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Darkness Visible

The Sculptor's Cave, Covesea, from the Bronze Age to the Picts

Ian Armit and Lindsey Büster

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Chapter 7

ENVIRONMENT, ECONOMY AND SUBSISTENCE

7.1 Introduction

Benton's excavation of the Sculptor's Cave occurred long before the development of modern scientific approaches to the environmental and economic context of archaeological sites. Consequently, aside from a brief statement on the animal bones (Benton 1931: 207), her published report has little to say on the subject. By the time of the Shepherds' excavations, however, environmental sampling was becoming commonplace, and considerable attention was paid to this aspect of the work. Significant quantities of material were wet-sieved on site, and some of the resulting residues survived in the site archive along with preliminary specialist reports, enabling reanalysis of plant macrofossils, charcoal, shell etc, during the present project. A substantial faunal bone assemblage was also recovered. As a result, it is possible to provide some insights into the environmental context of the cave and the subsistence practices of the human populations that used it (even if the latter must be tempered by the realisation that the cave was far from a standard domestic settlement; as such, we must be wary of selectivity in the material brought there).

In addition to the analysis of material from the Shepherd archive, new samples were taken in 2014 to facilitate soil micromorphological analysis of the surviving non-anthropogenic deposits.

7.2 Landscape reconstruction

Michael Stratigos

7.2.1 Background

The sandstone cliffs between Burghead and Lossiemouth, where the Sculptor's Cave lies, slope gently southwards to the coastal plain known as the 'Laich o' Moray' (illus 7.1). The region is now mostly rich, low-lying, arable land, with forestry plantations on the coastal dunes to the east and west. This landscape has, however, undergone radical transformations, both natural and man-made, since later prehistory.

Glacial isostatic models put this part of the Moray coast in a region of uplift, resulting in relative fall in sea level (Clayton 2003; Sturt et al 2013), though the applicability of these large-scale models to this relatively small region cannot always be assumed given the well established local nature of relative sea level changes (Griffiths et al 2015). Nonetheless, it is clear that there has been some relative sea level fall since later prehistory. Perhaps the most important landscape change, however, has been the cutting off of the formerly extensive sea loch of Loch Spynie from the Moray Firth (illus 7.2) and the loch's subsequent drainage. This has created a modern landscape far removed from the extensive and diverse wetland which formerly separated the north-facing coastal cliffs from the Moray coastal plain to the south.

The earliest attempts to understand the palaeogeography of this region date to the nineteenth century (eg Martin 1837; Gordon 1859), which noted earlier historical references to Loch Spynie being formerly connected to the sea and the former courses of the Rivers Spey, Findhorn and Lossie (Martin 1837). In the absence of modern primary data, more recent scholarship has made little advance, continuing instead to rely on documentary and cartographic evidence (Ross 1992; Jones and Keillar 2002; Jones and Mattingly 2002; Main 2009). What does seem certain, however, is that the connection between Loch Spynie and the Moray Firth was threatened from the fourteenth century onwards (Lewis and Pringle 2002: 12–13). By the time of the Pont maps *c* AD 1600, the former sea loch had become freshwater, and remained so until its draining in the early nineteenth century (Leslie 1811: 34–5). To the west, around Roseisle, there was a substantial body of open water surrounded by low-lying boggy terrain which was similarly impacted by incursions of windblown sand and eighteenth- and nineteenth-century drainage schemes. Reconstructing the former extent of these wetland and estuarine environments during later prehistory is important if we are to understand the landscape context of the Sculptor's Cave and the activities that took place there.

The following discussion combines modern data and historic records (written and cartographic) in an attempt to give the best possible reconstruction of the marine, intertidal and wetland environments of the region through time.

7.2.2 Sources

A full description of the methods and sources used to compile this report is included in the site archive. Cartographic, geotechnical and archaeological sources (table 7.1) have been analysed here to provide an interpretation for the condition of the Laich o'Moray at specific periods in the past.

7.2.3 Results

The landscape history of the Laich o' Moray is characterised by marine transgressions and isostatic uplift, as evident in a range of geomorphological features including raised beaches, and marine

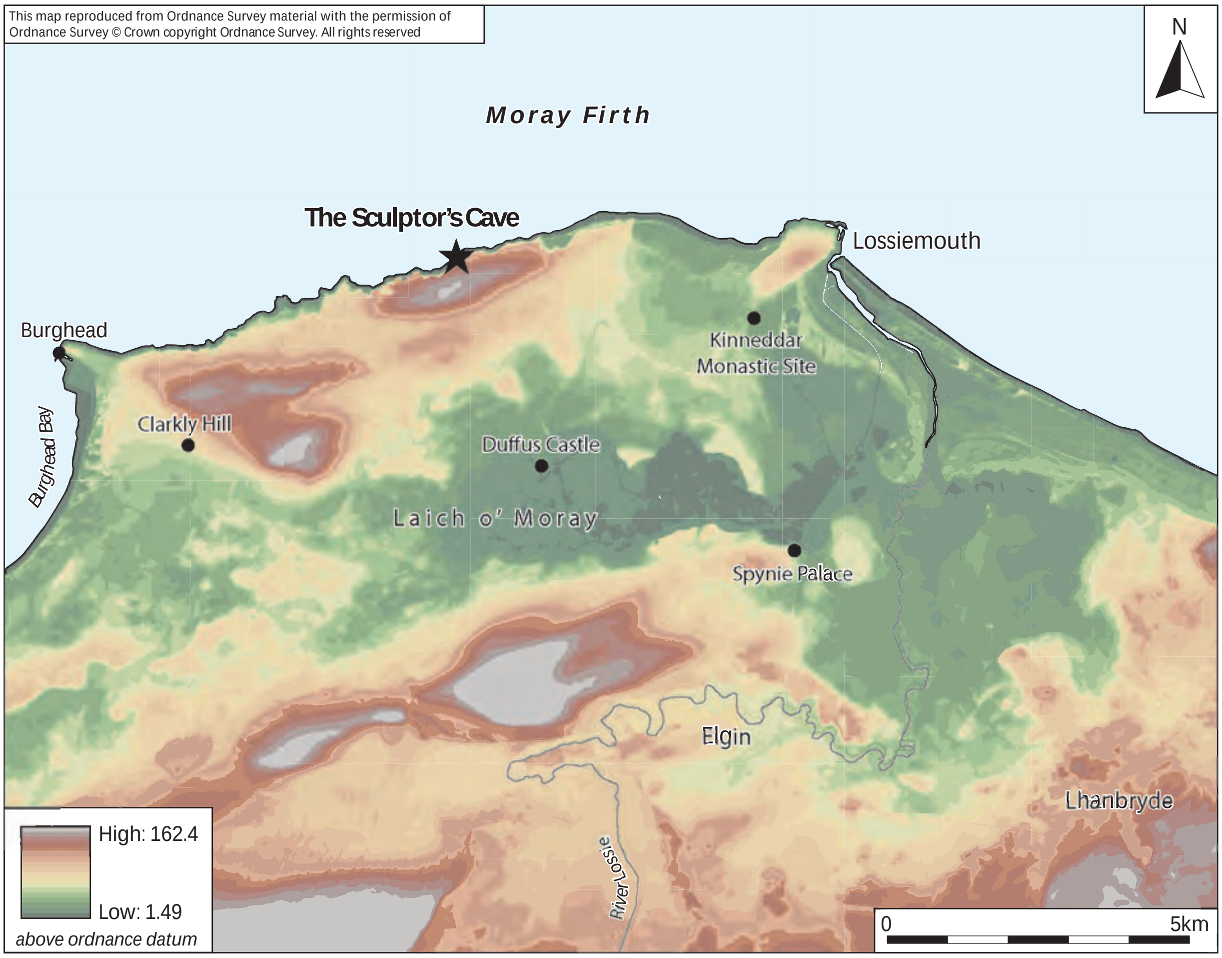

Illustration 7.1
Topography of the Laich o' Moray

and lacustrine sediments. The following account attempts to reconstruct the development of the landscape through time as far as can be ascertained using the sources described in table 7.1.

Palaeoenvironmental reconstruction

Immediately prior to the Loch Lomond Stadial (before *c* 10,000 cal BC), the Laich o' Moray was submerged, with sea level at least as high as +10m OD, creating an archipelago of the higher ground between Burghead and Lossiemouth (Comber 1995: 54; Lambeck 1995; Smith et al 2012). Evidence for this is seen in the quaternary marine silts and sands that cover most of the areas of the Laich o' Moray below +10m OD (BGS 1:50,000). Between 10,000 cal BC and 8000 cal BC, sea level dropped to between -1m OD and -3m OD (Smith et al 2012) and the Loch Spynie basin became terrestrial: a period probably represented by the submerged forest and land surface at Burghead beach (SCAPE nd: site #12864). This period of falling sea level, during the last glacial maximum, is followed by marine transgression that reached at least as high as +6m OD in this area (Smith et al 2012: 69). This period is represented by raised beach ridges that are evident under what is now pine plantation at Lossie Forest and are composed of finer sediment over the clastic layers indicated in three British Geological Survey (BGS) cores (Borehole Scan; BGS nd: IDs 764066, 725059, 608077). Likely cognate beach ridge formations are found at Culbin Sands and in the Dornoch Firth area, with the clastic layers dating from the earlier Holocene (before 4500 cal BC) and the finer sands and gravel to the later Holocene (after 4500 cal BC) (Comber 1995; Firth et al 1995; Hansom 2001). The outlet of the Loch Spynie basin passed through a relatively narrow gap, *c* 300m by 500m, between the beach ridge formations, where the River Lossie now flows (illus 7.2). At the west end of the Laich o' Moray were a series of freshwater lochs, the largest at Roseisle (illus 7.3). Throughout prehistory, these occupied a wide expanse of boggy ground, with islands of drier land reflected in several *inch* place names.

Between the late stages of the Mesolithic and medieval periods, despite continued relative sea level fall due to isostatic rebound, the Loch Spynie basin continued as an estuarine landscape, with freshwater wetland environments persisting to the west. It is likely that the Loch Spynie estuary was progressively shrinking (although not necessarily in a uniformly linear way) throughout prehistory and into the second millennium AD as relative sea level continued to fall through isostatic uplift. Although the rates of change are difficult to pinpoint, one model

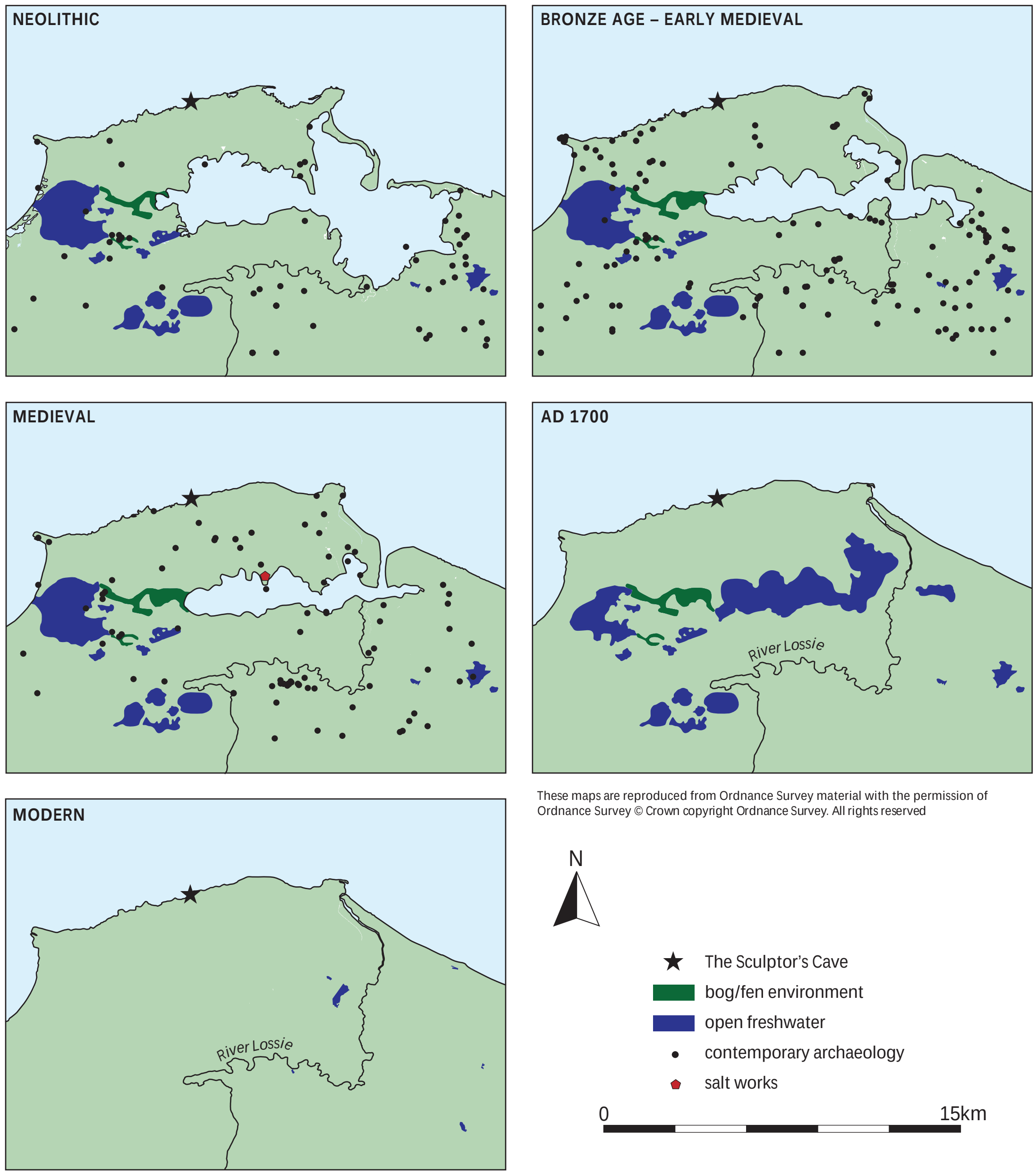

Illustration 7.2
Reconstructed palaeoshorelines of the former Loch Spynie estuary and surrounding lochs and bog/fen environments of the Laich o' Moray

suggests relative sea level in this area at +1.5–2m OD as late as *c* AD 700 (Smith et al 2012). Although Loch Spynie remained connected to the sea until at least the middle of the fourteenth century (Innes 1837: charter 163), it is not depicted as a sea loch on the Pont maps, which date to the late sixteenth century. It can therefore be assumed that the sea loch closed off *c* AD 1400–1600.

