

Excavation of a burnt mound and associated structures at Ceann nan Clachan, North Uist

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ABSTRACT

The excavations at Ceann nan Clachan were the first undertaken on a burnt mound in the Western Isles. The burnt mound was found to have formed around a small, boulder-footed, sub-oval structure which lacks the usual indicators of domestic activity. This building was subsequently replaced by a cellular structure which, while having some evidence for occupation, was seemingly designed for some specific, non-domestic purpose. The excavated structures appear to date to around 770–400 cal BC, a period which is otherwise poorly represented archaeologically in the Hebrides. They differ significantly from structures found associated with burnt mounds elsewhere in Scotland, notably Orkney. Yet the cellular building is closely paralleled by a recently excavated building at Cladh Hallan in South Uist, suggesting that it represents a recurrent Hebridean form. Various possible functions for the site are considered, such as cooking place, sweat-lodge or smoke-house, and its significance for our wider understanding of the Early Iron Age in the Western Isles is reviewed.

INTRODUCTION

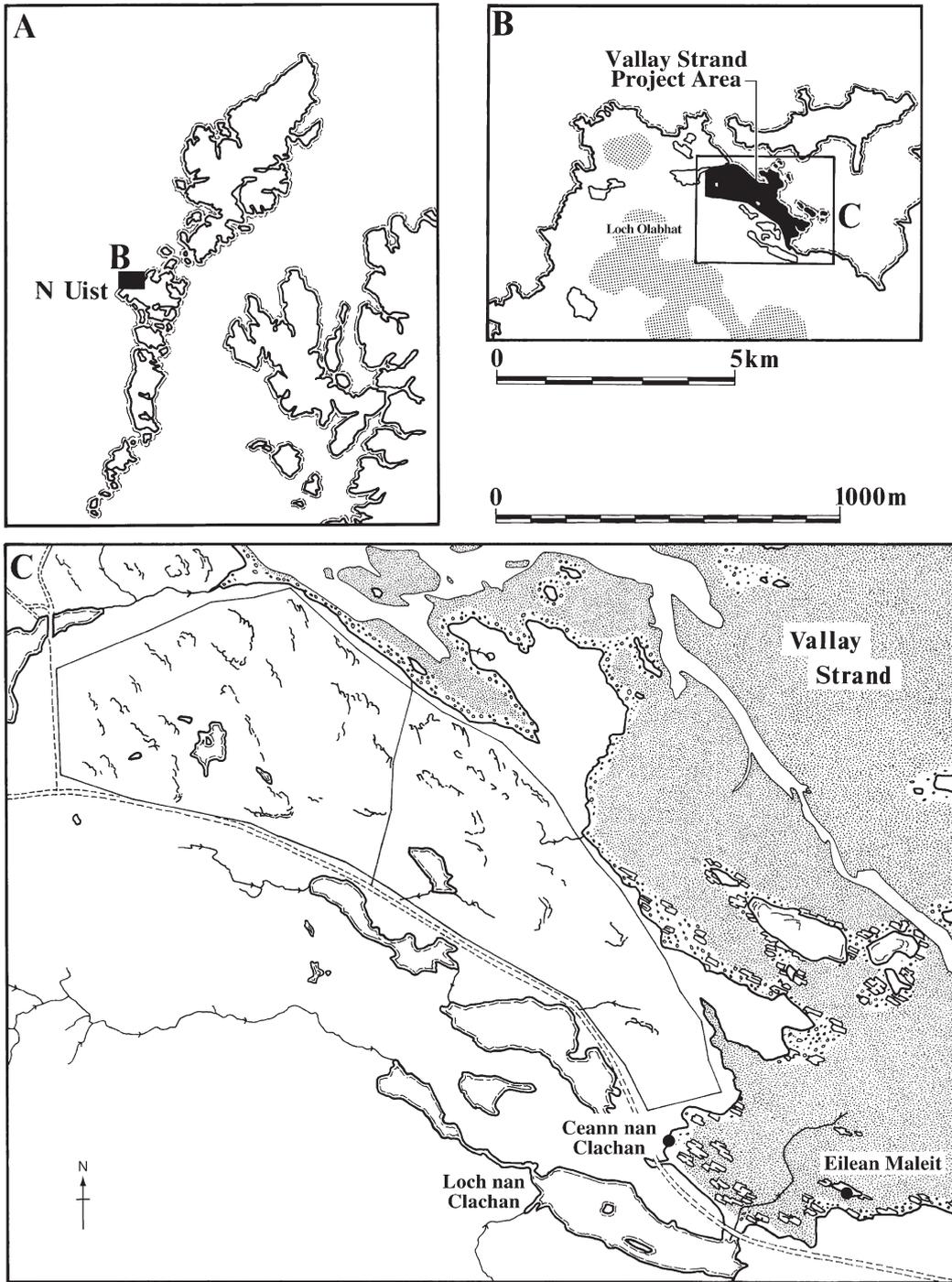
The burnt mound and associated structures at Ceann nan Clachan, North Uist, were excavated during three brief field seasons from 1995–7. The site was first identified during field-walking associated with the excavation of the nearby Eilean Maleit in 1995 (Armit 1998). Prior to excavation it was visible as a crescentic, grass-covered mound, of which the north-west side was being severely eroded by tidal action. Inspection of the eroding section revealed substantial quantities of burnt stone, along with evidence for associated structures (Armit & Braby 1995).

