the scale of the superstructure needed to support it. Timber [770/1] is 0.3 m in diameter and so could have accommodated a gatepost up to perhaps 0.25 m in diameter (Figure 18.10).

Depending on how the gate itself functioned, whether as a single-piece pivoting door or hung on iron hinges fixed to the pivoting post (see Ralston 2006: 72–73), the supporting frame required must have been substantial in order to support the weight of such heavy timbers. Evidence for gate furniture relating to Iron Age defences is, of course, very rare and few examples of organic preservation of entrance timbers have ever been investigated. Where they have been encountered, however, they have typically been interpreted as components of complex integrated gate houses in the ‘Maiden Castle style’, where a single or double-leaved gate hung within a roofed structure, perhaps only one storey tall but conceivably taller (Van de Noort et al 2007, 111–112; cf Crone 2000, frontispiece). At Sutton Common, several of the gate posts in the entrance were very substantial, in excess of 0.8 m in diameter, perhaps lending support to the reconstruction of a substantial superstructure. None of the vertical posts in the entrance

area during Episodes 2 and 3 at BLoM reached this size, but the closely-set birch posts [774] lining the threshold, some of which were pencil-tipped and driven deep into the peat, could have been jointed and braced higher up, forming the basis for a very rigid and strong structure capable of acting as a frame for a gate house. One of the very few examples of surviving early Iron Age gates, at Biskupin in Poland, was 2.4 m tall, 3.5 m in width and evidently hung from substantial oak posts, while a similar design was used at Jankowo I (Dzięgielewski 2017: 348; Kostrewski 1938; Ostoja-Zagórski 1978). Again, the lining revetment posts at Biskupin were more substantial than any found at BLoM, but the arrangement is similar and has formed the basis for the iconic gatehouse reconstruction at that site. Similarly, some southern Scottish forts, eg Broxmouth, have been interpreted as featuring roofed gatehouses controlling access through causeway-like entrances (Armit & MacKenzie 2013: 88–90) based on arrangements of lining posts and sockets that incorporated fences and substantial gates (Figure 18.9). While no direct evidence for this form of superstructure survived at BLoM and we can only speculate, it seems at least possible that the Episode 3 entrance incorporated a gatehouse that faced

the closest point on the adjacent shore to the SE, covering and controlling access along the log trackway.

Evidence in the form of dung, faecal sterols and insect remains for livestock at BLoM leaves no doubt over the question of whether animals were driven (and perhaps ridden) onto the settlement, but less clear is whether wheeled vehicles may have been brought along the track. A boggy wetland site might seem an unlikely context for the use of carts, but the recent discovery of a composite disc wheel re-used inside the roundhouse of a wetland palisaded settlement dated to the 4th–2nd century BCE at Hyndford quarry in Lanarkshire (O’Connell 2021) demonstrates that wheels and wetlands were not mutually exclusive. No evidence for the use of carts was found at BLoM, but the track and gate thresholds were all comfortably wide enough to allow them to have passed.

#### 18.4.3.3 Ramparts and ditches

The banks encircling the settlement in Episodes 2 and 3 have been referred to in this report as ‘ramparts’ for the sake of alignment with the terminology of contemporary sites, but their form and function should not be assumed to be defensive. As discussed above, the banks were slight, probably less than 3 m in maximum width and built principally in turf, as demonstrated by soil micromorphology; the stone revetting used around the Episode 3 bank at the entrance could not have formed a wall higher than *circa* 0.5 m and, given the history of land use prior to the 19th century, it is improbable that site was ploughed in the historic period, meaning that the ramparts were probably modest in stature. This should not preclude their incorporation into relatively substantial defences, if they formed the basis for post and wattle fences that were braced and jointed higher up in the fashion of box-type ramparts. On the whole, however, the impression given by the Episode 2 bank and the Episode 3 ‘rampart’ is not one of monumentality, and that demarcation and enclosure of the domestic space were the more important than fortification.

Of course, the surrounding bog provided significant protection on all sides except the closest point to the shore, where the access track led onto the site, meaning that fortifications may have been less essential in providing a sense of security and this may have been a major consideration in the choice of location in the first place. The Episode 1 ditch, cut into the natural peat beside the trackway, would almost certainly have been waterfilled, providing a further barrier to the outside, but this does not seem to have lasted long and was infilled and ST3 built over it in Episode 2; there is no evidence that further ditches were dug in association with the later refurbishments of the enclosure. It is notable that the ditch was infilled with midden material: while ditch terminals are commonly the most artefact-rich contexts on excavations of

ditched enclosures, the presence of several cattle skulls, disproportionately to other cattle bones, draws interesting comparisons with the causewayed entrance to Broxmouth where they are interpreted as structured deposits or, perhaps, deriving from display near the entrance (Armit & MacKenzie 2013: 90). It is possible that the skulls at BLoM had similar significance and could likewise have been hung or mounted near the settlement threshold.