In the fourteenth century, difficulties with sediment accumulation were occurring: it is recorded that Bishop John of Pilmuir (Bishop of Elgin from AD 1326–62) attempted to keep the basin navigable in and between ships that had beached and sunk in the shallow waters (Simpson 1927: 17). More widely, aeolian sand accumulation caused problems for medieval communities across north-east Scotland (and indeed the rest of north-west Europe), with records of windblown sand resulting in medieval settlement abandonment. For example, on 19 August 1413, a severe storm buried the town of Forvie near Newburgh, Aberdeenshire, under 30m of dune sand (Griffiths 2015: 108). It is possible that a similar event was responsible for finally cutting off Loch Spynie from the Moray Firth, as windblown sand sits across the point where the basin connected to the sea through the beach ridges (BGS 1:50,000). It is also likely that increased alluvial sedimentation from the River Lossie reduced the volume of the Loch Spynie basin and supplied material for

Table 7.1
Data sources used to reconstruct the former, and changing, extent of Loch Spynie over time

Data	Source
British Geological Survey Borehole Scans	http://www.bgs.ac.uk/data/boreholescans/home.html
British Geological Survey 1:50,000 Superficial Geology	http://mapapps.bgs.ac.uk/geologyofbritain/home.html
Ordnance Survey 5×5m Digital Terrain Model	https://digimap.edina.ac.uk/
Pont Maps of Scotland (1583–1614)	http://maps.nls.uk/pont/
Blaeu Atlas Maior (1662–5), Volume 6	http://maps.nls.uk/atlas/blaeu-maior/vol/6
Roy Military Survey of Scotland (1747–55)	http://maps.nls.uk/roy/index.html
Plan of the Loch of Spynie and Adjacent Grounds, Moray	Kinnaird 1783; http://www.scotlandsplaces.gov.uk/record/nrs/RHP427/plan-loch-spynie-and-adjacent-grounds-moray/nrs
First Edition 6" Ordnance Survey (Elgin Sheets, I, II, III, VI, VII, VIII)	http://maps.nls.uk/os/6inch/index.html
Canmore Database, Sites and Monuments of Scotland	https://canmore.org.uk/site/search
Registrum Episcopatus Moraviensis, e pluribus codicibus consarcinatum circa AD 1400	Innes 1837

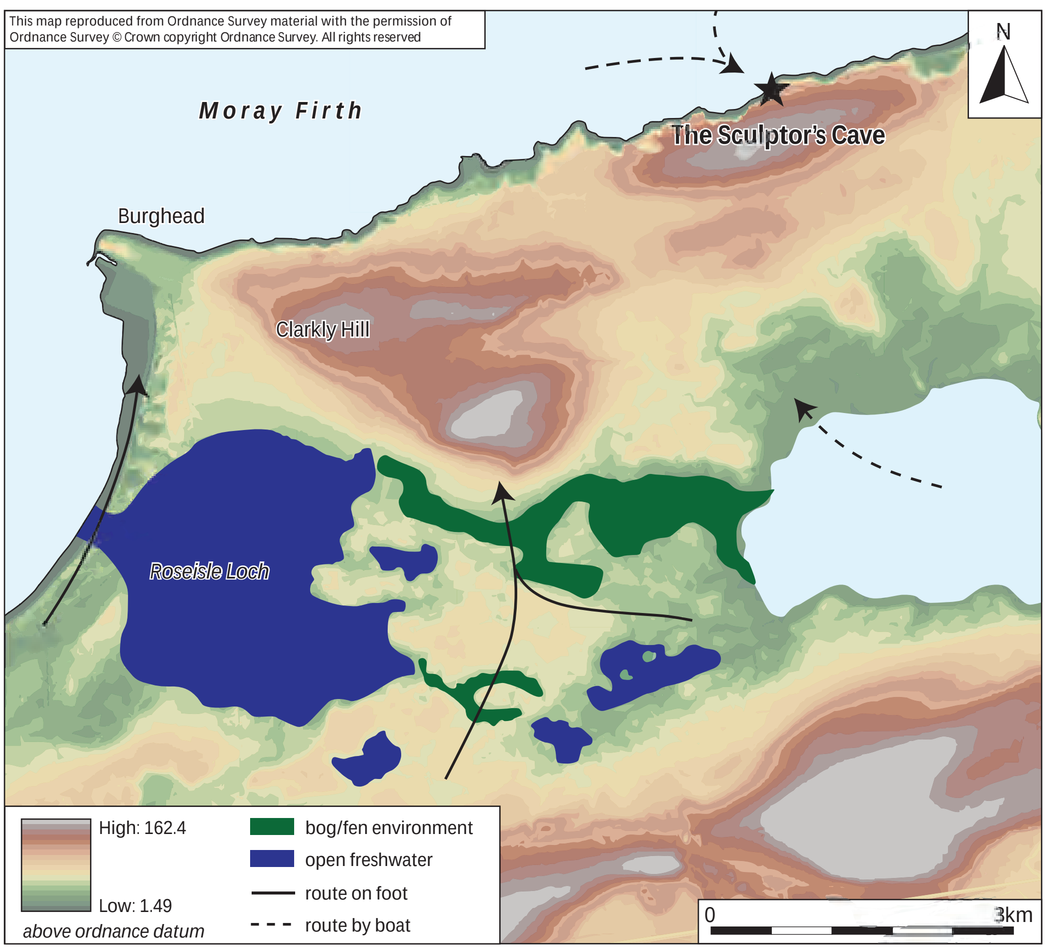

Illustration 7.3
Map showing the most likely routes to the Sculptor's Cave during the later prehistoric period

the formation of the blocking beach ridges and dunes. Although local factors have not been accounted for, the increased sediment loading of the river can be speculated to have been due to more intense agricultural practices and maintenance of a more deforested landscape from the Iron Age (*c* 800 BC) onwards (Edwards and Whittington 1997: 76–7), with forest cover diminishing to ~5% in Scotland between the sixteenth and twentieth centuries (Mather 2004). Despite the attempts of the Bishops of Elgin to maintain the connection of the Loch Spynie basin to the sea, some combination of sedimentation (both alluvial and aeolian), together with isostatic rebound, are ultimately responsible for Loch Spynie becoming cut off from the Moray Firth between AD 1400–1600.

At the west end of the Laich o' Moray, a large formation of dune sand accumulated landwards of Burghead Bay. As the Roseisle Loch appears on the seventeenth-century Blaeu and Pont maps but not on the Roy map of the mid-eighteenth century, it is tempting to think that the same storm or series of storms that overwhelmed the Culbin Estate, *c* 17km to the west, in AD 1694 (Griffiths 2015: 108) was responsible for the sand accumulation at Burghead. This storm event has been identified through excavation at Clarkly Hill, but its date here can only be pinned down to the post-medieval period (Hunter 2012).

By the time of the Roy map, all that remained of the former Laich o' Moray was the substantial freshwater Loch Spynie and a series of other small, relict freshwater lochs. The latter, and the boggy ground around them, were systematically drained as agricultural improvement began in earnest after *c* AD 1750 (Stratigos 2016). Loch Spynie itself was drained in the first decades of the nineteenth century through a complex series of canals, dykes and pumps (Leslie 1811: 34–5). A drainage scheme, dug through the Holocene beach ridges to the north-west of where the River Lossie now flows, is still used to keep the former Loch Spynie basin dry. By the production of the First Edition 6" Ordnance Survey map (1870–1), the only survival of the Laich o' Moray wetland environment was the small fragment of the former Loch Spynie that remains visible today.

Archaeological evidence for the extent of wetland environments

The recorded archaeology closely respects the extent of the former wetlands (illus 7.2). Sites and findspots relating to the Mesolithic and Neolithic appear to respect a former shoreline at *c* +6m OD, while Bronze Age to early medieval (*c* AD 1000) sites respect a palaeoshoreline at *c* +3m OD. Medieval settlement and agricultural remains respect a much reduced shoreline at *c* +2m OD. This pattern aligns closely with the history of relative sea level change and sedimentation processes outlined above.

A group of shell middens provides further confidence and insight into the former extent of the Loch Spynie estuary. Although not dated directly, some have produced finds that give some indication as to the period in which they were in use. The Nether Meft shell midden, *c* 1km east of the current course of the River Lossie, was over 50m in diameter, comprising layers of oysters, cockles, limpets, whelks and mussels up to 0.5m deep (Morrison 1871: 251–2). Although no diagnostic artefacts were recovered, ash, charcoal and burnt stone attest to an anthropogenic origin, and flint flakes recovered nearby may suggest a prehistoric date. Other shell middens in the area include one at Caysbriggs, measuring 91m by 27m, which produced medieval artefacts (Lubbock 1864: 335), and another 500m west of Spynie Palace, measuring over 40m in diameter and composed mostly of oyster shells (Shepherd and Keillar 1980). These middens indicate the likely positions of former shorelines and dating their stratigraphy might ultimately allow for more precise reconstructions of the chronology of the former extent of the Loch Spynie estuary. A further site that sheds light on the former extent of the estuarine environment is a medieval salt works at Salter Hill (illus 7.2). Within the former extent of Loch Spynie, near Duffus Castle, this salt-working site is now ploughed out, but a recognisable depression was evident as late as the early twentieth century (Mackintosh 1924: 72). Finally, the presence of a 9.1m-long oak-framed vessel, found in AD 1833 at Easter Oakenhead (Canmore ID 16519), provides evidence for the former use of the Loch Spynie estuary as a harbour. The exact findspot is imprecise, being located only to the eastern end of the former Loch Spynie (Mowat 1996: 86).

Access to the Sculptor's Cave and its landscape context

During prehistory, access to the stretch of land between Burghead and Lossiemouth, and thus to the Sculptor's Cave, could have been achieved on foot by one of two routes, both from the west (illus 7.3). The most straightforward option would have been to approach along the beach at Burghead Bay (a distance of around 8km), crossing the outlet burn of the Roseisle Loch, which may have been a substantial watercourse (it is depicted on Pont and Blaeu maps as feeding a mill). The second route was through the 3.5km-wide stretch of low-lying bog or fen between the western extremity of Loch Spynie and Roseisle Loch. While there is no evidence to suggest that this stretch of boggy ground would have been impassable, the absence of recorded sites suggests that it was wet enough to have been unfavourable for settlement at any point in later prehistory. At Wester Buthill (Canmore ID 149065), a possible trackway was indicated by aerial photographs next to a Pictish barrow cemetery among a range of other likely later prehistoric and early historic features (Greig 1999), suggesting that specific routeways were constructed.

The easiest way to move across the Laich o' Moray throughout prehistory, however, would almost certainly have been by boat. Logboats would have been ideal for use on the sheltered water of the Loch Spynie estuary, on the River Lossie, and on the lochs that scattered this landscape, but were not likely to have been used in the open Moray Firth in anything but the slightest of sea states (Coates 2005: 518). There is almost no direct evidence of other types of watercraft in Scotland until the appearance of Viking Age vessels in the ninth century, although it could be speculated that coracles were available, given the strong historic tradition of 'curragh' use on the nearby Spey (Hornell 1936: 5). There is also tentative evidence of an Early Bronze Age coracle burial at Barns Farm, Fife, hinting at the antiquity of skin boat traditions in Scotland (Watkins 1980; 1982: 118–19). However, secure and direct evidence for prehistoric watercraft outside of logboats remains very rare. The Oakenhead boat and the historic references described previously are strong evidence that the Loch Spynie estuary was used as an anchorage in the medieval period, so, while speculative,

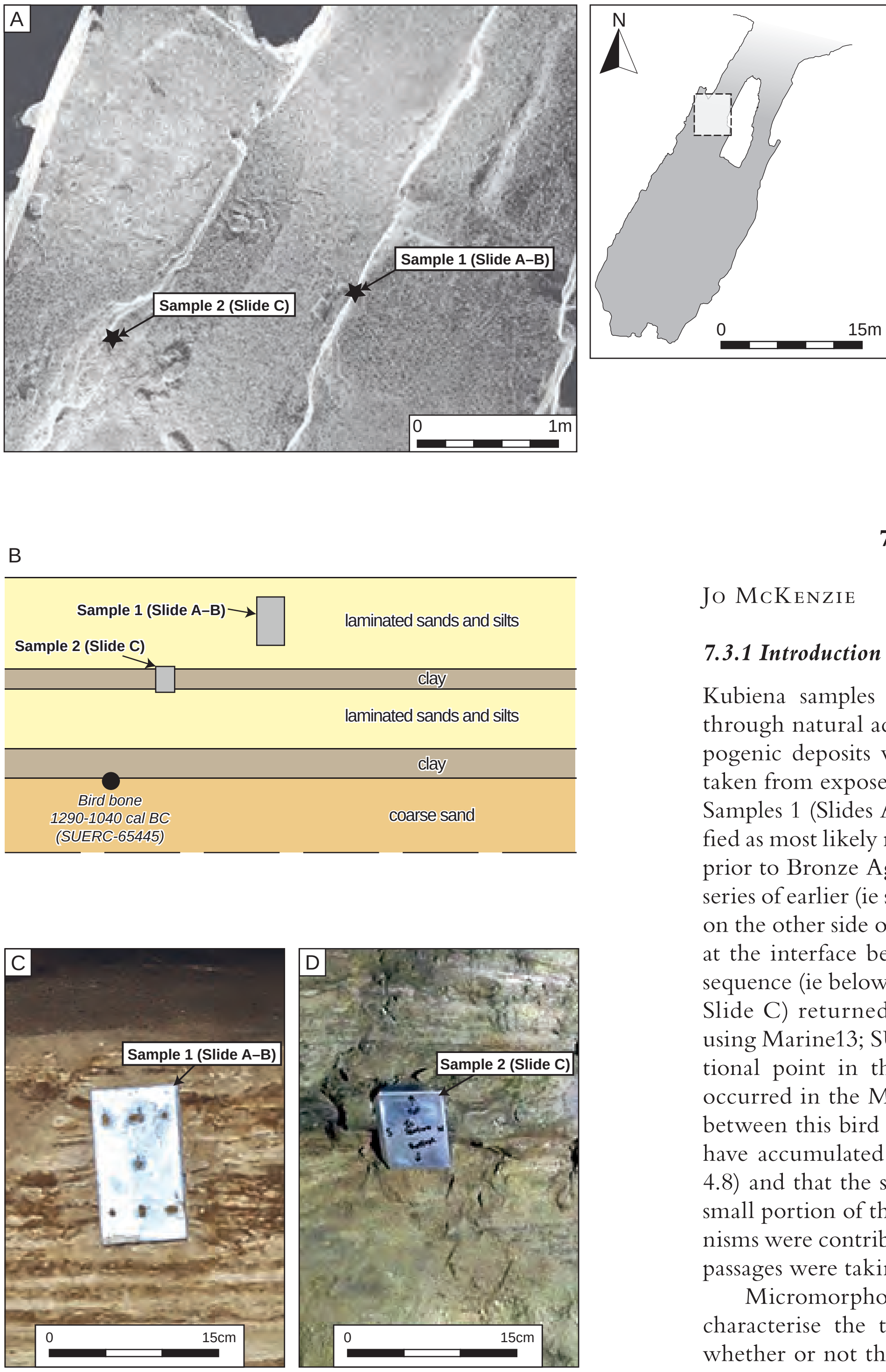

Illustration 7.4
Locations of micromorphology samples 1 (Slide A–B) and 2 (Slide C) in the Sculptor's Cave West Passage: (A) is a digital plan of the central part of the West Passage showing the in situ locations of the samples in exposed sections left by Benton's excavations, and (B) is a composite schematic showing the relative stratigraphic positions of both samples; (C, D) are photographs of the respective kubiena tins in situ within the deposits

it is not unreasonable to assume that it was in similar use in prehistory.

7.2.4 Conclusions

The Laich o' Moray has been radically altered through natural processes of deglaciation and climate change, followed more recently by human-induced landscape change. Through the period of human occupation, the Laich o' Moray has transformed from a marine environment to a dynamic estuary with surrounding lochs and bogs to a uniformly freshwater wetland environment, before being drained wholesale in the eighteenth and nineteenth centuries.

7.3 Soil micromorphology

Jo McKenzie

7.3.1 Introduction

Kubiena samples for micromorphological analysis were taken through natural accumulations underlying the excavated anthropogenic deposits within the Sculptor's Cave. The samples were taken from exposed sections created during Benton's excavations. Samples 1 (Slides A and B) targeted a sequence of deposits identified as most likely representing the cave environment immediately prior to Bronze Age activity, while Sample 2 (Slide C) targeted a series of earlier (ie stratigraphically lower) clay-dominated deposits on the other side of the passage (illus 7.4). A seabird bone stratified at the interface between a layer of coarse sand and a lower clay sequence (ie below the clay-dominated deposits contained within Slide C) returned an AMS date of 1290–1040 cal BC (corrected using Marine13; SUERC-65445), indicating that this clear transitional point in the depositional environment within the cave occurred in the Middle to Late Bronze Age. Given that deposits between this bird bone and the start of human activity appear to have accumulated over as little as *95–225* years (chapter 4; illus 4.8) and that the sampled deposits discussed here represent just a small portion of this sequence, it is possible that whatever mechanisms were contributing to sediment build-up within the entrance passages were taking place on a roughly annual cycle.

Micromorphological analysis aimed to comprehensively characterise the two sediment sequences in order to identify whether or not they contained evidence for human activity and whether their formation could shed light on the nature of the cave environment at this time.

The Sculptor's Cave is located within the Hopeman Formation: a coastal band of Permian and Triassic sandstones surrounded by older Devonian rocks. Rocks of these periods are rare in Scotland – most having been eroded since deposition – but are found around Elgin and particularly along the Lossiemouth to Burghead coast. They are often known as 'New Red Sandstone', differentiating them from the older and much more extensive 'Old Red' sandstones of the Devonian (Craig 1991; Auton et al

2011). The sandstones of the Hopeman Formation are classed as texturally mature: composed almost entirely of weathering-resistant quartz, typically well sorted and rounded as a result of aeolian transportation (Williams 1973). Fringed by marine beach deposits of gravel, sand and silt, and adjacent to superficial (drift) geological units including mapped areas of blown sand immediately adjacent to the coastal fringe, raised marine deposits, and till, the Sculptor's Cave is potentially open to incoming sediment originating from a wide range of geological sources (BGS 2015). Although currently inaccessible at high tide, the Sculptor's Cave itself is not thought to have been within tidal reach since the Neolithic or earlier (section 7.2).

7.3.2 Method

Julie Boreham and Jo McKenzie

Thin sections were prepared following the production methodology provided by Murphy (1986) and adapted by Julie Boreham at Earthslides.com. Full details are provided in the site archive. A range of magnifications (×10–×400) and light sources (plane polarised, crossed polars, oblique incident) were used to obtain detailed descriptions of the sediment sequence, which were recorded using a modified table designed to focus on sediment mineralogy, grain size and morphology, deposit structure and soil pedofeatures (see site archive).