The site lies on an area of peat-covered, eroding coastline on the south side of the

inter-tidal Vallay Strand, close to the outflow from Loch nan Clachan (illus 1). The area is dissected by numerous water channels and tidal pools subject to ongoing tidal erosion and re-working (illus 2). This is a relatively modern environment, caused by the distinctive development of the Vallay Strand machair system (Armit 1992, 10). The degree of modification of the environs of Ceann nan Clachan is such that little can be said from surface observation regarding its environmental context or local topography during prehistory. An unquantifiable proportion of the site had already been lost to tidal erosion prior to its discovery, and high tides continue regularly to scour both the beach section and surface of the site. The area lost may have included around

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ILLUS 1 Location map (Based on the Ordnance Survey map © Crown copyright)



ILLUS 2 Photograph showing the present environment of the site

half of the original area of the burnt mound, as well as substantial elements of the excavated structures.

At the time of its discovery in 1995, Ceann nan Clachan was one of only three burnt mounds reported in the Western Isles, along with Sidhean Tuath (Fojut 1994) and Oban Trumisgarry (Braby, Battley & Clarke 1996), both also located in North Uist. A preliminary section-recording exercise immediately following the discovery of the site demonstrated the presence of associated structures and deposits yielding later prehistoric pottery (Armit & Braby 1995). The perceived rarity of this type of field monument in the Western Isles, combined with the presence of associated structures, marked this as a potentially highly significant site and the magnitude and immediacy of the erosion threat prompted a successful application to Historic Scotland for funds to support a rescue excavation. The work was carried out over two years as part of the Vally

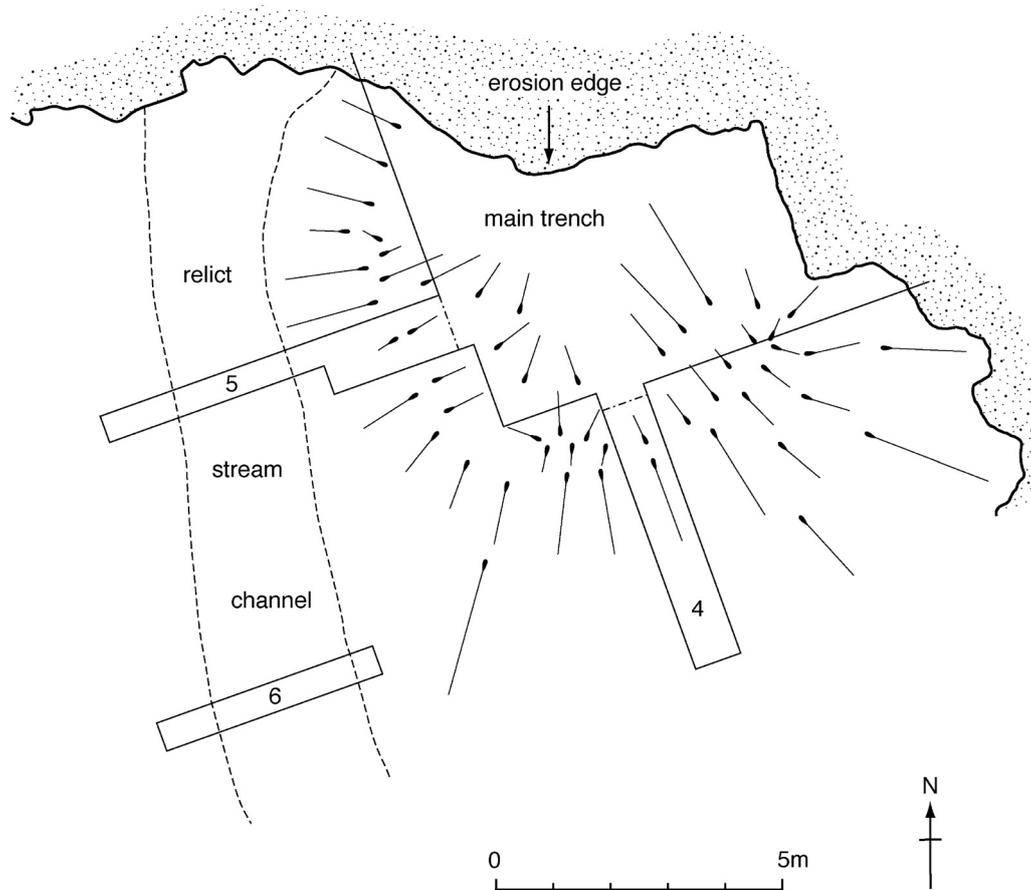
Strand Project (Armit & Dunwell, forthcoming), itself an off-shoot of the Loch Olabhat Project (eg Armit 1990).