## 18.5 Abandonment of houses and settlements

‘All archaeological sites have been abandoned, but people abandoned sites in many different ways, and for different reasons’ (Cameron & Tonka 1993). The exceptional preservation at BLoM has enabled us to identify specific abandonment practices in one house in particular, and because of the well-defined timescales the reasons for abandonment, at both the scale of the house and of the settlement, can be explored.

### 18.5.1 Abandonment of houses

The evidence for abandonment processes in the BLoM houses is summarised here. In all the most extensively excavated houses at BLoM, ie ST1, ST2 and ST3, the occupants appear to have left in a systematic manner, dismantling specific structural components and taking all their possessions with them. The hearths have been left intact and the walls left standing; there does not seem to have been any attempt to dismantle these constructions so that the stone and wood could be used in the new house, despite the energy cost involved in acquiring new building materials. The only component which was removed wholesale were the roofs; there is no evidence that the roofs were left to collapse and decay *in situ*. The rafters would probably have included some of the longest timbers in a roundhouse so their salvaging makes sense for practical reasons, and if the ring-beam was a jointed composite structure, as argued above, it would have facilitated disassembly. At Site Q, an Iron Age farmstead on the Assendelvers Polders in the Netherlands, the upper parts of the posts had been chopped off, presumably for re-use (Therkorn et al 1984: 365) and there is a similar example of a post-ring post in ST3 which had been chopped off and left *in situ* (Chapter 4.2.3.1). However, many of the posts in the BLoM houses were not earth-fast so it would have been relatively straightforward to lift them whole and that obviously did not happen. In the outer wall of ST2 the tops of the stumps of the earth-fast planks and posts on either side of the entrance were charred and there was not the quantity of charcoal present which one might anticipate had the entire wall burnt down (see below). It therefore seems probable that the upper parts of at least some of the vertical elements in the structure had been chopped off but salvage may not have been the

objective (see below). Pope (2003: 368) suggests that the salvaging of all but the largest rafters would have been uncommon because of the difficulty of working dry wood. The removal of roof timbers is also evidenced elsewhere (*ibid*: 369) and as Therkorn et al (1984) point out at Site Q, the posts could not have been chopped off if the roof was still in place.

In ST2 there is evidence of a controlled burning event which must have signalled the final end of the building (Chapter 3.2.7). The evidence consists primarily of partially charred *in situ* timbers and points to fires set within the cavity walls on either side of the entrance (Figure 3.42), the spread of which was subsequently controlled because there is no charcoal-rich horizon across the house indicative of a major conflagration. This provides further evidence that the roof had been dismantled; if it had still been *in situ* it is likely that a 'compartment fire' (Harrison 2013: 956) would have spread. There is no evidence of a final burning event in any of the other roundhouses. There is evidence of restricted conflagrations in ST3 during its lifetime (Chapter 4.2.10.1) but none associated with its abandonment, while in ST1 too little of the structure was exposed, including its entrance area, to be absolutely certain of the absence of evidence.

The existence of separate seats of fire within the termini of the cavity walls indicates that the burning was a deliberate act (Harrison 2013: 958), presumably associated with the permanent abandonment of ST2. Deliberate burning has been recognised as an element of 'structured' or 'ritualised' house abandonment behaviours (Lightfoot 1993: 168; Churchill 2002), although where conflagrations are recorded in prehistoric structures in Britain and Europe they are generally thought to have been accidental (Gerritsen 2003: 97; Pope 2003: 375). Webley (2007: 140) interpreted the partial dismantling of house walls as part of the process of 'structured' abandonment; the reduction of the oak planks and posts on either side of the entrance in ST2 could be viewed in the same light rather than as an exercise in salvage. The majority of the closing rituals associated with abandonment of prehistoric structures, however, concern the deposition of artefacts (Bruck 1999b; Gerritsen 2003; Webley 2007) but this activity is not recorded at BLoM. As we have seen, the houses were kept remarkably clean during their lifetimes and the few artefacts recovered have been interpreted as either small accidental losses or the deliberate placement of an item under a floor surface, possibly to mark a key transitional moment in the use-life of the house. The only possible example of an abandonment deposit might be the iron ploughshare tip found in ST1, resting on the final floor surface between the hearth and the postulated entrance (Figure 3.66). Although it was damaged the iron object was a valuable commodity that could have been reworked and, as such, is unlikely to represent accidental discard.