7.3.3 Analysis

Sample 1 (Slide A–B)
The sediments form a continuous sequence, divided into 26 deposits (illus 7.5), recorded from the base of the sequence at lower Slide B (D1) to the top of upper Slide A (D26). The uppermost deposit (D12) in Slide B is likely to continue into Slide A as D13. The sediments can be divided into two main and two further categories:

1. Sand deposits (D1, D3, D5, D6, D8, D10, D12, D13, D15, D17, D19, D21, D23): these range in grain size from very fine (63–125µm) to coarse (up to 1mm), with mineral grains dominantly smooth and rounded in shape. They are generally poorly sorted at the microscopic scale and contain a varying, through always very minor, proportion of larger (though still all <4mm) rock fragments (section 7.3.4).
2. Laminations of clay and silt (D2, D16, D18, D20, D22, D24, D26): these are characterised by generally alternating and sometimes interleaving fine lenses of silt and clay, ranging from poorly to well expressed.
3. Three sections of the sequence consist of interleaving laminations of clay, silt and discrete bands of sand (D4, D9, D11) which, although clearly representing several discrete events, cannot be separated into individual sand and clay/silt lenses.
4. Three further deposits (D7, D14, D25) represent a fourth depositional category: accumulations of generally non-laminated clay and some silt within discrete horizons defined by concentrations of particularly coarse-grained sediment and rock fragments.

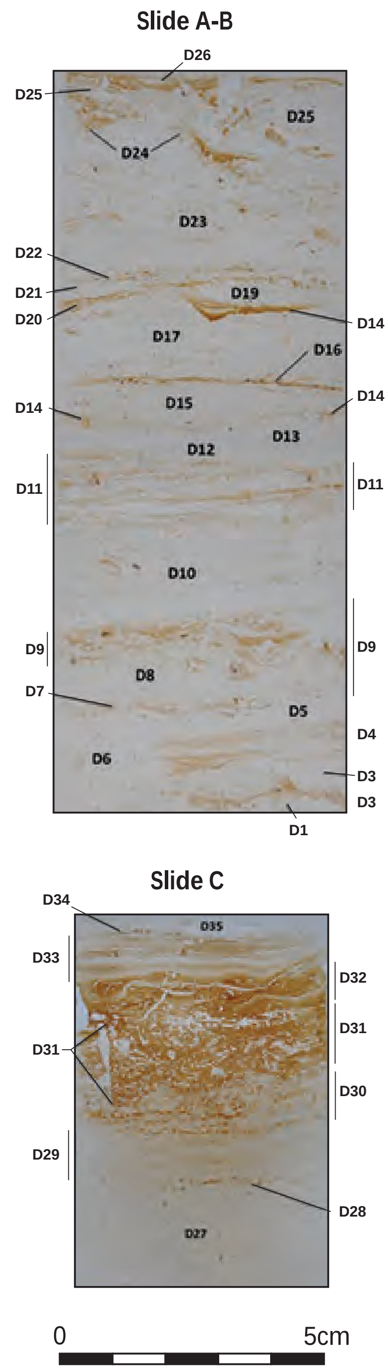

Illustration 7.5
Detailed sequence of deposits in Slide A–B (upper, laminated deposits) and Slide C (lower deposits, including interface between laminated sands and underlying clay)

The deposits lie generally on a horizontal plane, with relatively clear though sometimes diffuse boundaries. Episodes of apparent disturbance interrupt this: at the base of the sequence, deposits D1–D4 are truncated halfway along the sample width, indicating possible localised turbation by soil fauna. At the top, chunks of clay/silt lamination apparently originating from disaggregated deposit D24 appear adrift within D23 below. Large cracks within extant fragments indicate drying, as does a large fissure extending through D25–D26.

Sample 2 (Slide C)

A continuous sequence through this smaller sample was divided into nine separate deposits (illus 7.5) recorded from the base of the sequence (D27–D35). The Slide C sequence can be categorised as follows:

1. Sand deposits (D27, D29, D35): similar in mineralogy and overall texture to those of Slide A–B, with the exception of D29, which shows extensive lamination throughout (section 7.3.4).
2. Laminations of clay and silt (D33): characterised by alternating fine lenses of silt and clay, generally very well expressed with less interleaving than those seen in Slide A–B.
3. Two further thin deposits (D28, D34) representing discrete horizons defined by concentrations of coarser-grained sediment which show significant clay accumulation (generally non-laminated, discontinuous and undulating).
4. The clay-dominated sequence (D30, D31, D32): three deposits, unique in texture to Slide C, defined by significant accumulation of clay but varying in individual microstructural and compositional features. These appear to represent a sequence of events reflecting a very different cave environment to that seen in the rest of the sample sequence.

As seen in Slide A–B, there is evidence for minor disturbance to the profile. An extended vertical channel runs the depth of lower clay D31 on the left of the slide, which may indicate drying/cracking. The uppermost D29 lenses are also apparently truncated midway across their length (illus 7.6, 2B). It is possible that this represents removal of the upper part of D29 through aeolian or (more likely) colluvial action prior to the development of D30 (section 7.3.4).

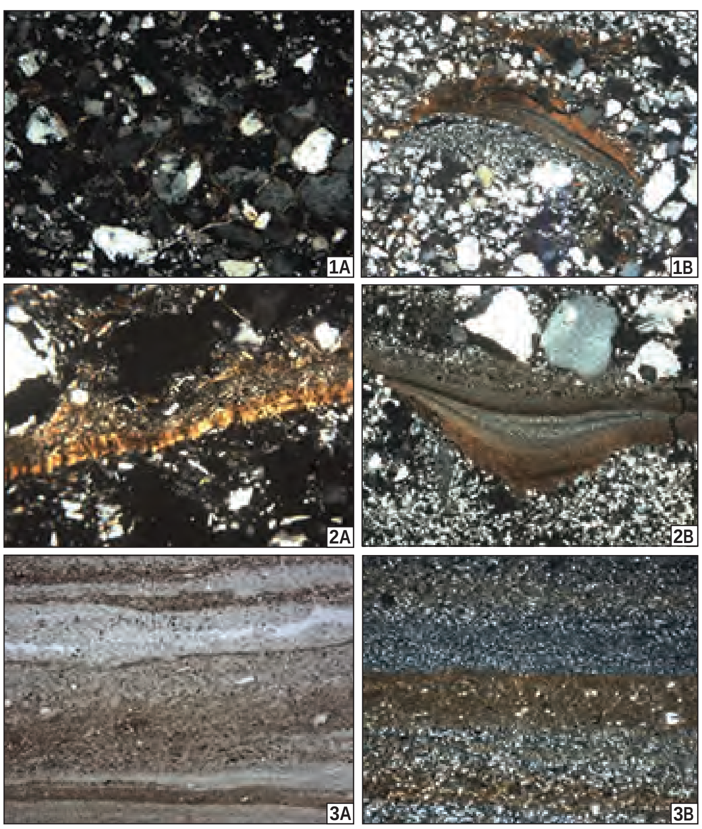

Illustration 7.6
(1A) Illuvial clay coatings form a localised 'bridged' or gefuric microstructure in D10 (crossed polarised light, image width: 1.5mm), (1B) inverted, displaced fragment of clay and silt lamination within sand deposit D10 (crossed polarised light, image width: 5mm), (2A, 2B) bright, clear, strongly oriented (limpid) clay in D11 (2A) contrasts with the opaque orange tones of the finely laminated, but weakly oriented clay domains in D18 (2B), (crossed polarised light, image widths: 5mm), (3A, 3B) finely laminated clayey silt deposit D33 (seen at image widths of 5mm, in plane polarised light (3A) and 1.5mm, in crossed polarised light (3B))

7.3.4 Main deposit group profiles

Sand deposits

The generally very similar mineralogy of the 13 sand deposits in Slide A–B suggests a largely out-of-cave origin for the material, with the variety of rock fragments and dark minerals plus the relatively few extant sandstone fragments present suggesting sediment sources additional to the sandstone bedrock. Aeolian transport of sediment into the cave is also strongly suggested by both size ratio and sphericity/roundness. Grains typically peak at medium sand size (the upper limit for quartz grains movable by strong winds; Nichols 2009: 115) and the smooth, rounded grains characteristic of aeolian sediments are dominant (detailed characterisation of deposits can be found in the site archive). Transport from a local environment is also suggested by the relatively poor sorting of the sands at the microscopic scale: sand grains are typically fractionated by size, shape and density the greater the distance of travel (ibid: 117). Well sorted at the macro scale, at higher magnification, the sands within this sequence (adjacent to the cave entrance) are relatively poorly sorted within their broad size classes, indicating transport from relatively nearby, ie the adjacent beach. Low compaction and a voided, open deposit structure are typical.

Organic content is uniformly very low, with the majority of the sand deposits showing little or no fine material groundmass, with only rare, discrete small patches of silty clay with small amounts of amorphous organic material present. Organic inclusions are similarly rare, as are diatoms, and no anthropogenic materials are identified.

The soil pedofeatures present relate to illuviation processes. Bright yellow 'limpid' clay coatings are seen in all these deposits, with particular concentrations in deposits D8, D10 (illus 7.6, 1A) and D23, and indicate movement of fine clay down-profile as a result of water percolation. Small nodules of iron accumulation, also indicators for illuviation, are present in small numbers in several horizons.

Slide C, located further into the cave, shows three similarly sand-dominated deposits. Two of these (D27, D35) are very similar to those described above, but the third (D29) is notably different, showing clear lamination and a degree of sorting within its sequence of individual sand lenses which is not seen in the rest of this deposit group (illus 7.5). This points to a more gradual accumulation of sand at this point in the profile and may also relate to the location of this sample further within the cave, perhaps subject to degrees of variation in wind strength/direction compared to the sequence adjacent to the cave entrance.

A particularly interesting feature is the presence of displaced fragments of clay/silt laminations within several of the sand/interleaving deposits (D4, D6, D10, D17, D23 and D29; an example in D10 is shown in illus 7.6, 1B). Fragments such as this have been interpreted as indicative of clay-rich layers exposed and dried at the soil surface as a result of processes of disturbance such as colluviation (Stoops et al 2010: 225). This is perhaps particularly well illustrated in deposit D29.

Clay/silt laminations

Layers D2, D16, D18, D20, D22, D24 and D26 are finely laminated, usually alternating bands of clay and silt of varying thickness, with a high coarse mineral input. Silts appear undisturbed and are probably (due to its high resistance to weathering) composed almost entirely of quartz; only in D18 can silt-sized mica be tentatively identified (illus 7.5). The clays almost all show absent, weak or generally discontinuous small bands of orientation, with only clay laminations within D9 and especially D11 (both deposits composed of interleaving sand, silt and clay) showing the limpidity characteristic of strong parallel orientation (illus 7.6, 2A, 2B).

The only deposit broadly within this category in Slide C is D33. Located immediately above clay sequence D30–D32 (illus 7.5), this is the thickest (8mm) and most finely laminated of the clay/silt sequences, with over 24 individual episodes of deposition (illus 7.6, 3A, 3B). However, it shows notably little or no coarse mineral fraction or organic component and is in this respect more similar to the clay it seals than the clay and silt depositions of Slide A–B. Clearly, the accumulation of deposit D33 seems to have taken place when the environmental conditions which produced the clay sequence at least still partly prevailed.

Clay-dominated deposits

The defining event of Slide C is the sequence of clay-dominated deposits seen within the majority of the upper part of the slide (D30, D31, D32; illus 7.5; 7.7, 2A, 2B). These can be interpreted as a single sequence of events indicative of a significant and established change in the in-cave environment from generally dry or subject to wetting/drying to significantly or completely waterlogged. All three deposits show elements of a vughy microstructure: the presence of amorphous to often star-shaped voids, which may relate to the markedly saline conditions noted during slide manufacture, and the action of gypsum salts on the structure of the clay matrix (illus 7.7, 2A). Clay orientation is also distinctive to all three deposits. A faint but consistent horizontal lamination is partially masked by an undulating, poorly oriented clay matrix, although upper deposit D32 shows a sequence of very clearly expressed clay laminations bisected by occasional large cracks. This faintly turbated appearance is strongly suggestive of deposition within a waterlogged environment.

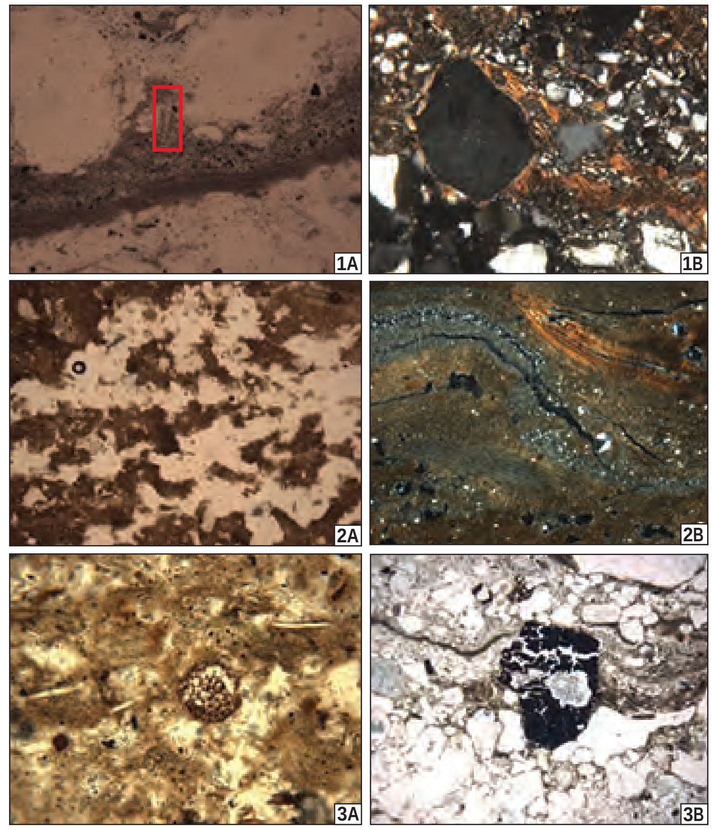

Illustration 7.7

(1A) Red outline highlights diatom aligned vertically just above oriented (limpid) clay lens of D11 (same view as illus 7.6, 2A; plane polarised light, image width: 5mm), (1B) D7: illuvial clay forms coatings around coarse quartz grain; to base of image, redder, iron-rich laminations of clay can be seen (crossed polarised light, image width: 1mm), (2A) vughy, voided and (to right) cracked microstructure of deposit D31 (plane polarised light, image width: 2mm), (2B) undulating clay/fine silt laminations within deposit D32 (plane polarised light, image width: 1.5mm), (3A) organic inclusions including fungal sclerotia (top centre) in clay lens within deposit D2 (plane polarised light, image width: 1mm), (3B) carbonised fragment in clay/silt lamination in deposit D9 (plane polarised light, image width: 1.5mm)

In lowest deposit D30, vughy, undulating patches of clay are mixed with areas dominated by medium sand, which dwindle to near absent in D31 and D32. This may suggest at least some settling through water of heavier mineral grains within the clay-dominated sequence. All three deposits show extremely few additional features: no anthropogenic material, few organic inclusions and rare (illuvial) pedofeatures.

Organic content, organic and biogenic inclusions, and potential anthropogenic influence

The amount of organic material in the Sculptor's Cave sediment sequence is extremely low and relatively undiagnostic. Organic inclusions include plant-derived fragments (cell residue, rare sections through probable root fragments), which are seen in all of the laminated clay/silt horizons in Slide A–B with the exception of D26 but are rarely present in Slide C. Rare fungal sclerotia are seen in six of the Slide A–B deposits, mostly the laminated clay/silt horizons (illus 7.7, 3A). Small fragments of carbonised material, all of windblow size and none necessarily diagnostic of anthropogenic activity, are seen in several deposits, with the largest in otherwise low organic content deposit D9 (illus 7.7, 3B). Only two probable carbonised fragments can be seen in the Slide C sequence (both in pre-clay deposit D28); both show clear cellular structure (potentially charcoal, though too small for secure identification) and one appears red in oblique incident light, potentially indicating a reheated mineralised fragment. Rare heated mineral grains are seen, again preferentially within Slide A–B, but their number and size are too small to indicate direct anthropogenic activity within the cave. Input of amorphous organic material, identifiable as orange to brown fine material groundmass, is also quite strongly biased towards the laminated clay/silt lenses and is almost absent from the sand deposits.

A perhaps surprising feature of both sequences is the almost complete absence of diatoms and other silica bodies such as (in this environment) spicules or foraminifera. Diatoms are microscopic algae which are abundant in almost all aquatic habitats and are important diagnostic indicators in palaeo-environmental reconstruction, partly due to a robust siliceous structure which ensures that they survive well in most conditions. Eleven deposits in the Slide A–B sequence show diatoms/spicules: usually one, no more than three, some only tentatively identified (illus 7.7, 1A). This low number would more commonly indicate a generally non-aquatic environment. For Slide C, no diatoms are securely identified, despite other features of the clay-dominated portion of this sequence strongly indicating waterlogged conditions (section 7.3.5).