Following excavation, the trenches were back-filled and re-turfed. A rough boulder revetment was constructed along the main erosion face in an effort to reduce direct tidal erosion. It is not anticipated, however, that this limited protection will prevent the complete loss of the site to tidal erosion in the medium term.

EXCAVATION RESULTS

Three phases of human activity were identified, along with evidence for a buried soil that pre-dated all of the excavated structures. The phases can be defined as follows, although it should be noted that there is no evidence for any breaks in the continuity of the site's use:

Phase 0: pre-mound soils;



ILLUS 3 Pre-excavation plan and location of trenches

Phase 1: the construction of an oval, boulder-footed building (Structure 1) and the formation around it of a burnt mound;

Phase 2: the demolition of Structure 1 and the construction of a cellular building (Structure 2);

Phase 3: the abandonment and limited re-use of part of the cellular building (Structure 3).

In the following summary of the excavation results, context numbers are given in brackets for particularly significant features and deposits. These enable the reader to cross-refer between the various sections of the report and the illustrations (as well as enabling direct cross-reference to documents in the site archive). Context numbers, however, are not routinely given for all contexts mentioned or illustrated: fuller detail can be found in the Data

Structure Reports contained in the site archive (Armit & Braby 1996; 1997)

The excavation area was originally divided into a series of numbered trenches, several of which were amalgamated as the excavation increased in scale during 1997 (Armit & Braby 1996; 1997). For the purposes of this report, Trenches 1–3 have been combined and will be described as the ‘main trench’ (illus 3).

The various specialist reports have been edited from fuller versions contained within the site archive. These generally contain additional detail, tabulated and quantified information, and details of the specific methodologies followed. An additional report detailing the results of routine soil analyses from the site has been prepared by Dr M Cressey and is lodged in the site archive.

PHASE 0: PRE-MOUND DEPOSITS

Fragments of a peaty soil (illus 7) were preserved at the base of the excavated deposits of Structure 1 (241) and under the burnt mound (210). These were sampled for soil micromorphological analysis (see below), and pollen analysis (unfortunately these deposits proved too heavily disturbed for pollen analysis). Micromorphological analysis supported the field interpretation that these deposits were the disturbed remnants of a pre-mound soil. The area under the mound itself was heavily disturbed, while that under the floor of the associated buildings (241) was rather better-preserved (illus 7).

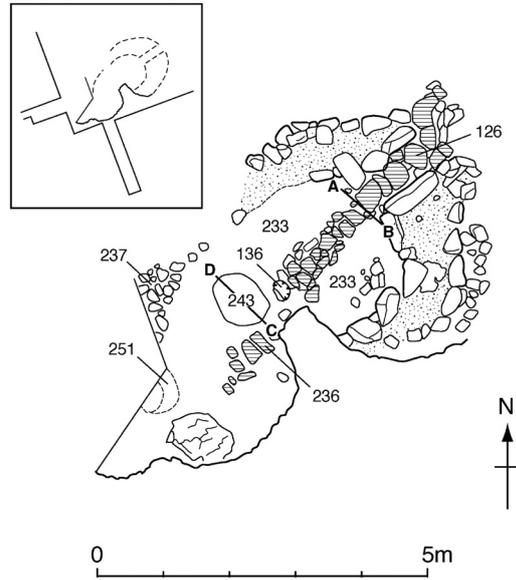
PHASE 1: THE BURNT MOUND AND ASSOCIATED STRUCTURE

Structure 1

Structure 1 was a boulder-footed building of apparently elongated oval form, founded directly on the pre-mound peaty deposits (241), and partly onto bedrock (illus 4, 5). It appears to be the primary construction on the site and thus to pre-date the formation of burnt mound.