We know that the Episode 1 houses were in use for little more than a generation but why were they abandoned? There was little to no evidence for refurbishment of the superstructures so maybe they were abandoned for practical reasons, that they had simply reached the end of their use-life, timber decay and subsequent instability making them untenable. In this context it is worth noting Mytum & Meek's observations from their roundhouse reconstruction and deconstruction at Castell Henllys that this type of structure '...could probably be maintained almost indefinitely if during rethatching, when much of the weight is removed from the building and all structural wall and roof timbers are accessible, necessary maintenance and replacement takes place' (2020: 18). Of course, the conditions in which the Castell Henllys and BLoM houses were built were very different and the damp and spongy substrate on which the BLoM houses stood may have contributed to their deterioration but nonetheless, there is no evidence that the occupants made any attempt to maintain the superstructure, or at least none that is visible in the archaeological record, nor is there any recognisable evidence for damage that might have contributed to the decay of the building. It is possible that they were never intended for longevity.

Examining Iron Age houses in the Netherlands Gerritsen (1999: 86) proposed that the duration of occupation of a house 'was a matter of cultural traditions and specific social circumstances', rather than being physically determined, by decay and damage. If this was also the case at BLoM, as the evidence suggests, then what were the cultural traditions and social circumstances in operation there? It has become commonplace to take a biographical approach to prehistoric dwellings, to view their life cycles as being commensurate with the life cycles of their occupants, with the birth and death of the house and other significant events in between being marked in the same way, with ceremony and ritual; thus the house provides symbolic space in which the key events are acted out (Büster 2021). There is some evidence at BLoM which could be interpreted in terms of this model. The quartz pebble caches deposited under floors, around post-holes and under wickerwork walls in ST2 and ST3 could be viewed as foundation or inaugural deposits (Chapter 15.10.6), while the apparently unnecessary (from a 21st century view) replacement of functioning structural elements described above could be seen as marking key events in the life of the community. In this model then, the deliberate demolition of the house, particularly the symbolic destruction of the entrance area, may have marked the death of an important occupant, or some other significant communal event. The removal of the entrance literally closed the door, creating a barrier between the world experienced inside the house and that experienced outside, while the removal of the roof effectively neutralised the internal space in terms of the activities that were previously undertaken inside the house.

### 18.5.2 Abandonment of settlements

The settlement itself was not abandoned after ST2 was demolished. It is possible that ST1 and ST5 continued in use although ST1 did not produce any post-Episode 1 dates from the latest deposits over the house. Within a decade or so after the construction of ST2 the palisade enclosing the Episode 1 settlement was slighted and new houses built in the southern half of the island. Whether this was an expansion by the Episode 1 inhabitants or occupation of the island by other communities cannot be determined; there are many aspects of the new buildings which suggest a different community but it is also possible that the buildings were used for different functions by the original inhabitants. In studies of Native American pueblos, Churchill (2002: 7) concluded that the way in which the roof was treated could be used to infer the distance to the new structure; if the roof timbers were removed, they had little distance to travel, if left they were moving far away. Lightfoot (1993: 168) also observed that burned or partly burned roofs signalled that the occupants had no intention of returning. On this basis, it could be argued that it was the original inhabitants who expanded out, possibly using the ST2 roof timbers in the new buildings.

Whoever built the Episode 2 houses, the chronological evidence shows that they must have lived cheek-by-jowl with the very recently derelict ST2 house stance. In a modern study of a collapsed shed Pope (2003: 371) observed how an abandoned, decaying structure almost invites human interaction, becoming an 'activity trap' where things are dumped, removed, vandalised. The stone post-settings lying over ST2 (Chapter 5) may relate to temporary structures built within the old stance, which could have been used as byres or stores, for instance, but their interpretation is ambiguous. Less ambiguous are the numerous hearths built over the house stance, one on top of the old central hearth stack, one over the entranceway and a smaller one straddling the old post-ring (Figure 5.1). This is reminiscent of the rituals recorded in New Ireland, Papua New Guinea in which the house stance of a deceased person is prepared for ceremony by building cooking huts there (Gerritsen 1999: 81). Perhaps the hearths over ST2 were for the preparation of a funerary or celebratory feast.