Soil pedofeatures

Pedofeatures within both of the Sculptor's Cave sample sequences reflect processes of physical and chemical movement through illuviation: clay features, as discussed above, and, to a lesser extent, features of iron mobilisation and deposition. Small, usually dark red, iron 'nodules' and occasional plant pseudomorphs are seen in small numbers throughout the sequence and represent iron accumulation. These features are indicative of general illuviation throughout the profile.

7.3.5 Interpretation

Deposit formation

While the sampled sequences generally show clear, undisturbed sediment stratigraphies, any interpretation of the environment beyond the scale of these individual profiles must consider the small size of the thin section sample. This is particularly true for the potentially very varied local sedimentary environment within a cave (Farrand 2001: 13).

Windblown deposits

The most likely formation process for both sand- and silt-dominated layers in both sequences is aeolian accumulation, albeit clearly influenced by water movement, with the clay- and silt-dominated lenses providing more detail on post-depositional processes alongside the typically aeolian structures of the coarse sand deposits. The strongly oriented horizons of D9 and D11 suggest illuviation and a classic down-profile movement of fine clay (Stoops et al 2010: 218). Above these features (D10, D12 and especially D13 in Slide A–B, and also D29 in Slide C), localised patches of bridged limpid clay coatings point to drying (ibid: 221). Patterns of clay movement and deposition within the mid-section of the Slide A–B sequence (D9–D17) and possibly the lower, pre-clay portion of Slide C (D28–D29) therefore indicate water movement combined with periodic drying out. Vertical cracks extending through individual clay-rich deposits (eg D16, D18) support this interpretation. Non-laminated clay and coarse mineral deposits D7, D14 and (possibly) D25 in Slide A–B, and D28 and D34 in Slide C, also feature frequent clay accumulations, and here it appears that these lenses of coarser and/or less voided material act as hiatus points for illuvial material.

More prevalent are the non-oriented to poorly oriented clay laminations. A significant feature of these deposits is their higher concentration of organic features compared to the sands, including varying degrees of amorphous organic content (illus 7.6, 2B; 7.7, 3A). Localised concentrations of organic materials of this kind may indicate surface exposure and may point to these particular clay-rich lenses representing (presumably short-lived, since organic content is still low overall) ephemeral surface horizons. At high wind velocities, silt- and clay-sized particles can be carried as suspended load 'dust' (Nichols 2009: 115). This is very possible along the exposed Moray coastline, known for previous dramatic storm and sand-blow events, such as that which devastated the nearby Culbin Estate in 1694 (Ross 1992; section 7.2.3). These sequences may therefore include phases of surface dryness, suggested by the illuvial cycling described above and formed from a mix of fine dusts and blown-in detritus. It is notable that the Slide C profile, located further within the cave and therefore presumably at a more sheltered location, does not display this kind of deposit.

Waterlogged deposits

A very different sequence is seen in the upper section of Slide C. Here, a group of three strongly clay-dominated layers show a range of features indicating the development of a waterlogged environment at this point in the profile: dense deposits of gently turbated though horizontally laminated clay, poorly oriented; a coarse fraction heavily weighted towards the lower deposit; and a vughy structure indicative of a highly saline environment.

Resin curing failures during the processing of Slide A–B identified the presence of salts, although not concentrated enough to be present in crystal form (eg gypsum) and thus identifiable in thin section. At too low a level to suggest saline immersion, it seems that the coastal atmosphere likely deposited salts as an aerosol onto sediment surfaces (Julie Boreham pers comm).

Effects of this saline environment were dramatically more pronounced in Slide C, where elementary chemical analysis showed a markedly higher saline content than in Slide A–B (Julie Boreham pers comm). One effect of a saline environment is the general retardation of processes of clay movement (and thus the development of illuvial pedofeatures) through flocculation, where individual clay particles aggregate as a result of a chemical reaction with another substance, usually saltwater, and thus become heavier, faster-settling particles. The lower, pre-clay deposits of Slide C (D27, D28 and D29), despite being sealed by an extremely clay-rich deposit sequence, show relatively few of the clay illuviation features which are such a distinctive feature of Slide A–B (illus 7.5; 7.6, 2A, 2B).

Other structural features illustrate likely input differences at the two sample locations. D33's extensive sequence of laminations contrasts with the more exposed Slide A–B, where only limited development of such sequences is seen before coarser aeolian deposition once more prevails. There is also far less organic material present in Slide C than in Slide A–B, probably due to decreased input of blown 'dust' settling into the deposits.

An interesting feature of both sample sequences is the general lack (in Slide A–B) and the complete absence (in Slide C) of identifiable diatoms. These distinctive silica bodies are found in almost all aquatic environments, to the extent that they are commonly used as proof of immersion in water in forensic science (Smol and Stoermer 2010: 534). In micromorphology, they are a common indicator of a waterlogged environment. One reason for this absence, especially in Slide C, may be the amount of light present in the cave. Diatoms rely on the sun for energy and therefore only exist within the photic zone, that is, the depth to which sunlight can penetrate water. The extent of this zone relies not only on the location of the water body relative to penetration of sunlight, but also the clarity of the water. It is possible that these elements of the in-cave environment inhibited diatom colonisation and may reflect the location of the main body of standing water towards the rear of the cave. The most clearly identifiable of these features in the whole sample sequence comes not from the clay, but from one of the potentially 'wetter' deposits within the sequence nearer to the cave entrance (D11; illus 7.7, 1A).

Anthropogenic activity

There is a general lack of diagnostic features for anthropogenic activity in both sample sequences. However, given the remote location of the cave, the few windblown particles of carbonised material in both sequences (notably, also in the pre-clay (pre-waterlogging) portion of Slide C) could indicate some human presence both prior to and after the development of standing water in the Sculptor's Cave.

7.3.6 Conclusions

Information from the two sample profiles combine to produce a fairly robust interpretation for the development of the Sculptor's Cave deposits through time. The earlier deposits, represented in in-cave Slide C, separate into three very clear phases: an upper and lower sequence of sand- and silt-dominated deposits which are broadly similar to those seen in Slide A–B and which represent aeolian deposition, and a central sequence of deposits dominated by clay accumulation which display a range of physical (structural) and chemical characteristics indicative of the development of a waterlogged environment, ie the development of a body of standing water within the cave. Specific features of both upper and lower sand- and silt-dominated phases of accumulation at this location may reflect the more sheltered environment of the cave interior. Near to the entrance, the later deposits of Slide A–B represent an initial aeolian sequence which, through a mixture of wetting and drying cycles, developed a series of clay, silt and slightly organic-influenced layers that indicate illuviation of fine material within sand horizons, plus likely phases of surface dryness and accompanying 'dirty', organic-influenced clay lenses formed from a mix of fine dusts and blown-in detritus.

7.4 Animal bone

Clare Rainsford

7.4.1 Introduction

A substantial assemblage of animal bone was recovered from the Shepherds' excavations at the Sculptor's Cave. This was initially assessed by Dale Serjeantson (nd) and the data made available to Bradford for reanalysis within the revised phasing and chronological framework (the bone itself was not systematically reanalysed).

7.4.2 Methods

The assemblage comprised 3673 bone fragments (table 7.2), retrieved both via hand collection (1396 fragments) and from wet-sieved samples (2277 fragments). These were analysed together, as sample sizes for most phases otherwise became problematically small, and the material recovered from wet sieving showed generally similar patterns to the hand-collected material. Almost two-thirds of the assemblage (2185 fragments; 60%) was identified to some taxonomic level, although it should be noted that this includes mammals only identified to size class (large/medium/small), unidentified fish and unidentified birds. Biometric measurements are contained in the site archive. Benton (1931: 207) mentions 536 animal bones from her excavations, which probably reflects a more selective recovery strategy. These bones do not survive and the brief description in Benton's report suggests a similar species coverage to the Shepherd material.

7.4.3 Results

The faunal material assemblages from Phases 1 and 2 (Late Bronze Age and Iron Age), are, in terms of fragment count, largely equal in size (tables 7.2, 7.3). The proportion of unidentified material is higher in Phase 2 compared to Phase 1 (52% compared to 35%), potentially indicating higher fragmentation in Phase 2. A substantial proportion of the overall assemblage (753 fragments, 21%) was unstratified or else from disturbed (Phase 3) or mixed (Phase 2/3) deposits.

Mammal remains

The Sculptor's Cave assemblage is dominated by the remains of domestic mammals, predominantly sheep/goat and cattle, with pig the third most abundant taxon (table 7.3). Minimum number of individuals (MNI) figures (calculated by Lindsey Büster) are given in table 7.4. Other mammals, including dog, horse, wild mammals and micromammals, are very uncommon, totalling less than 5% of the identified assemblage. Small but diverse assemblages of both birds and fish were also present and are discussed in more detail below.

Table 7.2
Faunal assemblage from the Shepherd excavations at the Sculptor's Cave by block. All numbers given are number of identifiable specimens (NISP)

Species	**Phase 1**						**Phase 2**							**Phase 2/3**	**Phase 3**	**Unstratified**	**Total**
	1.1	**1.2**	**2.1**	**2.2**	**2.3**	**2.4**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**2.5**	**2.6**	**2.7**	**2.8**		
Cattle (*Bos taurus*)	2	42	1	10	6	1	29	6	13	9	1	3	10	22	–	22	**177**
Sheep (*Ovis aries*)	–	3	–	5	–	–	–	1	–	–	–	–	–	–	–	–	**9**
Goat (*Capra hircus*)	–	–	59	–	1	–	–	–	–	–	–	–	–	–	–	–	**60**
Sheep/goat (*Ovis/Capra*)	2	84	–	23	12	–	9	17	16	38	2	2	3	15	–	14	**237**
Pig (*Sus scrofa*)	2	20	–	3	–	–	2	3	5	3	1	–	–	4	–	9	**52**
Horse (*Equus caballus*)	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	**1**
Roe deer (*Capreolus capreolus*)	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	1	**3**
Dog (*Canis familiaris*)	–	–	–	1	–	–	–	–	–	–	17	–	–	–	–	–	**18**
Fox (*Vulpes vulpes*)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Beaver (*Castor fiber*)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Large ungulate	2	64	–	15	4	–	8	2	24	13	2	4	4	4	–	15	**161**
Medium ungulate	4	89	–	45	19	–	18	7	34	95	4	–	2	13	–	23	**353**
Small mammal	–	1	–	–	–	–	2	–	–	–	–	–	–	–	–	–	**3**
Shrew (*Sorex* sp.)	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	**1**
Field vole (*Microtus agrestis*)	–	9	–	1	–	–	–	–	1	–	–	–	–	–	–	1	**12**
Vole	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**1**
Rat (*Rattus* sp.)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Mouse/vole	–	3	–	1	1	–	1	2	1	–	–	–	–	1	–	5	**15**
Frog (*Rana temporana*)	–	–	–	2	–	–	–	–	1	–	–	–	–	–	1	–	**4**
Toad (*Bufo bufo*)	1	–	–	–	–	–	1	–	1	1	1	–	–	–	1	–	**6**
Bird	–	5	3	5	–	1	3	2	1	2	5	4	–	2	3	31	**67**
Fish	22	262	–	41	14	90	51	58	31	82	11	4	3	15	13	305	**1002**
Total ID	**35**	**584**	**63**	**152**	**57**	**92**	**124**	**98**	**128**	**246**	**44**	**17**	**22**	**76**	**18**	**429**	**2185**
Unidentified	15	384	4	110	16	7	158	61	145	336	7	6	9	33	5	192	**1488**
Total by block	**50**	**968**	**67**	**262**	**73**	**99**	**282**	**159**	**273**	**582**	**51**	**23**	**31**	**109**	**23**	**621**	**3673**
Total by phase	**1519**						**1401**							**109**	**23**	**621**	**3673**

Table 7.3
Domesticates from the Sculptor's Cave by phase. All numbers given are number of identifiable specimens (NISP).

Species	Phase 1	Phase 2	Total
Cattle (*Bos taurus*)	62	71	**133**
Sheep (*Ovis aries*)	8	1	**9**
Goat (*Capra hircus*)	60	0	**60**
Sheep/goat (*Ovis/Capra*)	121	87	**208**
Pig (*Sus scrofa*)	25	14	**39**
Horse (*Equus caballus*)	0	1	**1**
Dog (*Canis familiaris*)	1	17	**18**
Medium ungulate	157	160	**317**
Large ungulate	85	57	**142**
Total	**519**	**408**	**927**

Table 7.4
Minimum number of individuals (MNI) for major domesticates in Phases 1 and 2

Species	Phase 1		Phase 2	
	MNI	Element	MNI	Element
Sheep/goat (*Ovis/Capra*)	7	Ulna (right)	3	Tibia (right)
Cattle (*Bos taurus*)	4	Pelvis (right)	3	Radius (right)
Pig (*Sus scrofa*)	2	Radius (right)	3	Femur (left)

Sheep/goat
By fragment count, sheep/goat is the most numerous taxon in the Sculptor's Cave assemblage. Both sheep and goats have been positively identified from the assemblage, although, excluding the associated bone group (ABG; discussed below), only one other element has been identified to goat, in comparison to nine sheep elements. All elements of the skeleton appear to be present, with little evidence of selection in terms of body parts (table 7.5).

While age distribution is difficult to discuss in small sample sizes, for sheep it appears relatively even, with both young and older animals entering the assemblage and no clear kill-off peak (illus 7.8). Wear data are available from ten mandibles. Of these, M3 is present and in wear in seven cases, and dP4 is present in three with unerupted or absent M3, again indicating the presence of both older and younger sheep. Elements from foetal and immature animals are also present in both Phases 1 and 2.

Cattle
After sheep/goat, cattle remains are the second most abundant taxon from the Sculptor's Cave. On average across the assemblage, sheep/goat and cattle are in a ratio of 1.7:1. There is a slight increase in cattle remains in Phase 2 compared to Phase 1, with the ratio changing from 2.3:1 (sheep/goat: cattle, including cattle-size and sheep/goat-size categories) in Phase 1 to 1.9:1 in Phase 2. This is consistent with trends across Britain, with cattle generally becoming more prevalent in the Iron Age.

As with sheep/goat, all elements of the cattle skeleton appear to be present, with little evidence of selection in terms of body parts (table 7.6).

Table 7.5
Element representation for sheep/goat

Element	Phase 1	Phase 2
Head/neck		
Maxilla	3	–
Mandible	–	5
Skull	4	1
Horn core	1	–
Cervical vertebra	18	2
Tooth	17	23
Body		
Thoracic vertebra	12	5
Femur	9	5
Scapula	6	–
Humerus	7	1
Radius	8	3
Ulna	9	1
Rib	9	11
Sacrum	1	1
Pelvis	16	2
Tibia	10	6
Long bone	1	–
Patella	3	1
Extremities		
Astragalus	4	1
Calcaneus	2	–
Metacarpal/metatarsal	24	15
Phalanges	13	5
Caudal vertebra	2	–
Total	**179**	**88**

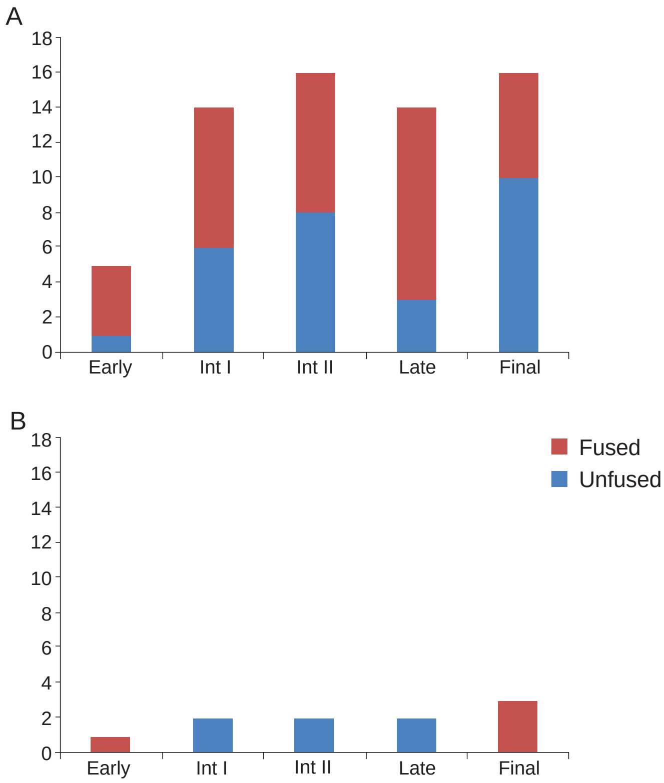

Illustration 7.8
Element fusion data for sheep/goat from (A) Phase 1 and (B) Phase 2 (categories follow O'Connor 1989)