The frontal (north-east) portion of the structure was the best preserved, and this contained a north-east-facing entrance (illus 5). The central part of the north wall had been lost to tidal erosion, but a heavily disturbed fragment of the west portion remained. The south portion of walling had been entirely removed in antiquity, however, as bedrock was exposed in this area (assuming that our extrapolation of the wall alignment is broadly correct). The contours of the burnt mound, which apparently formed around Structure 1, provide some evidence for its original dimensions. The structure would thus have had maximum external dimensions of 7.5m NE/SW by 5m NW/SE, and inner dimensions of approximately 5m by 2.5m.

The north-east end of the building was sufficiently well-preserved to provide some information on the mode of construction. The surviving wall was some 1m wide with an earthen core revetted by internal and external boulder alignments. There was little evidence for the former presence of coursed walling, and it seems probable that the stone component of the wall was never of any great height. The most likely reconstruction may be of a turf-built wall with rough alignments of boulders



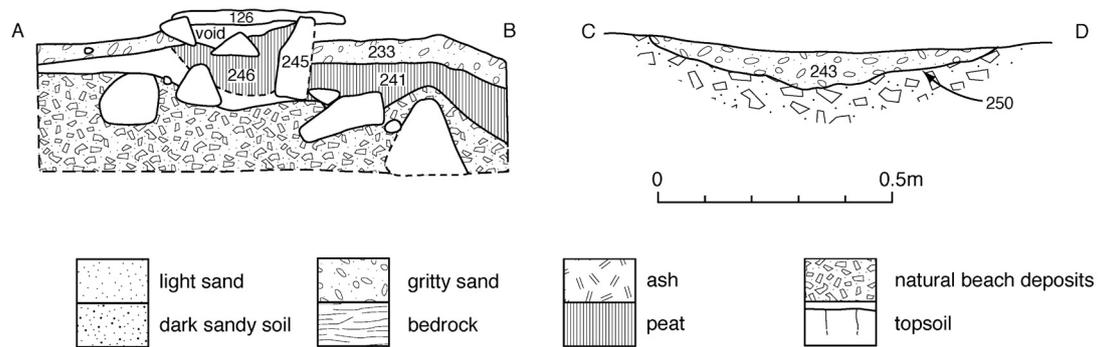
ILLUS 4 Plan showing Phase 1 features

along the base, internally and externally, to provide stability and aid drainage. The wall widened markedly at the entrance to around 1.5m, although the entrance passage was extremely narrow at between 0.4–0.55m at ground level (illus 5). The entrance passage appears to have been partly dug into the natural subsoil (illus 12).

A series of features lay within the projected interior of Structure 1 and appear to relate to its use (in that they clearly pre-date the later Structure 2). It included a well-paved drain which ran from the central part of the interior, out through the entrance passage, turning north just outside the entrance (illus 4 & 6); the covering slabs of this drain (126) also formed the paving of the entrance passage (illus 5) and stood proud of the old ground surface, the floor having apparently been 'levelled up' with a gritty floor deposit (233). A small, shallow pit, conceivably a post-hole for a roof support, lay at the inner end of the drain (136). A further area of paving (236) and a shallow pit or hollow (243) also occupied the central area of the building, the former apparently extending the alignment of the drain covering. A small, discrete patch of ash survived in what was probably the extreme west part of the interior (251), suggesting the former presence of a hearth (illus 12). Micromorphological analysis indicates that this ash dump comprised at least six depositional 'events' (Carter, below). The position