The central hearth stacks of these houses were still visible when we arrived in 2010 (Chapter 1.4) so they must have been very prominent during the succeeding episodes of occupation on the island. The walls of ST2 must also have remained visible for a long time, defining the old house stance. Despite the restricted area for settlement on the island no attempt was made to flatten it to create a new space, inevitably leaving ST2 as a daily reminder of the previous generation and/or former inhabitants. That it was not pilfered for valuable building materials, such as the large greywacke slabs and boulders used in the hearths or the stumps of the oak wall planks which remained *in situ*

until we excavated them, suggests that the house stance may have been venerated, possibly functioning as an ancestral memorial.

### 18.6 Conclusions

With the excavations at Whitefield Loch (Cavers et al 2011), Loch Arthur (Henderson & Cavers 2011) and Cults Loch (Cavers & Crone 2018) the work of the SWAP programme in SW Scotland has already demonstrated the variability in construction, morphology and location that is subsumed under the generic label 'crannog', and the excavations at BLoM show that there is probably an even greater variety of wetland site types to be uncovered. A brief review of the antiquarian literature reveals several sites in similarly peaty locations to BLoM. At nearby Dowalton Loch, Stuart (1868: 120–121, Plate XII) had mapped a cluster of little stone mounds surrounded by piles on the E edge of the loch which he described as dwellings; with the benefit of our experience at BLoM, a good working hypothesis for that site might be that these mounds represent the hearth mounds at the centres of buildings within a similar wetland settlement. At Whiteburn Moss, Spottiswoode, Berwickshire several round timber structures which sound remarkably like those excavated at BLoM (Scott 1871; Canmore 55833) were found within a similarly terrestrialised lochbed environment, and at Kelloside Farm, near Sanquhar, Dumfries & Galloway, Wilson (1898: 32–33; Canmore 45516) recorded a timber 'stockade' roughly 25 m in diameter in low-lying ground which would have been partially surrounded by water when the River Nith was at original levels. The recent excavations at Hyndford, Lanarkshire (O'Connell 2021) confirm the widespread existence of palisaded settlements built in wetland environments and together with BLoM give more concrete form to these antiquarian records.

These differences in construction, morphology and location, particularly between those sites with and without artificial foundations, can no longer be explained away as diachronic. BLoM could well have been built within the same year as the more conventional 'crannog' in Cults Loch and certainly no more than a couple of decades apart. WLoM, another 'classic crannog', was built just 300 m away from BLoM and was occupied and abandoned over the same time period. This synchronicity suggests that the Iron Age builders did not discriminate between artificial and natural; what was important to the Iron Age communities was not the nature of the foundation structure but the ability for at least some part of the community to live out on the water. As Munro wrote *'The social and military exigencies that led people to construct artificial islands would also lead them to take advantage of such natural ones as would be found most suitable...'* (1882: 243). The social exigencies, the reasons for building and living out on the water, are examined further below.

One consequence of this conclusion is support for the view that attempts to classify crannogs, island duns and other wetland settlements by physical form are likely to lead to artificial and probably erroneous divisions. At best this could obscure our understanding of the phenomenon; it was evidently the location that was important, and the format could vary (Cavers 2010: 175–176). Harding (2019) noted that, as the precise dates for wetland settlements increase in number and these are integrated with concurrent studies of other settlements in the broadly contemporary landscape, it becomes noticeable that the layout and style of settlement used by a local community could vary quite significantly over time. It seems clear now that this was indeed the case, and that the format and layout of settlements were diverse; the important factor must have been the choice of location.

In 1885 Munro wrote (1885: 77) *'In claiming, therefore, for Wigtownshire the honour of being the first county in Scotland in which the existence of crannogs was proved by systematic investigations, and their antiquity and historical importance determined by an indubitable array of relics, I am not straining the laws of legitimate inference.'* We can perhaps now claim that Wigtownshire is the county in which the term 'crannog' has finally been deconstructed. There, of course, remains the prickly issue of terminology which was recently reviewed by Blankshein et al (2023: 226) who settled on the all-inclusive 'archaeological island', a useful term which does not carry any interpretative connotations relating to date, function, appearance etc. However, the sites described above are not necessarily islands; while BLoM was built on a low peaty promontory projecting out into a loch, most of the other sites (excluding, perhaps, the mounds at Dowalton) appear to have been built in peatlands with no demonstrable connection to a body of water other than they were surrounded by wet boggy terrain. The excavations at BLoM and Hyndford have demonstrated that at least some of these sites are indeed settlements so perhaps the more laden term 'wetland settlement' is appropriate.