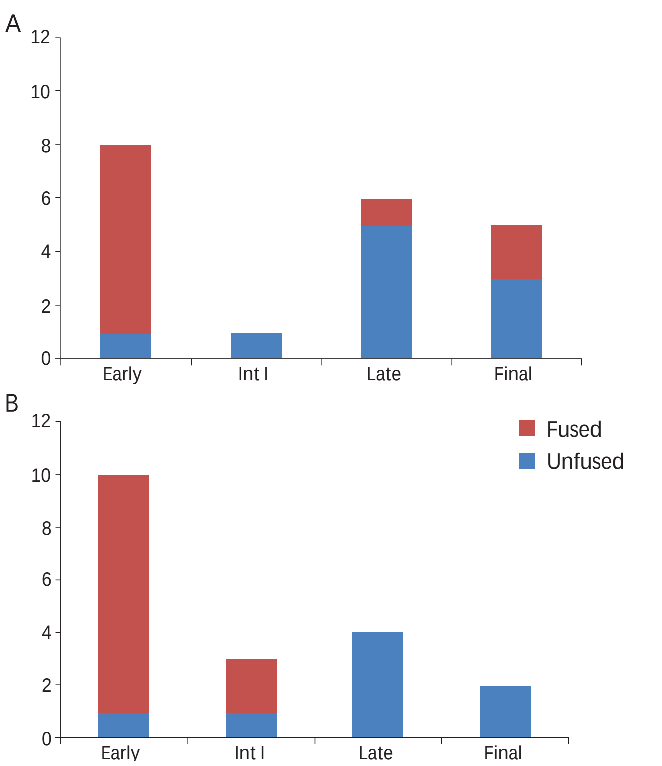

Illustration 7.9
Element fusion data for cattle from (A) Phase 1 and (B) Phase 2 (categories follow O'Connor 1989)

Table 7.6
Element representation for cattle

Element	Phase 1	Phase 2
Head/neck		
Skull	3	2
Maxilla	–	1
Mandible	1	1
Cervical vertebra	3	–
Tooth	5	12
Body		
Thoracic vertebra	1	–
Femur	3	–
Scapula	2	2
Humerus	3	–
Radius	2	4
Ulna	1	2
Tibia	4	2
Rib	8	4
Sacrum	2	1
Pelvis	5	–
Extremities		
Astragalus	1	1
Calcaneus	1	1
Sesamoid	–	3
Metacarpal/metatarsal	5	15
Phalanges	7	14
Caudal vertebra	3	–
Symphysis	1	5
Total	**61**	**70**

No ageable cattle mandibles are present in the assemblage, but epiphyseal fusion data show that, in Phase 1, the majority of elements with late- and final-fusing epiphyses are unfused at the point of death, while those with early-fusing epiphyses are predominantly fused, suggesting that most cattle entering the cave assemblage were aged approximately 3–4 years, with few surviving beyond this point (illus 7.9). A number of bones from foetal or very immature animals are also represented. In Phase 2, the ageable cattle bones are predominantly foetal or very immature, although a single M3, which is in wear, indicates that adult cattle were also present. Knife marks on one immature cattle scapula indicate that these animals were eaten (Serjeantson nd).

Pig

The third most common mammalian species in the assemblage is pig, although this is poorly represented compared to sheep/goat and cattle, making up less than 10% of the overall identified mammalian bone. The majority of pigs appear to be immature, since almost no late- or final-fusing elements are fused. Half of the pig elements for which age data were available were categorised as foetal or very immature, and in two of the three mandibles dP4 was erupting. Pigs typically exhibit a young kill-off pattern, with most being killed for meat prior to reaching skeletal maturity. However, the proportion of very young pigs is notable and bears comparison to the very young cattle and sheep mentioned above. It is possible that not all of these pigs were domestic. Serjeantson (nd) identified one probable and one possible wild boar canine on the basis of biometric measurements, both from Phase 1 (IIb17); there were also several boar tusks from the Benton assemblage, one of which was worked (SF849; illus 5.19). This raises the possibility that at least some of the other earlier pig remains are the result of hunting rather than domestic farming.

Dog

The presence of dogs around the cave is attested by a single metacarpal in Phase 1 (IIc17) and an ABG in Phase 2 (Ib2b: see discussion below), but also by dog gnawing on a few elements from both Phases 1 and 2.

Horse

One stratified element of horse (a left lateral metacarpal) was found in Phase 2 (Ib6).

Wild animals

Wild mammals are very sparse in the assemblage. Although three elements of roe deer were present (one each in Phases 1 (Ib47) and 2 (Ib6) and one unstratified; table 7.2), red deer was apparently absent from the Shepherd assemblage, despite the occurrence of numerous tools made from the bones and antlers of this species (see section 5.3.2) and the presence of red deer bone in Benton's assemblage (Neill 1931: 208). Elements of fox and beaver were also present in the unstratified material (both were also noted in Benton's assemblage; ibid), as was an unstratified hare carpal (Serjeantson nd: 6), though the latter was absent from the surviving archive. Other small mammals included voles, mice and shrews, as well as amphibians (frogs and toads).

Associated bone groups (ABGs)

Two associated bone groups (partial or complete animal skeletons; Morris 2011) were present in the assemblage. The first is an ovicaprid ABG from IIb19 (Block 2.1, Phase 1), dated to 1130–910 cal BC (SUERC-16613; section 2.3.2) and identified by Serjeantson (nd) as a goat of 3.5–5 months of age. The skeleton is almost complete, with elements present from all the major body areas excepting the upper forelimb. There are no butchery marks to indicate whether the carcass was processed and no contextual information is available to ascertain whether this was found in articulation or as scattered bones.

The second ABG is a dog skeleton from Ib2b (Block 1.7, Phase 2; illus 2.33) and is AMS dated to 400–200 cal BC (SUERC-16593; section 2.4.3). The skeleton is substantially less complete than that of the goat, consisting predominantly of skull, torso and lower right leg; this is likely due to disturbance by Benton or later, since it sat at the top of the Shepherd sequence. All elements present are fused and the teeth are in wear, indicating an adult animal (Serjeantson nd). With a complete right radius length of 15.8cm, the dog had a likely shoulder height of around 52cm (Harcourt 1974), representing a medium-sized animal of roughly border collie size.

Bird remains

A small assemblage of bird bones was recovered, comprising only 2% of the total identified assemblage (tables 7.2, 7.7). Around half of this assemblage is from unstratified contexts and the remainder is distributed relatively evenly across the phases. The birds are a mixture of coastal and seabirds (gulls, cormorants, auks) and a few land-based birds (raven, curlew, great-crested grebe, redwing). Of these, the most notable is the single element of white-tailed eagle from IIc23 (Block 2.2, Phase 1). The white-tailed eagle is a large predatory bird with a wingspan of up to 2.5m and would have been relatively common around the Scottish coastlines. All of these birds would have been present year-round in the vicinity of the cave, aside from the redwing, which is present mainly from September to April. The presence of a very similar range of birds is attested at the Iron Age site of Old Scatness in Shetland, where it was considered that all of the seabirds and many of the land-based birds (including, arguably, the raven) were consumed (Nicholson 2015a). However, there are no butchery marks on the bird bones from the Sculptor's Cave and it is possible that at least some of these bones were introduced into the cave without human agency.

Table 7.7
Bird assemblage from the Sculptor's Cave. All numbers given are number of identifiable specimens (NISP)

Species	**Phase 1**	**Phase 2**
White-tailed eagle (*Haliaetus albicilla*)	1	–
Cormorant (*Phalacrocorax carbo*)	1	–
Guillemot (*Uria aalge*)	–	1
Razorbill (*Alca torde*)	–	1
Puffin (*Fratercula arctica*)	–	1
Great-crested grebe (*Podiceps cristatus*)	–	1
Curlew (*Numenius arquata*)	–	1
Raven (*Corvus corax*)	–	1
Small bird	7	6
Medium bird	1	4
Large bird	–	1
Total	**10**	**17**

Fish remains

A substantial assemblage of fish bone was recovered, predominantly from the wet-sieved samples. The majority is unidentified or identified only to size class (large/medium/small/tiny; table 7.8). The identified fish remains are mostly from marine taxa, including gadids, wrasse, mullet, gurnard and flatfish. Most spend part or all of the year in shallow coastal waters and could have been fished in the vicinity of the cave. The majority of both identified and unidentified fish are small or very small, with most under 250g and some of the unidentified species under 10g in weight (Serjeantson nd). However, there is some variability, with a few large or medium-sized fish present throughout the assemblage. There is little apparent diachronic change, although it is worth noting that Phase 2 (Ib15) provides the only evidence for fish which may have had to have been fished further offshore, including one element of a large cod (estimated weight: 12lb/5.5kg).

Table 7.8
Fish assemblage from the Sculptor's Cave (sizes are based on Colley 1983). All numbers given are number of identifiable specimens (NISP)

Species	Phase 1	Phase 2
Ray (*Raja* sp.)	–	7
Gadid (*Gadiforme*)	3	8
Cod (*Gadus morhua*)	–	1
Haddock (*Melanogrammus aeglefinus*)	–	2
Herring (*Clupea harengus*)	1	1
Wrasse (*Labridae*)	17	9
Mullet (*Mugilidae*)	4	1
Gurnard (*Trigildae*)	1	–
Salmon/trout (*Salmo* sp.)	–	1
Flatfish (*Pleuronectiforme*)	2	–
Flounder (*Platichthys flesus*)	1	1
Plaice (*Pleuronectes platessa*)	1	–
Large fish	1	3
Medium/large fish	6	7
Medium fish	15	6
Small/medium fish	10	–
Small fish	71	14
Small/tiny fish	1	–
Tiny fish	3	2
Unidentified fish	260	186
Total	**397**	**249**

The dominance of very small fish in the assemblage suggests the possibility that a large proportion may not have been introduced to the cave by humans, with Serjeantson (nd) suggesting the cormorant or shag, or potentially the sea otter, as the most likely non-human agents. The presence of amphibian and rodent bones, predominantly vole, supports this argument, as these may also have been introduced by non-human predators. However, it is worth noting that very few rodent and amphibian remains are present in comparison to the fish remains. The fish assemblage does not appear to be separated either spatially or temporally from the domestic animal bone assemblage, which would seem to indicate that fish were being introduced into the cave while in use by humans, making it less likely to be the work of non-human predators, unless human use was sporadic or light. The capture and drying of small yearling saithe for winter consumption has been argued at the Iron Age site of Old Scatness, Shetland (Nicholson 2015b). While the capture and processing of small fish is unlikely to have been the main activity at the Sculptor's Cave, Old Scatness and other sites demonstrate that fish of this size were not beyond the realm of human consumption.

7.4.4 Discussion and wider context

Despite the unusual location of the site, the faunal material from the Sculptor's Cave appears to be more or less typical of later prehistoric assemblages. Comparison with the Bronze Age and Iron Age assemblages from Tofts Ness, Sanday (Nicholson and Davies 2007), for example, shows very similar patterning in the mammalian remains, with sheep/goat and cattle overwhelmingly dominant (illus 7.10). Pig and other mammals appear to comprise a slightly larger proportion of the assemblage at the Sculptor's Cave compared to Tofts Ness.

There is no strong evidence to suggest how or why domestic animal remains were introduced to the cave, although the element representation would appear to indicate the presence of whole bodies. Knife marks have been noted on a few elements of both sheep/goat and cattle, which can all be interpreted as standard jointing of the carcass: removing the lower legs (radius, ulna, astragalus), removal of meat at shoulders and hips (scapula, pelvis), sectioning of the torso (vertebrae, ribs). Evidence of burning and carnivore gnawing on a small percentage of the assemblage is also consistent with the bone being predominantly the result of human consumption practices, although some of the fish assemblage may have been collected by a non-human predator. The presence of foetal or very immature bones of sheep/goat, cattle and pigs indicates that the cave was in use in the spring and summer, and that it may have been visited at lambing or calving time. The wild taxa – predominantly seabirds and fish – would have been available within the vicinity of the site, but it does not appear that they constituted a strong reason for visiting the Sculptor's Cave, since they would not have dominated the diet in terms of meat weight.

It is interesting to compare the Sculptor's Cave with High Pasture Cave, on the west coast of Scotland (Drew 2005), which is of a similar date and degree of inaccessibility but which has a markedly different faunal assemblage. At High Pasture Cave, the assemblage is dominated by selected portions of pig carcasses. Pigs are often considered to be a 'luxury' animal, as they are raised

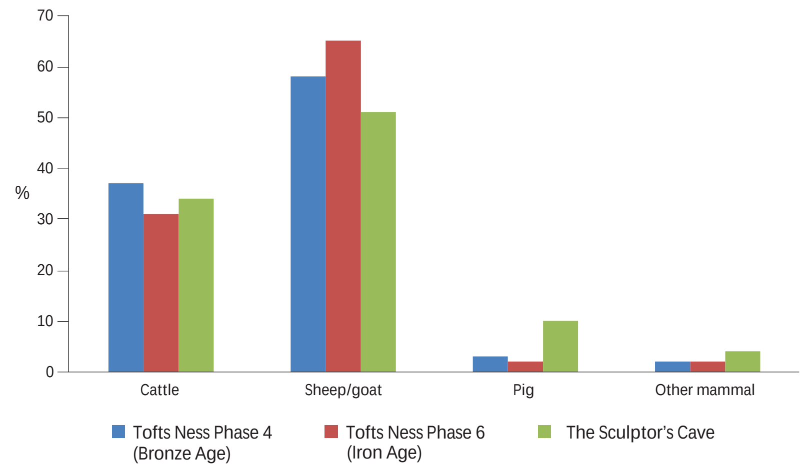

Illustration 7.10
Distribution of major mammalian groups at Tofts Ness (data from Nicholson and Davies 2007) and the Sculptor's Cave. Proportions are given as percentage of total mammalian bone

for nothing but meat, and the Sculptor's Cave fits the general pattern of having very little pig in an assemblage predominantly composed of cattle and sheep. Indeed, the animal remains appear indistinguishable from domestic sites of a similar date on Orkney and Shetland. While the island ecology and settlement structure may be different, the sites are all similar in terms of the locales exploited: focused on farming but facing the sea.

7.5 Marine Molluscs

Daniel Shaw

7.5.1 Introduction

Marine shells were found, in varying concentrations, in a range of contexts during the Shepherd excavations (table 7.9). Some contexts contained large quantities of complete or near-complete shells (eg Ia22, Ib6a, IIc13a; Blocks 1.2, 1.6 and 2.5 respectively) whereas others had only fragmentary pieces. As the assemblage appeared to be a mixture of hand-collected and wet-sieved material, it was not possible to produce reliable quantitative analysis, but some comments can be made.

7.5.2 Quantification

The assemblage is dominated by limpets, with three species being present: the common limpet (*Patella vulgata*), the rough limpet (*Patella ulyssiponensis*) and the Chinaman's hat (*Calyptraea chinensis*). Together these three comprise 86% of the total identifiable assemblage (63%, 10% and 13% respectively). Rough periwinkles (*Littorina saxatillis/arcana*) are also quite well represented, making up 13% of the total identifiable assemblage. Twenty per cent of the total assemblage comprises unidentifiable shells. These were either too eroded or too fragmentary for a firm identification to be made. Two common mussel shells (*Mytilus edulis*) from context Ia22 (Block 1.2) are the only examples of this species.

7.5.3 Modified shells

Eighteen common limpet shells, one rough limpet shell and one Chinaman's hat shell are perforated. Of the common limpet shells, one was recovered from Ia22 (Block 1.2), eight from Ib6a (Block 1.6), one each from IIb15 and IIb15b (Block 2.4) and seven from IIc13a (Block 2.5). The rough limpet shell was recovered from Ib6a and the Chinaman's hat shell from IIc13a. In most cases perforation appears to have been the result of human action, but a minority with particularly regular and small holes are possibly the result of natural predation by other molluscs.

7.5.4 Conclusions

Although the uncertainties over collection strategy prevent any detailed interpretation, the broad outlines of the marine shell assemblage are nonetheless clear and indicate certain key contexts (eg Ia22, Ib6a, IIc13a) as being particularly rich in shell. Eighty per cent of the assemblage was recovered from Phase 2, with a particular concentration (44%) in Block 1.6 in the West Passage.

7.6 Carbonised plant macrofossils and charcoal

John Summers

7.6.1 Introduction

During the Shepherds' excavations, the deposits within the two entrance passages were extensively sampled. Many of these samples were processed and assessed at the time (Fairweather nd; Boyd 1985), while a quantity of material was retained in the archive. Following a detailed programme of processing and sorting, the entire collection of sampled sediment has now been fully processed and investigated for plant macrofossils and charcoal. The resulting material represents a rich record of plant use associated with human activity in the cave.

7.6.2 Methods

Many samples were processed by flotation shortly after excavation. For most samples, no record survives of the volume of sediment processed. A small amount of unprocessed material was found in the archive, for which sediment volumes were recorded during processing. Unfortunately, these are a minority, and many appear to represent small sub-samples, which produced much less carbonised material than the samples processed in the 1980s, meaning little valuable information can be gleaned from these data. In the absence of sample volumes for the majority of the material, therefore, all remains have been grouped according to context, with litred and unlitred samples combined. Full details of the

Table 7.9
Percentage (by weight) of identifiable species of marine mollusc represented in each stratigraphic block

Phase	Block	% of total identifiable species by weight (g)					% of unknown/ fragments of total weight (g) by block	Total weight (g) by block	% of total assemblage
		Common limpet (*Patella vulgata*)	**Rough limpet (*Patella ulyssiponensis*)**	**Chinaman's hat (*Calyptraea chinensis*)**	**Rough periwinkle (*Littorina saxatillis/arcana*)**	**Common mussel (*Mytilus edulis*)**			
1	1.1	–	–	–	–	–	–	–	–
	1.2	57	3	7	32	1	43	954	8
	2.1	–	–	–	–	–	–	–	–
	2.2	–	–	–	–	–	100	12	0.1
	2.3	100	–	–	–	–	83	29	0.2
	2.4	69	1	16	14	–	17	997	8
									17
2	1.3	58	–	–	42	–	70	243	2
	1.4	37	–	10	53	–	51	39	0.3
	1.5	45	4	15	36	–	32	1588	13
	1.6	61	18	12	9	–	14	5276	44
	1.7	67	–	0	33	–	88	24	0.2
	2.5	77	7	14	2	–	11	2484	21
	2.6	100	–	–	–	–	50	14	0.1
									80
2/3	2.7	51	–	–	49	–	9	227	2
									2
3	2.8	56	–	22	22	–	9	89	1
									1
Total weight (g)								**11976**	—
Species as % of total assemblage		63	10	13	13	1	–		

Table 7.10
Detailed results from Phase 1 deposits containing identifiable plant macrofossils. X: low, XX: medium and XXX: high abundance

Taxon	Number/abundance by block				
	1.1	1.2	2.2	2.3	2.4
Cereal grains					
Cereal NFI	1	140	–	–	–
Hordeum sp. – Barley	–	113	1	–	–
(*Hordeum* sp. – tail grain)	–	(1)	–	–	–
(*Hordeum* sp. – immature grain)	–	(12)	–	–	–
Hordeum vulgare var. *vulgare* – Hulled barley	1	58	–	–	1
(Hulled barley – twisted grain)	–	(3)	–	–	–
(Hulled barley – immature grain)	–	(18)	–	–	–
(Hulled barley – germinated grain)	–	–	–	–	(1)
Hordeum vulgare var. *nudum* – Naked barley	–	15	–	–	–
(Naked barley – twisted grain)	–	(2)	–	–	–
Triticum sp. – Wheat	1	6	–	1	–
Triticum dicoccum/spelta – Emmer/spelt wheat	–	1	–	–	–
Triticum/Hordeum sp. – Wheat/barley	–	–	–	1	–
cf *Avena* sp. – Oat	–	1	–	–	–
Avena sp. – Oat	–	–	1	–	–
Cereal indeterminate detached embryos	–	1	–	–	–
Cereal chaff					
Cereal indeterminate culm	–	–	–	–	1
Wild taxa					
Chenopodium sp. L. – Goosefoot	–	1	–	–	–
Spergula arvensis L. – Corn spurrey	–	1	–	–	–
Prunus spinosa L. – Blackthorn	–	1	–	–	–
Galium sp. L. – Bedstraw	–	1	–	–	–
Eleocharis cf *palustris* (L.) Roem. and Schult – Common spike-rush	–	1	–	–	–
Hazelnut shell					
Corylus avellana L. – Hazel (nutshell) (g)	0.7	36.6	0.2	–	0.3
Charcoal					
Charcoal >2mm	XX	XXX	XXX	XXX	XXX
Other carbonised material					
Monocot. culm	–	–	–	–	X
Monocot. culm base	–	–	X	–	–
Indeterminate root base	–	–	X	–	–
Dicot. stem/root	–	–	–	–	X
Ericaceous charcoal	X	XX	X	–	XX
Ericaceous leaf	–	–	X	–	–
Vaccinium sp. stem	–	–	X	–	–
Fucoid algae	–	13	2	–	5
Root/tuber	–	2	–	–	–
Indeterminate carbonised organic	–	X	–	X	–

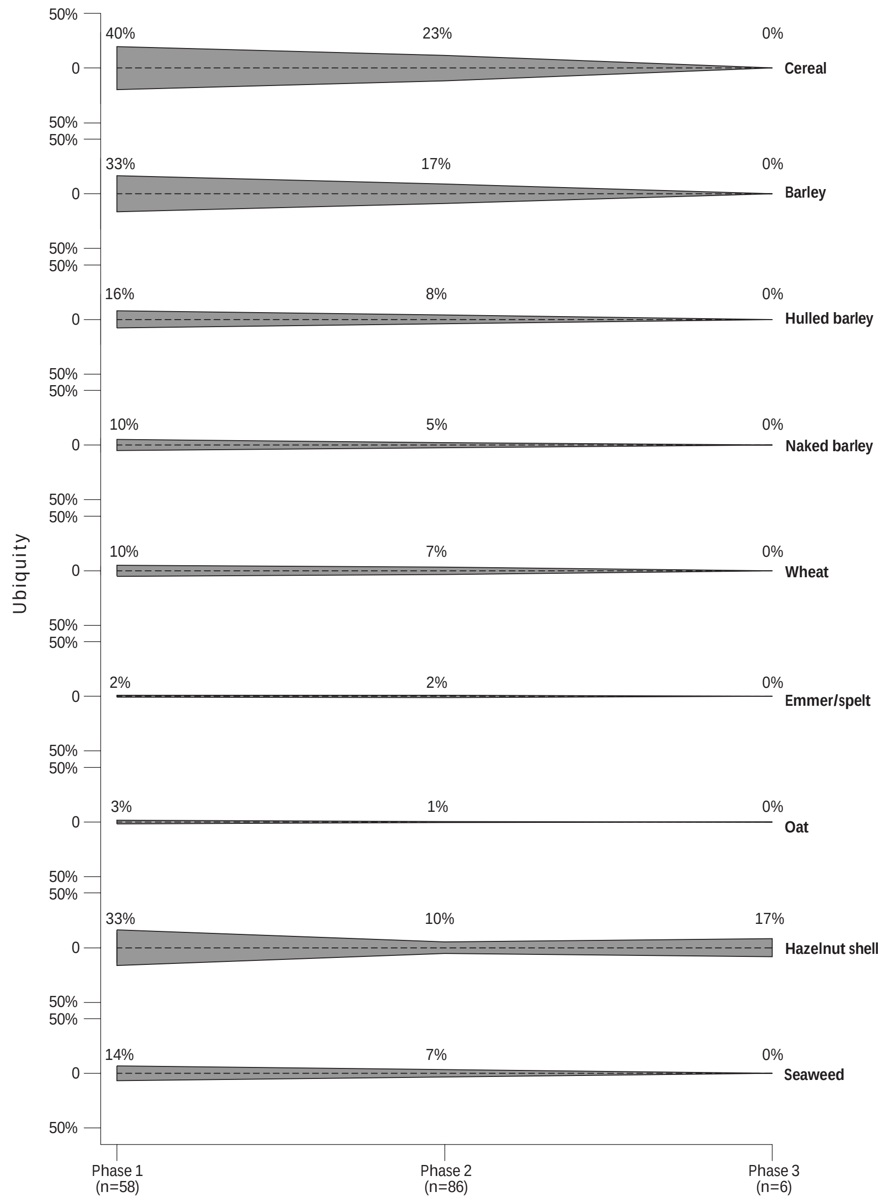

Illustration 7.11
Ubiquity scores for key taxa, arranged by phase. Phase 2/3 omitted due to intermediate nature and low number of sampled deposits

methods used are contained in the site archive.

A sub-sample of 30 deposits was also selected for charcoal identification and quantification based on assessment data concerning charcoal abundance, combined with a judgement on which of these deposits were of greatest archaeological interest (based on, for example, the presence of human skeletal and/or artefactual material). An attempt was made to investigate material from all phases, although only three samples with sufficient charcoal content could be identified from Phase 2/3 and only one from Phase 3.

7.6.3 Results

Tables 7.10, 7.12 and 7.15 show the results from all phased samples containing carbonised plant macrofossils. Tables 7.11, 7.13, 7.14 and 7.16 display the charcoal data from the 30 samples selected for full identification and quantification.

Phase 1: Late Bronze Age

Carbonised plant macrofossils

Samples were present from 58 contexts attributable to Phase 1. Cereal remains were recorded in 40% of the sampled contexts (illus 7.11). Most evidence of cereal remains was encountered in Block 1.2 (table 7.10), which appears to have been a focal point for the use and carbonisation of cereals during Phase 1. Within the Phase 1 contexts, the most commonly encountered cereal was barley (33% ubiquity), with hulled barley (16% ubiquity), including asymmetric grains (*Hordeum vulgare* var *vulgare*), being well represented. A lower concentration of naked barley (10% ubiquity), also including asymmetric grains (*Hordeum vulgare* var *nudum*), was recorded. The remains were well preserved in many instances and the identifications considered accurate. This implies that both hulled and naked barley varieties were being cultivated, perhaps being brought to the cave from multiple sources. A number of individual deposits contained a mixture of hulled and naked forms. The hulled trait in barley is controlled by a single recessive gene (Zohary and Hopf 2000: 60) and an alternative explanation to dual cultivation is that the crop at this time was genetically mixed, with both hulled and naked types present in the population. Some specimens did appear to be intermediate, perhaps being weakly hulled, and were recorded only as *Hordeum* sp.

Wheat (*Triticum* sp.) was recorded in 10% of deposits. Where identifiable, grain morphology was indicative of glume wheat (*T. dicoccum/spelta*), although only a single grain of this type was recorded (in Ia20, Block 1.2). Wheat was an important cereal across Britain, including northern Scotland, from the Neolithic period (eg Fairweather and Ralston 1993: 319–20).

Oat remains were an occasional occurrence (3% ubiquity). In the absence of diagnostic chaff elements, it is not possible to determine whether a wild or cultivated variety is represented. However, considering the period, it is most likely that they are present as weeds among other cereal crops. Evidence of regular oat cultivation in the region is not generally recognised until the Late Iron Age (cf Hastie 2010: 20), although oat has been recorded in much earlier assemblages, such as occasional specimens in the Neolithic archaeobotanical material from Balbridie, Aberdeenshire (Fairweather and Ralston 1993: 319).

Non-cereal remains comprised a number of seeds from wild plant taxa, including goosefoot (*Chenopodium* sp.), blackthorn (*Prunus spinosa*), corn spurrey (*Spergula arvensis*), dock (*Rumex* sp.), common spike-rush (*Eleocharis palustris*) and bedstraw (*Galium* sp.). Goosefoot and dock tend to prefer more fertile soils and may reflect the manuring of arable fields (though goosefoot is also frequently found on the upper stony beaches in the vicinity of the Sculptor's Cave; Janet Trythall pers comm). Common spike-rush could also have been gathered from heathland habitats with other heathland taxa, such as heather.

In addition to cereals were frequent carbonised fragments of hazelnut shell (*Corylus avellana*), which were recorded in 33% of deposits. In contexts Ia22a and Ia23d (Block 1.2), nutshell fragments were particularly abundant, and a number of others (Ia22, Ia23/27 and Ia27; Block 1.2) contained >50 fragments. The richer samples in particular are indicative of concentrated deposits resulting from the shelling and consumption of hazelnuts, with shells most likely discarded in the fire. A single sloe stone (*Prunus spinosa*) was recorded in Ia23c (Block 1.2) and could also represent gathered fruit that was processed and consumed at the site. However, the evidence of a single stone is inconclusive; it could have entered the cave with fuel resources (see charcoal, below).

The remains of ericaceous stems/charcoal (ie heather) were common (43% ubiquity) in the samples. This is likely to have been readily available in heathland habitats a small distance inland (see also charcoal, below). Heather makes a good fuel but can also be used for bedding and craft production (eg Dickson and Dickson 2000: 261).

Also frequently recorded were remains of seaweed, more specifically wracks (fucoid algae), which were present in 14% of deposits. This is perhaps to be expected considering the site's location. However, seaweed, including wracks, produces a thick acrid smoke when burned (Rachel Ballantyne pers comm) and, combined with the abundant charcoal evidence, it is unlikely that it was present as a significant proportion of the fuel resource. Seaweed could have been an incidental inclusion, associated with gathered marine resources such as shellfish (see section 7.5). Alternatively, it could have been deliberately added to fires, perhaps if the smoke had a role in funerary activities. Elsewhere in Scotland, such as Orkney, cramp (the product of burning seaweed) was frequently included in cist burials and cremations from the Late Neolithic to Middle Bronze Age (Photos-Jones et al 2007) and may have been a significant component in funerary rites. Seaweed ash may also have had an economic role, with records of its use for preserving food into the historic period (Summers 2015); this is, however, less likely in the present context.

A single deposit of probable cramp was present within the archive but was unstratified. The material was pale grey, amorphous and bubbled, though not vitrified. Within the matrix were numerous small stones (*c* 2–10mm), fragments of marine shell and occasional pieces of charcoal. Although it is not possible to be certain, this material might be modern, since it retained the smell of burning, which suggests the retention of volatiles that would be lost over prolonged burial. The historic seaweed burning industry in Scotland was concentrated in the west Highlands, the Hebrides and Orkney (Rymer 1974; Kenicer et al 2000) and does not appear to have had economic significance in the Covesea area. However, any burning event including seaweed could have led to the formation of such a deposit and it may simply represent remains from an informal fire within or just outside the cave mouth.

The frequent occurrence of cereal remains is a strong indication that cereals were regularly consumed within the Sculptor's Cave during the Late Bronze Age. Combined with evidence from hazelnut shell and faunal remains (section 7.4), it seems likely that food preparation and consumption activities were being undertaken within the cave itself. Block 1.2 yielded the bulk of the archaeobotanical remains, most likely indicating that this was the primary area for the carbonisation of plant material and its subsequent deposition.

Charcoal

Six samples from Phase 1 (Blocks 1.2 and 2.2) were targeted for analysis and were selected on the basis of their abundant charcoal content and their association with artefact-rich deposits, dated contexts or those containing human remains (table 7.11). A total of 586 charcoal fragments were identified, with a total weight of 109g. A wide range of taxa were represented: Scots pine (*Pinus sylvestris*), oak (*Quercus* sp.), birch (*Betula* sp.), alder (*Alnus* sp.), hazel (*Corylus* sp.), willow/poplar (*Salix/Populus* sp.), heather (*Calluna vulgaris*), apple/pear/hawthorn/whitebeam (Maloideae), gorse (*Ulex europaeus*) and holly (*Ilex aquifolium*). Birch was dominant by weight (52%) and fragment count (36%), excluding the 'indeterminate' portion of the assemblage.

Within the assemblage, numerous fragments of alder and hazel displayed strong ring curvature characteristic of small branches. Ring counts ranged from 3–15, although few fragments displayed an entire sequence. The exception to this pattern was oak, which routinely showed moderate to weak ring curvatures, indicating the cutting of larger branches and trunks. A number of the fragments also contained tyloses in the vessels, which is a feature of heartwood. In IIc23 (Block 2.2), fragments of hazel also showed moderate ring curvature, as did occasional fragments of alder, birch and Maloideae, suggesting that more than just slender branches were cut. However, overall, the evidence was weighted towards smaller branches and trunks than the felling of large trees.

Seasonality was difficult to assess as the small number of fragments with evidence of bark were diffuse or semi-ring porous types, where the distinction between early and late wood is less clear. In some instances, different fragments from the same sample were judged to have complete outer rings (autumn/winter) and partial outer rings (spring/summer). This could either reflect problems with preservation and recognition, particularly in relation to diffuse porous types, or the potential incorporation of gathered deadwood, which could have fallen in any prior season.

The wide range of taxa and the frequent strong ring curvature is not typical of driftwood, a potential source of wood for a coastal site, and it is more likely that the wood was gathered from inland habitats.