The emerging evidence also suggests that in southern Scotland at least, settlements in wetland environments, whatever the differences in form and construction amongst them, were an integral part of the settled landscape in the Iron Age. These were not marginalised communities but groups with access to, and possibly control of, valuable resources (ie ancient oak woodland) who were able to display their authority, strength and wealth through monumental constructions. The connectivity between communities living on the lands around the loch and those living out on the water is highlighted by the century-long hiatus in occupation between Episodes 2 and 3 at BLoM, from *circa* 370 BCE to 270 BCE, during which interval the occupants must have moved elsewhere. There is a strong likelihood that it was the descendants of the same

community, employing the same woodworking techniques and exploiting the same oak woodlands, that returned to the site in the 3rd century BCE, the implication being that they had not moved far away.

If seasonal occupation is considered a possibility (Robertson & Roy 2019: 12), this would also imply a closely entwined relationship with shore-based settlements, but this is difficult to demonstrate. The Episode 1 settlement was constructed in the spring/ summer and, while we cannot demonstrate the season of construction for the Episode 2 settlement, it seems reasonable to assume they built when the site was at its driest. Bracken, one of the key flooring materials used on the settlement, was gathered in spring, summer and autumn while some of the foodstuffs indicate late summer/ autumnal occupation (ie soft fruits in late summer, sloes and hazelnuts in autumn). Rising water levels during the winter might make life on the settlement very unpleasant but would the occupants invest so much energy in gathering flooring materials in autumn and collecting large quantities of hazelnuts, only to abandon the house for the winter? This is perhaps only anachronistic from a 21st century viewpoint but while the occupation of the settlement might not have been seasonal, it may still have been intermittent. We have argued above that the rebuilding events seen in the Episode 1 houses may have been instigated after a period away from the settlement; at the very least the rebuilding would require the evacuation of the house for some time. Occupation of ST2 is estimated at between 10 and 40 years so almost every decade the house had to be vacated for a time while rebuilding took place. In Episode 2 ST3 may have been occupied for as little as 16 years, during which time the central hearth/ working surface complex was replaced eight times in varying designs and sizes. This is very suggestive of a highly mobile community, frequently moving between settlements and rebuilding for a new function each time they returned to BLoM. This reflects the evidence from Cults Loch where the sequential and short-lived nature of the settlement in and around the loch prompted the speculation that the same community moved from the palisaded enclosure on the shore to the crannog and back again (Cavers & Crone 2018: 241). At Cults Loch the concept of the *Siedlungskammer*, a European term defined as a small area or territory within which settlement is dynamic and mobile, while patterns of resource exploitation remain stable (Ebersbach 2013: 295), was employed to conceptualise the settlement landscape. This also seems an appropriate model for BLoM, where there is not only evidence for a mobile community but also evidence that ancient oak woodlands were actively managed over several centuries and where bracken may also have been managed to ensure a constant supply. The likely size of such a territory raises the question of the relationship between the BLoM community and that inhabiting the crannog in WLoM. Were they both in the

same territory or did they lie on the border between two territories, much in the same way that the early medieval crannog at Drumclay sat at the junction between three townlands (Barrett 2023)? No archaeological work has taken place on the probable Iron Age settlements in the immediate vicinity of BLoM, but use of the fort at Fell of Barhullion (inland) and coastal fortifications like Barsalloch in the same broad period would not be difficult to envisage, and both were likely nodal points in the settled landscape. The surrounding farmland is not well suited to the production of cropmarks which might indicate further contemporary settlements that do not have surviving upstanding remains.

There are, however, inevitable complications that hint that the full reason for the settlement patterns we see may have been driven by factors that will not be easy to identify. While movement within a territory might help explain the physical evidence we are left with, at Cults the non-wetland sites were located a few hundred metres from the loch, raising the question, why move at all? Conventional models for transhumance would normally involve changes in grazing regime or in exploited resources, both of which seem improbable drivers when the distances within the territory were apparently so small. As always when exploring Iron Age rationales, we are left with the feeling that the true, underlying motivations will always be hard for modern researchers to access.