The range of taxa is indicative of four main habitat groups, which give an insight into woodland availability in the vicinity of the cave. Deciduous woodland is indicated by oak and hazel as well as Maloideae and holly. These taxa also all grow as part of hedgerow habitats. Together these make up 26% of the Phase 1

Table 7.11
Charcoal data from Phase 1 deposits

Taxon	Common name	Fraction	Weight (g) by block	
			1.2	2.2
Pinus sylvestris	Scots pine	>5mm	–	0.05
		2–5mm	–	–
		Total	–	0.05
Pinaceae	Pine	>5mm	–	–
		2–5mm	–	–
		Total	–	–
Quercus sp.	Oak	>5mm	1.2	0.2
		2–5mm	0.3	0.2
		Total	1.5	0.4
Betula sp.	Birch	>5mm	27.5	–
		2–5mm	2.6	–
		Total	30.1	–
Alnus sp.	Alder	>5mm	4.1	3.7
		2–5mm	0.1	0.2
		Total	4.2	3.9
Corylus sp.	Hazel	>5mm	7.9	1.5
		2–5mm	1.0	0.1
		Total	8.9	1.6
Salix/Populus sp.	Willow/poplar	>5mm	0.1	–
		2–5mm	–	–
		Total	0.1	–
Calluna vulgaris	Heather	>5mm	0.05	0.04
		2–5mm	0.08	0.04
		Total	0.1	0.08
Prunus sp.	Cherries	>5mm	–	–
		2–5mm	–	–
		Total	–	–
Maloideae	Apple/pear/hawthorn/rowan	>5mm	1.1	–
		2–5mm	–	–
		Total	1.1	–
Ulex europaeus	Gorse	>5mm	1.4	0.9
		2–5mm	0.07	0.1
		Total	1.5	1.0
Ilex aquifolium	Holly	>5mm	1.2	–
		2–5mm	0.2	–
		Total	1.4	–
Indeterminate diffuse-porous	–	>5mm	1.0	0.2
		2–5mm	0.8	0.06
		Total	1.8	0.3
Indeterminate	–	>5mm	16.0	0.07
		2–5mm	29.2	5.0
		Total	45.2	5.1
Total	–	**>5mm**	**61.7**	**6.6**
		2–5mm	**34.5**	**5.8**
		Total	**96.2**	**12.4**

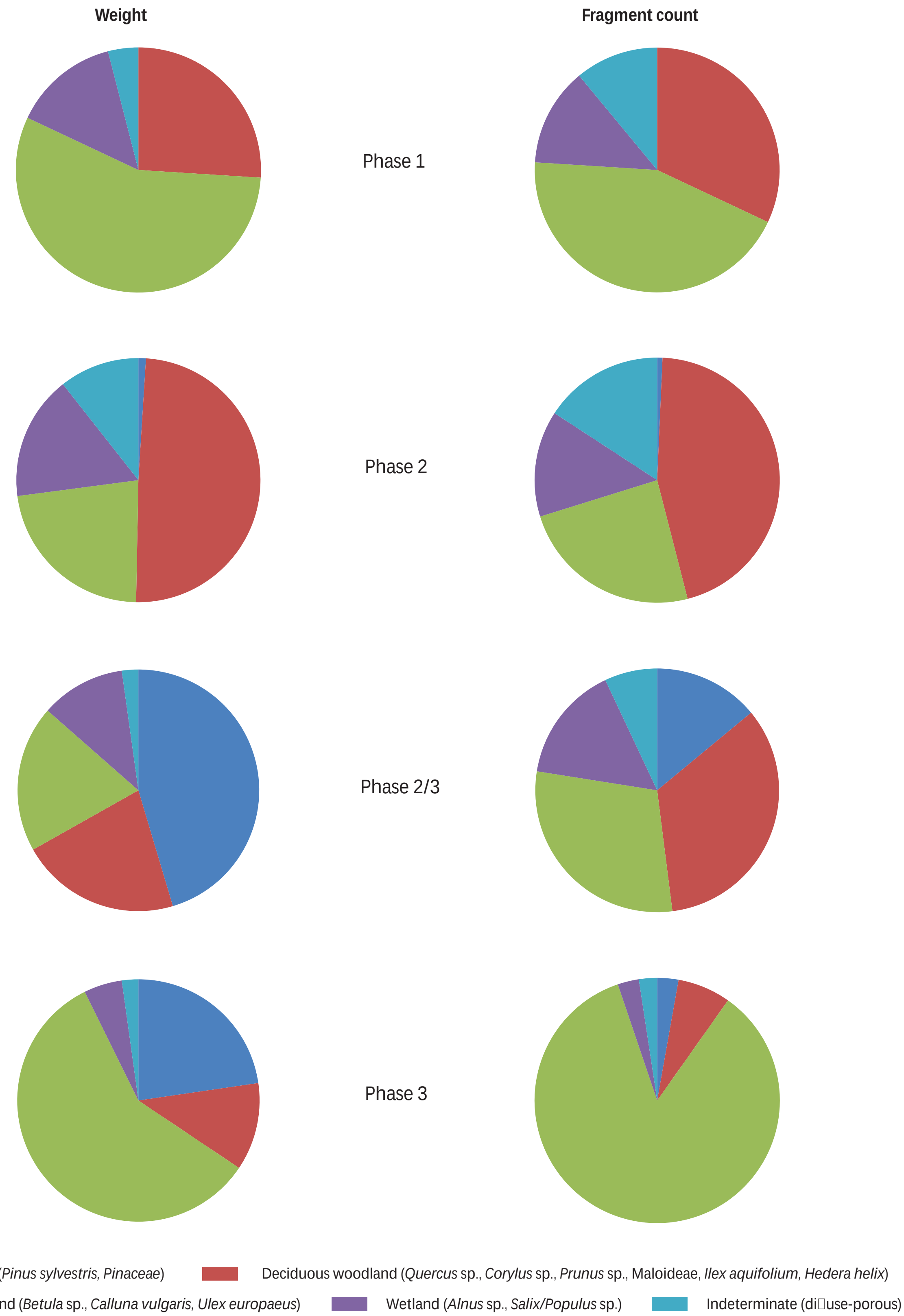

Illustration 7.12
Charcoal distribution by habitat group, based on weight and fragment count by phase. Conifer has been excluded from the Phase 1 charts owing to its minor presence within the assemblage

Table 7.12
Detailed results from Phase 2 deposits containing identifiable plant macrofossils. X: low, XX: medium and XXX: high abundance

Taxon	Number/abundance by block					
	1.3	1.4	1.5	1.6	2.5	2.6
Cereal grains						
Cereal NFI	27	–	–	5	76	–
Hordeum sp. – Barley	39	–	2	3	17	–
(*Hordeum* sp. – tail grain)	–	–	–	–	(1)	–
(*Hordeum* sp. – immature grain)	(4)	–	–	–	–	–
Hordeum vulgare var. *vulgare* – Hulled barley	21	–	–	–	14	1
(Hulled barley – twisted grain)	(1)	–	–	–	(2)	(1)
Hordeum vulgare var. *nudum* – Naked barley	3	–	–	2	–	–
Triticum sp. – Wheat	1	–	–	2	32	–
(*Triticum* sp. – tail grain)	–	–	–	–	(4)	–
Triticum dicoccum/spelta – Emmer/spelt wheat	–	–	–	1	–	–
Triticum dicoccum – Emmer wheat	–	–	–	–	2	–
Avena sp. – Oat	–	–	–	–	1	–
Cereal indeterminate detached embryos	–	–	–	–	2	–
Hordeum sp. – Barley rachis	–	–	–	–	2	–
Triticum dicoccum – Emmer wheat glume base	–	–	–	–	54	–
Triticum dicoccum – Emmer wheat spikelet fork	–	–	–	–	12	–
Triticum dicoccum/spelta – Emmer/spelt wheat glume base	–	–	–	–	32	–
Triticum dicoccum/spelta – Emmer/spelt wheat spikelet fork	–	–	–	–	12	–
Triticum dicoccum/spelta – Emmer/spelt wheat rachis	–	–	–	–	12	–
Triticum sp. – Wheat rachis	–	–	–	–	7	–
Triticum sp. – Wheat basal rachis	–	–	–	–	2	–
Triticum sp. – Wheat awn fragment	–	–	–	–	7	–
Cereal chaff						
Cereal indeterminate culm	–	–	–	–	1	–
Wild taxa						
cf *Rhynchospora* sp. Vahl. – Beak-sedge	–	–	–	1	–	–
Chenopodium sp. L. – Goosefoot	–	–	–	–	6	–
Caryophyllaceae indeterminate – Pink family	–	–	–	–	1	–
Rumex sp. L. – Dock	–	–	–	–	1	–
Plantago lanceolata L. – Ribwort plantain	–	–	–	–	1	–
Veronica sp. L. – Speedwell	–	–	–	–	1	–
Carex sp. L. – Sedge	–	–	–	–	1	–
Poaceae indeterminate – Grass (large)	–	–	–	–	2	–
Poaceae indeterminate – Grass (medium)	–	–	–	–	1	–
Poaceae indeterminate – Grass (small)	–	–	–	–	1	–
Hazelnut shell						
Corylus avellana L. – Hazel (nutshell) (g)	5.271	0.294	–	0.038	–	–
Charcoal						
Charcoal >2mm	XXX	XXX	XXX	XXX	XXX	–
Other carbonised material						
Monocot. culm	–	–	–	–	X	–
Monocot. culm base	–	–	–	–	–	–
Cyperaceae stem	–	–	–	–	X	–
Indeterminate root base	–	–	–	–	–	–
Dicot. stem/root	X	–	–	–	–	–
Ericaceous charcoal	XX	X	XX	XX	XX	–
Ericaceous leaf	–	–	–	X	–	–
Fucoid algae	8	–	–	–	10	–
Root/tuber	–	–	–	1	–	–
Indeterminate carbonised organic	–	–	–	–	X	–

Table 7.13
Charcoal data from Phase 2 deposits

Taxon	Common name	Fraction	Weight (g) by block					
			1.3	1.4	1.5	1.6	2.5	2.6
Pinus sylvestris	Scots pine	>5mm	–	–	–	–	–	0.05
		2–5mm	–	–	–	–	–	–
		Total	–	–	–	–	–	0.05
Pinaceae	Pine	>5mm	–	0.05	0.2	0.02	–	0.5
		2–5mm	–	–	0.02	–	–	0.1
		Total	–	0.05	0.2	0.02	–	0.6
Quercus sp.	Oak	>5mm	1.8	1.2	3.6	4.9	1.0	1.6
		2–5mm	0.6	0.3	0.9	1.9	0.4	0.3
		Total	2.4	1.5	4.5	6.8	1.4	1.9
Betula sp.	Birch	>5mm	–	0.02	0.4	0.4	0.7	0.05
		2–5mm	–	–	–	0.08	0.3	0.05
		Total	–	0.02	0.4	0.5	1.0	0.1
Alnus sp.	Alder	>5mm	2.8	0.3	1.9	2.3	3.6	0.5
		2–5mm	0.01	0.2	0.2	0.2	0.5	0.04
		Total	2.8	0.5	2.1	2.5	4.1	0.5
Corylus sp.	Hazel	>5mm	7.3	0.2	1.4	3.5	3.6	1.3
		2–5mm	1.5	0.02	0.4	0.6	0.3	0.2
		Total	8.8	0.2	1.8	4.1	3.9	1.5
Salix/Populus sp.	Willow/poplar	>5mm	0.06	–	0.4	2.1	–	–
		2–5mm	0.01	–	0.06	0.2	–	–
		Total	0.07	–	0.5	2.3	–	–
Calluna vulgaris	Heather	>5mm	0.8	0.5	1.1	1.9	0.6	0.1
		2–5mm	0.9	0.4	1.2	1.2	0.2	0.02
		Total	1.7	0.9	2.3	3.1	0.8	0.1
Prunus sp.	Cherries	>5mm	0.08	–	–	0.3	0.1	–
		2–5mm	–	–	–	0.04	–	–
		Total	0.08	–	–	0.3	0.1	–
Maloideae	Apple/pear/hawthorn/rowan	>5mm	0.1	–	–	–	0.1	–
		2–5mm	–	–	–	–	–	–
		Total	0.1	–	–	–	0.1	–
Ulex europaeus	Gorse	>5mm	4.0	–	1.2	2.4	0.4	0.5
		2–5mm	0.4	–	0.2	0.7	0.09	0.09
		Total	4.4	–	1.4	3.1	0.5	0.6
Ilex aquifolium	Holly	>5mm	0.2	1.4	0.2	0.4	2.6	0.1
		2–5mm	0.05	0.2	0.1	0.1	0.2	–
		Total	0.3	1.6	0.3	0.5	2.8	0.1
Indeterminate diffuse-porous	–	>5mm	1.3	0.2	1.0	2.0	0.3	0.07
		2–5mm	1.6	0.07	0.8	0.9	0.6	0.1
		Total	2.9	0.3	1.8	2.9	0.9	0.2
Indeterminate	–	>5mm	18.2	0.6	0.9	3.4	20.1	0.5
		2–5mm	56.0	6.8	12.1	34.8	59.0	5.4
		Total	74.2	7.4	13.0	38.2	79.1	5.9
Total	–	**>5mm**	**36.6**	**4.5**	**12.3**	**23.6**	**33.1**	**5.3**
		2–5mm	**61.1**	**8.0**	**16.0**	**40.7**	**61.6**	**6.3**
		Total	**97.7**	**12.5**	**28.3**	**64.3**	**94.7**	**11.6**

assemblage by weight (excluding the indeterminate specimens) and 32% by fragment count (illus 7.12).

Alder and willow are generally found in wetter areas such as the margins of streams, rivers and lakes, and other damp areas such as bogs and mires. Alder and willow/poplar constituted 14% of the charcoal remains from Phase 1 by weight and 13% by fragment count.

Heather is a heathland taxon, growing on acidic soils on moors, heaths and bogs. Birch is also common on the acidic soils of heathland, moors and bogs, comprising a scrub component in these areas. Gorse is quite an invasive species that can occupy a range of habitats but is often found on sandy or peaty soils, quite often in heathland areas (Stace 1997: 436). At present, large areas of gorse exist along the coast in the vicinity of the Sculptor's Cave. Birch, heather and gorse made up 56% of the Phase 1 charcoal by weight and 44% by fragment count.

Coniferous wood was very sparsely represented (0.05% by weight and 0.2% by fragment count) and cannot be considered to have made any significant contribution to the fuel resource during Phase 1.

Overall, the Phase 1 charcoal assemblage indicates that deciduous woodland taxa and heathland taxa made up the bulk of the fuel debris recovered from the deposits. Taxa such as oak and hazel are likely to have represented the best long-burning fuel woods and may have been preferentially sought. The prevalence of roundwood indicates a preference for smaller stems and branches. These would not only have been easier to cut or gather as fallen wood, but also easier to carry to the cave as bundles. The heathland taxa are likely to have grown in large open areas, readily accessible from the site, representing the most easily obtained fuel resource. Heather and gorse both burn fiercely and gorse in particular retains its deadwood, making a ready supply of kindling. It is possible that these taxa in part fulfilled the role of kindling in the fires lit within the cave.

Phase 2: Iron Age

Carbonised plant macrofossils

Eighty-six sampled deposits were represented from Phase 2, with 23% containing carbonised cereal remains (illus 7.11). Within the Phase 2 contexts, barley was most frequently recorded among the identifiable cereals (17% ubiquity), with both hulled (8% ubiquity) and naked (5% ubiquity) varieties present. Wheat remains were recorded in 7% of deposits, with glume wheat grains also identified (2% ubiquity). Emmer wheat (*T. dicoccum*) glume bases were identified in IIc13 (Block 2.5), suggesting that this was the primary wheat species present, most likely in both phases.

The largest collection of wild taxa was also found in IIc13, which included goosefoot (*Chenopodium* sp.), pink family (Caryophyllaceae), dock (*Rumex* sp.), ribwort plantain (*Plantago lanceolata*), speedwell (*Veronica* sp.), sedge (*Carex* sp.) and wild grasses (Poaceae) (table 7.12). Many of these taxa can occur as arable weeds and, together with the emmer wheat glume bases, indicate the presence of cereal processing by-products. The presence of processing by-products from de-husking and fine sieving is of interest in a cave context. At least some of the cereals consumed at the site were transported in a semi-processed state, with final processing taking place at the cave prior to consumption. It is likely that wheat at this time was stored as spikelets and that this material was probably drawn directly from stored products for use at the cave.

Hazelnut shell was recorded in nine contexts (10%) and was particularly prevalent in two Block 1.3 contexts: Ia17, where it was represented by 79 fragments, and Ic8, where it was represented by 275 fragments. As with the Phase 1 assemblage, high densities of hazelnut shell are likely to represent the disposal of shells from consumed nuts into hearths within or in the vicinity of the cave.

Heather (ericaceous charcoal) was frequently recorded and occurred in 45% of deposits. As noted above, heather could have had a number of roles, although it may have primarily functioned as an expedient, locally available fuel resource. Seaweed (fucoid algae) was present in four deposits and is unlikely to have had a significant role in the cave during Phase 2. Charcoal was quite well represented, most likely as the remains of spent fuel debris.

The number of plant remains recovered, in terms of both cereals and hazelnut shell, indicate that structured visits including food preparation and consumption were also a feature of the Iron Age use of the site.