The recurrent question in Scottish lake settlement studies is, 'why?'. To modern sensibilities, the choice to live in a bog, where the ground must have been a perpetual quagmire under foot if not augmented with log corduroy track or hurdle matting, where buildings must have been prone to sinking and subsidence, and where storage of dry produce must have required special arrangements, seems inexplicable. Boggy ground in the Machars must be

sought out: the majority is reasonable or good agricultural land and eminently suitable for settlement construction, so the choice to build in bogs and lochs was a deliberate statement. In discussion of the Cults Loch crannog settlement, the current authors considered the 'mentality' of the builders in choosing a wet, peaty promontory over the immediately adjacent fields (Cavers & Crone 2018: 235–237). Defence, or perhaps more accurately, the outward appearance of defensibility, may have been a consideration but, inescapably, there are simpler ways to achieve the same result (and perhaps more effectively). When discussing wetland settlement in prehistory we are inevitably forced to address the influence of non-practical motivations related to belief systems that we cannot know, and symbolism that we can only speculatively interpret. It is perhaps in this sense that BLoM, and its 'defences' are best understood. The enclosing structures clearly had functional aspects, perhaps most easily related to livestock control and delineation of the settled space, while the outward appearance of strength most clearly recognised in the oak plank façade indicates a concern with aesthetics, but the strongest motivating factor seems likely to have been something less tangible. As at Cults Loch, at BLoM and perhaps at all Iron Age wetland sites, the intention may have been to demonstrate authority and control over a powerfully symbolic location, at the liminal interface between wet and dry worlds (Fredengren 2002: 198–201, 2007: 38–39). The use of defensive architecture conveyed a sense of strength and authority, but the format was otherwise in keeping with the standard template of Iron Age settlements across southern Scotland. If sense is to be made of the motivations for these structures, it is perhaps important to remember that the primary motivation may have been one that we cannot understand, and which will not be resolved through study of material remains.

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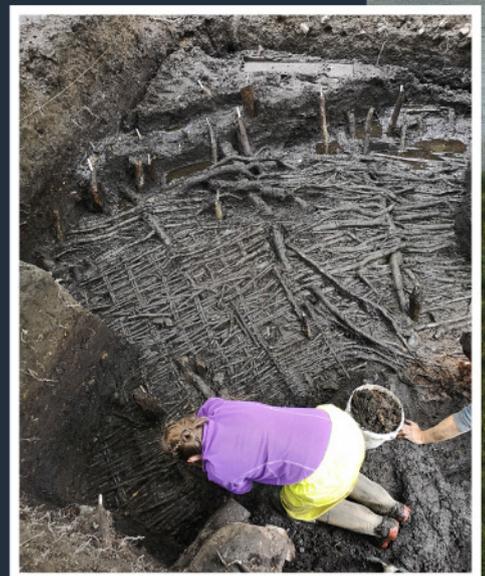
# BLACK LOCH OF MYRTON

This monograph presents the results of excavations at an Iron Age wetland settlement at Black Loch of Myrton (BLM), located on the Machars peninsula in Wigtownshire, Scotland. Although first noted in the 1880s, the site remained unexamined until its rediscovery during modern drainage work. Excavations were carried out between 2013 and 2019 as part of the Scottish Wetland Archaeology Programme (SWAP), supported by Historic Environment Scotland and the UK Arts and Humanities Research Council. The project used a multidisciplinary approach, combining dendrochronology, radiocarbon dating, micromorphology, and multi-proxy environmental analyses.

The settlement, built on a natural peat island in a small loch, revealed three main episodes of occupation between the mid-5th and early 2nd century BCE. The earliest phase (c. 437 BCE) featured a log trackway, defensive palisades, and roundhouses. Around 425–420 BCE, the site expanded beyond the original boundaries with new roundhouses and an earthen rampart. A third phase (starting c. 278 BCE) involved substantial reconstruction of the perimeter defences using oak planks and palisades.

Excavation revealed exceptionally well-preserved wooden structures, hearths, and organic floor deposits. These finds allowed detailed reconstructions of domestic life, construction techniques, and the site's interaction with its environment. The site's deep stratigraphy and ecofactual remains – including plants, insects, animal bones, and lipid biomarkers – offer unique insights into living conditions, resource use, and spatial organisation.

Thanks to precise dating through dendrochronology and radiocarbon modelling, the research demonstrates that wetland settlements were an integral part of Iron Age life in northern Britain. These findings reshape our understanding of settlement patterns, defence, and resource management during the mid to late first millennium BCE.



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