Charcoal

A similar range of wood types was recognised in the 18 charcoal samples analysed from Phase 2 as from those of Phase 1 (table 7.13). The dominant taxon by count in Phase 2 was oak (*Quercus* sp.), accounting for 21% of the assemblage, while the most dominant taxon by weight was hazel, accounting for 22% of the assemblage (excluding the indeterminate category).

In the Phase 2 assemblage, the deciduous woodland grouping (oak, hazel, Maloideae, holly) accounted for 50% by weight and 45% by fragment count (illus 7.12). This is greater than the proportion calculated in the Phase 1 samples. Wetland taxa (alder, willow) made up 17% of the assemblage by weight and 14% by fragment count, which is comparable to the results from Phase 1. Heathland taxa (birch, heather, gorse) accounted for 23% by weight and 24% by fragment count, which is lower than the same group in Phase 1.

As in the previous phase, many of the fragments showed strong ring curvature characteristic of smaller diameter roundwood, such as small branches. Although complete sequences were again rare, ring counts ranged from 3–13. Fragments of oak and occasional fragments of hazel and alder also displayed moderate ring curvature, characteristic of larger branches and small trunks, but evidence of large trunks was limited. No reliable evidence for seasonality was identified.

These results indicate the persistent exploitation of deciduous woodland, scrub or hedgerow habitats during Phase 2. There does, however, appear to be a decline in the exploitation of heathland habitats for fuel resources. It is likely that these habitats remained available in the proximity of the site but that the fuel resource was less valued than previously.

Phase 2/3: Iron Age/Roman Iron Age

Plant macrofossils

Four contexts were sampled from Phase 2/3. The majority were devoid of carbonised plant macrofossils, although a small amount of fucoid algae was identified in IIb2 (Block 2.7).

Table 7.14
Charcoal data from Phase 2/3 deposits

Taxon	Common name	Fraction	Weight (g) by block
			2.7
Pinus sylvestris	Scots pine	>5mm	10.2
		2–5mm	–
		Total	10.2
Pinaceae	Pine	>5mm	0.9
		2–5mm	0.03
		Total	0.9
Quercus sp.	Oak	>5mm	2.3
		2–5mm	0.6
		Total	2.9
Betula sp.	Birch	>5mm	1.5
		2–5mm	0.02
		Total	1.5
Alnus sp.	Alder	>5mm	1.5
		2–5mm	0.04
		Total	1.5
Corylus sp.	Hazel	>5mm	1.5
		2–5mm	0.08
		Total	1.6
Salix/Populus sp.	Willow/poplar	>5mm	1.2
		2–5mm	–
		Total	1.2
Calluna vulgaris	Heather	>5mm	1.5
		2–5mm	0.4
		Total	1.9
Prunus sp.	Cherries	>5mm	0.05
		2–5mm	–
		Total	0.05
Ulex europaeus	Gorse	>5mm	1.3
		2–5mm	0.1
		Total	1.4
Ilex aquifolium	Holly	>5mm	0.2
		2–5mm	–
		Total	0.2
Hedera helix	Ivy	>5mm	0.4
		2–5mm	–
		Total	0.4
Indeterminate diffuse-porous	–	>5mm	0.4
		2–5mm	0.1
		Total	0.5
Indeterminate	–	>5mm	1.3
		2–5mm	6.1
		Total	7.4
Total	–	**>5mm**	**24.2**
		2–5mm	**7.5**
		Total	**31.7**

Charcoal

Three samples were examined for their charcoal content from Phase 2/3, which contained a similar range of taxa to the previous phases (table 7.14). The most significant difference from the preceding phases was the significant proportion of conifer charcoal, consisting predominantly of Scots pine, which constituted 45% of the assemblage by weight (illus 7.12). Oak had the highest fragment count (22%). Pine was represented by a number of large fragments in context IIb2. This high concentration in a single sample may reflect an opportunistically available log or tree, either in local woodland or as driftwood, although a more general increase in pine woodland in the local area is possible.

Maloideae was entirely absent, and ivy (*Hedera helix*) was only recorded as a single fragment in IIb2. Ivy is unlikely to have been gathered for fuel in its own right and may have been transported to the site on other wood cut/gathered for fuel. As such, it has been placed in the deciduous woodland category, since this is the most likely habitat from which it was obtained.

Deciduous woodland (oak, hazel, holly) is best represented in the Phase 2/3 deposits (33% by fragment count and 21% by weight). Heathland (birch, heather, gorse) was the next most abundant (30% by fragment count and 20% by weight), followed by wetland species (alder, willow), which represented 16% by fragment count and 11% by weight. Aside from the increased proportion of coniferous wood, the proportion of taxa is more comparable to Phase 1 than Phase 2. This shows that the presence of heathland habitats likely continued in the vicinity of the site but that less use of this resource for fuel was made in Phase 2.

Phase 3: Roman Iron Age

Plant macrofossils
Six sampled deposits were examined from Phase 3. All were devoid of carbonised plant macrofossils (illus 7.11). However, a range of uncharred material was recorded in posthole IIc7 (Block 2.8; table 7.15). Identifiable seeds included dock (*Rumex* sp.), henbane (*Hyoscyamus niger*), sedge (*Carex* sp.) and small grass (Poaceae). In addition were common remains of heather (Ericaceae) and crowberry (*Empetrum* sp.) accompanied by moss (Bryophyte) and wood. Anaerobic preservation appears to have been the mechanism for survival of this material, although whether this was through waterlogging or another means is uncertain. Preserved wood within this posthole likely represents surviving elements of the original post, although the material was too fragmentary and friable to allow for identification. The same could also be true for wood remains in posthole IIb7. These species are not what one would expect to grow in proximity to the cave and they would appear to have been deliberately brought to the site, presumably from nearby habitats. Whether this represents modern material brought into the cave or a specific set of preservation conditions in some of the upper layers of deposits is uncertain at present and the possibility that they are intrusive remains a possibility. Posthole IIb7 also contained uncharred wood and a fragment of uncharred hazelnut shell. Abundant charcoal was recorded in IIb7 and IIc2 (see below).

Charcoal
Three samples were examined for their charcoal content (table 7.16). The heathland group was dominant (58% by weight and 85% by fragment count), largely due to the concentration of heather charcoal in IIc2 (Block 2.8; illus 7.12). The fact that numerous taxa were present in Phase 3, as indicated by the varied remains from posthole IIb7, indicates that a range of habitats were still available for exploitation, although their extent compared to earlier periods is unknown. The prevalence of heather charcoal in IIc2 may either indicate that woodland resources were less easily accessible, at least in proximity to the cave, or that concern was only to gather readily available fuel. The heather charcoal could also have been gathered with peat or heathy turves, such as those comprising possible wall foundations in IIb14 (Block 2.5; illus 2.27).

The expedient gathering of heather as fuel may reflect less structured and shorter visits to the cave during this period, an interpretation supported by the absence macrofossil remains.

Table 7.15
Detailed results from Phase 3 deposits containing identifiable plant macrofossils. X: low and XX: medium abundance

Taxon	Number/abundance by block
	2.8
Wild taxa (uncharred)	
Rumex sp. L. – Dock	131
Hyoscyamus niger L. – Henbane	78
Carex sp. L. – Sedge	4
Poaceae indeterminate – Grass (small)	1
Charcoal	
Charcoal >2mm	X
Other carbonised	
Ericaceous charcoal	XX

7.6.4 Preserved stakes

Two preserved wooden stakes from an unstratified deposit within the East Passage were lifted in sediment blocks during the Shepherds' excavation. Both were pieces of hazel (*Corylus* sp.) roundwood, still with adhering bark. Both pieces had dried out and displayed shrinkage, distortion and cracking. One measured 0.03m in diameter and 0.1m in length and was set in a stakehole 0.04m in diameter. The second measured 0.02m in diameter, tapering to 0.01m, and 0.09m in length, and was set in a stakehole 0.03m in diameter, tapering to 0.02m. The latter appeared to have had a point formed at one end by two or three longitudinal cuts *c* 30–35mm in length. However, these were difficult to identify clearly due to the distorted nature of the dried-out wood. The poor preservation of the stakes meant that it was not possible to determine a count of growth rings that would provide an age at death or to examine the terminal growth ring to identify the season during which the wood was cut. Whether the stakes were cut as branches from hazel trees found in the surrounding area or were from coppiced trees in managed woodland somewhere inland is likewise impossible to determine.

7.6.5 Discussion

Preservation of carbonised plant remains within the cave deposits was good and it appears that the fine sediments and limited post-depositional disturbance helped to protect material from mechanical damage. Despite the unusual nature of the setting, there is good evidence for plant use, in particular the processing of cereals and gathered wild foods. Although evidence of cereals was most frequently encountered in Phase 1 deposits, there was good evidence for cereal processing activities in Phase 2, despite the overall less intensive deposition of cereal remains during this period. It appears that Iron Age use of the cave incorporated some apparently 'domestic' activities involving the processing of cereals; in at least one deposit (IIc13; Block 2.5) there was evidence for the de-husking of emmer wheat, which appears to have been brought to the site as whole spikelets, at least on some occasions. The other deposits of cereal remains are more characteristic of cleaned grain and may indicate that most cereals were brought to the site in fully processed form. Hazelnut shell is the clearest evidence of gathered wild plant foods, although other plants, less readily

Table 7.16
Charcoal data from Phase 3 deposits

Taxon	**Common name**	**Fraction**	**Weight (g) by block**
			2.8
Pinus sylvestris	Scots pine	>5mm	1.7
		2–5mm	–
		Total	1.7
Pinaceae	Pine	>5mm	0.8
		2–5mm	0.08
		Total	0.9
Quercus sp.	Oak	>5mm	0.5
		2–5mm	0.2
		Total	0.7
Betula sp.	Birch	>5mm	0.5
		2–5mm	0.06
		Total	0.6
Alnus sp.	Alder	>5mm	0.5
		2–5mm	–
		Total	0.5
Corylus sp.	Hazel	>5mm	0.5
		2–5mm	0.1
		Total	0.6
Salix/Populus sp.	Willow/poplar	>5mm	0.1
		2–5mm	0.01
		Total	0.1
Calluna vulgaris	Heather	>5mm	2.1
		2–5mm	3.7
		Total	5.8
Ulex europaeus	Gorse	>5mm	0.4
		2–5mm	0.1
		Total	0.5
Ilex aquifolium	Holly	>5mm	–
		2–5mm	0.04
		Total	0.04
Indeterminate diffuse-porous	–	>5mm	0.1
		2–5mm	0.1
		Total	0.2
Indeterminate	–	>5mm	0.2
		2–5mm	4.8
		Total	5.0
Total	**–**	**>5mm**	**7.4**
		2–5mm	**9.2**
		Total	**16.6**

preserved through carbonisation, may also have been consumed. A considerable proportion of the Phase 1 and 2 charcoal assemblages were composed of hazel, and it is possible that some of the nutshells became carbonised while still attached to branches burned as fuel. However, the occasionally large volumes of hazelnut shells present, for example, in Ia22a and Ia23d (Block 1.2, Phase 1) and Ic8 (Block 1.3, Phase 2), do suggest consumption.

Although the cave is unlikely to have been subject to long-term occupation, the carbonised remains indicate that visits were more than just brief stops. The remains of cereal processing and the likely preparation and consumption of meals, including cereal-based foods and hazelnuts along with meat and fish (see section 7.4), suggest longer periods of activity. Unfortunately, it is impossible to determine whether these were simple overnight stays or activity which lasted a few days.

During Phase 1, the carbonisation of cereals and hazelnut shells appears to have been concentrated in the West Passage, more specifically in deposits within Block 1.2. This may be reflective of the zonation of activity within the cave at this time, with cooking and consumption activities perhaps being restricted in their extent. During Phase 2, there appears to be a wider distribution of such activities in the cave, with carbonised cereal deposition in both the West Passage (Block 1.3) and the East Passage (Block 2.5) and carbonised hazelnut shell in the West Passage (Block 1.3). The more defined area of deposition during Phase 1 may be reflective of the more structured use of the cave in a funerary context at this time.

It seems that those using the cave brought much of the food resources they needed with them. Although the location of settlement and agriculture for those visiting the cave is unknown, it seems unlikely that this was in the immediate vicinity of the coast due to the likely extent of Loch Spynie during prehistory, which would have cut this area off from inland settlement further to the south (see section 7.2). Transport of people and resources to the site by boat across the loch is likely to have enabled the movement of larger items, such as volumes of grain, and minimised the distance over which they needed to be carried.

Charcoal remains, which included a significant proportion of smaller-diameter roundwood, indicate that fuel wood was gathered locally. During Phases 1 and 2, much of the wood was from deciduous woodland taxa, particularly oak and hazel. These are good fuel woods and may have been preferentially selected. This material could have come from woodland margins or hedgerow-type habitats and could have included a proportion of fallen branches that were easily gathered. Also well represented were more scrubby heathland taxa in the form of birch, heather and gorse. Open heathland habitats currently exist close to the coast around the Sculptor's Cave, including large areas of gorse, and this may also have been the case in prehistory. Gorse and heather in particular make good kindling and may have fulfilled this role at the cave.

A more minor group comprised trees of wetland habitats (alder and willow/poplar), probably derived from the formerly extensive wetlands around Loch Spynie (see section 7.2). The use of pine was less structured and appears to have been opportunistic, perhaps targeting driftwood, with the bulk of the evidence from a single Phase 2/3 deposit (IIb2).

Interestingly, there is no evidence of decline in the exploitation of woodland taxa between Phases 1 and 2. The transition between the Late Bronze Age and Early Iron Age is noted for climatic decline from *c* 800–750 BC (eg Brown 2008), which could have had a significant impact on woodland and tree cover. However, there is little evidence of this from the Sculptor's Cave charcoal assemblage. If there was any decline in local deciduous woodland, it would appear that those using the cave continued to preferentially select predominantly high-quality fuel wood, in particular oak and hazel. Evidence of two preserved stakes within the cave demonstrates that hazel was also used structurally, although whether this was standard practice is difficult to confirm on the basis of just two surviving examples.

Present-day Moray has favourable climate and soils for arable cultivation, including wheat and barley. It is likely that this was also true during the Late Bronze Age and that agriculture would have been successful, subject to careful management and soil improvement. Published sites with contemporary evidence for cereal cultivation are rare in the Moray area; an exception is Grantown Road, Forres, where hulled barley was the dominant crop, though the assemblage was poorly preserved (Roberston 2016). A number of sites in Sutherland have also been excavated and sampled. Bronze Age deposits at Lairg (Holden 1998) showed a focus on naked six-row barley, with only occasional hulled-type grains identified. No other cereal types were identified in the deposits, dated to 2000–1000 BC. The settlement at Lairg, Sutherland, is somewhat further north and in an area more marginal to arable cultivation, which could explain the narrower range of cultivated taxa in its assemblage, in particular the absence of wheat. Cereals from Upper Suisgill, also in Sutherland (van der Veen 1985), were dominated by naked six-row barley but were accompanied by a small number of hulled barley grains, wheat and oat. The range of cereals at Suisgill is broadly comparable with those from the Sculptor's Cave except for the predominance of naked barley over the hulled variety at the former.

Excavation of a roundhouse at Navidale, Sutherland, dated to 1400–1200 BC, produced limited evidence of barley and hazelnut (Dunbar 2007: 146). The structure lay in a Bronze Age agricultural landscape which appears to have fallen into decline due to the effects of soil erosion and depletion. This may have been a common occurrence in similar upland areas in Sutherland (ibid: 164–5). Moray, however, is more fertile, with a more favourable climate for agriculture, and Iron Age settlements such as Birnie (eg Hunter 2010b) are a clear indication that successful settlement and agriculture continued here throughout the Iron Age. Hulled barley was dominant in Late Bronze Age and Iron Age contexts at the extensive settlement of Kintore, Aberdeenshire, though naked barley appears also to have been grown as a separate crop (Holden et al 2008: 252). A roundhouse at Oldmeldrum, Aberdeenshire, produced an assemblage dominated by naked barley, accompanied by rarer hulled barley and occasional oats (Hastie 2010).

Something many of the above sites have in common is the predominance of naked barley during the Bronze Age, which is often considered not to have been replaced by the hulled variety until the Iron Age (eg Hastie 2010: 20). However, at the Sculptor's Cave, there is a predominance of the hulled variety from the Bronze Age onwards, which may suggest that it was more regularly selected for consumption, at least in this context. On the other hand, the remains from Kintore (Holden et al 2008: 252) show that some contemporary arable economies were dominated by the hulled variety, perhaps as a dual crop in parallel with naked barley. This indicates that there may have been variability in the selection of crops by different settlements/communities based on local conditions or cultural preference. Potential data from more closely associated settlements in the future may help refine understanding of the local arable economy that formed the subsistence of those using Sculptor's Cave, but, at present, the dominance of hulled barley is unusual within the regional Bronze Age setting. Persistent evidence of cereal remains and hazelnut shells in the Phase 2 deposits demonstrates continued organised visits to the cave at this time.