ILLUS 5 Structure 1 from the north-east

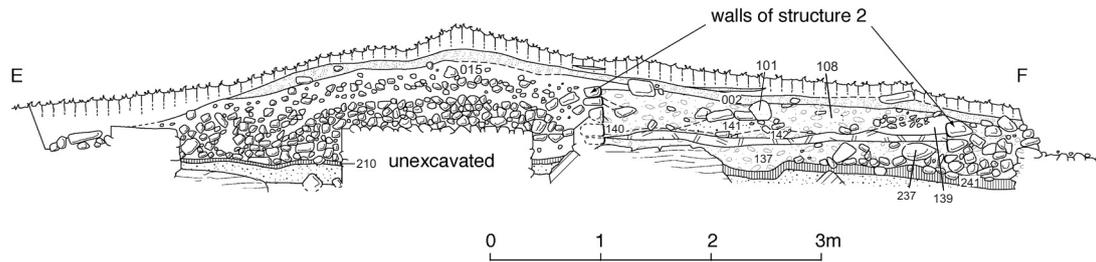


ILLUS 6 Structure 1, sections

of the adjacent walling to the north and bedrock to the south of the ash dump suggest that it may have been recessed into the far south-west wall of the building, in much the same way as the later Structure 2 (see below): however, this is no more than a possibility as the wall did not survive in situ at this point.

The natural peaty soil (241) below the floor of the building was shown by micromorphological

analysis to have dried and cracked (see Carter, below, sample points indicated on illus 12), probably through exposure to heat within the building, and microscopic deposits of sand had become incorporated into these cracks. This would appear to suggest that a sand floor had been laid over the natural soil within the structure. This putative sand floor did not survive in this part of the interior, suggesting that the structure had been thoroughly



ILLUS 7 Section across Trench 4, showing the structure of the burnt mound and its relationship to Structure 2

cleared out, hence the absence of Structure 1 occupation deposits in the section recorded in illus 7. However, the north part of the interior had apparently been levelled with a thin gritty silt deposit (233: illus 6) which may have been the preserved fragment of a similar laid floor. The laying and routine cleaning-out of sand floors is consistent with observation of similar practices at the better-preserved (and rather later) buildings in the Cnip wheelhouse complex in Lewis (Armit, forthcoming a & b). Routine cleaning of the structure would explain the very limited presence of floor deposits (essentially the localized ashy dumps in the west part of the structure, 247, 248 & 251), which are perhaps best interpreted as 'terminal deposits' relating to the final episode of use (cf Armit, forthcoming a). It would also suggest that features such as the shallow pit or scoop (250: illus 6) may have been significantly truncated.

Following its abandonment, the structure had apparently been substantially dismantled, re-exposing bedrock in the west portion of the building's foot-print. Localized deposits of burnt mound material appear to have spread across the walls and interior of Structure 1 during this demolition process (eg context 237 indicated on illus 7).

The burnt mound

The crescentic burnt mound as identified from field observation effectively enveloped Structure 1. Its composition was investigated by means of two trenches, 4 and 5, which cut across it approximately N/S and E/W respectively (illus 3).

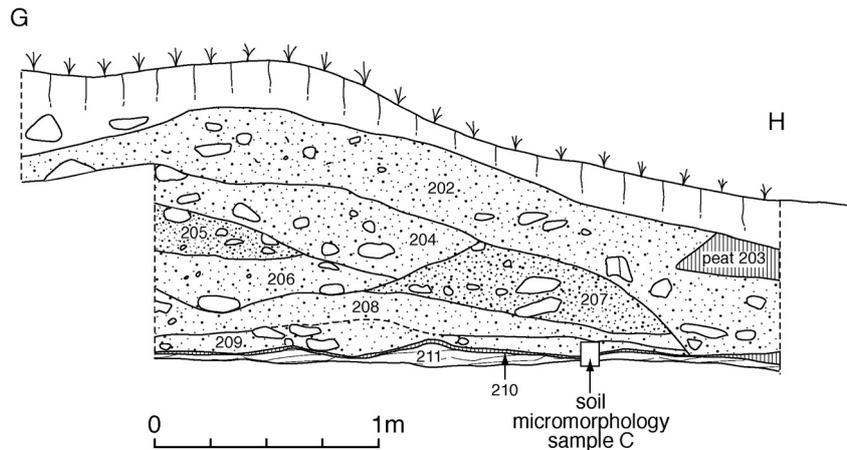
The clearest indication of the formation and structure of the mound came from Trench 4 (illus 7). The burnt mound was founded directly on the former peaty ground surface (210) already described (see also soil micromorphology report

below). It comprised a voided core of heat-fractured, angular gneiss pebbles overlain by similar deposits containing a rather greater soil content. The mound seems to have been spread to around 4m in width, although it was truncated by the walls of Structure 2. The in situ deposits of burnt material reached a height of c 1m above the buried soil.

All the burnt stone sampled from the mound was Lewisian gneiss. There is thus no evidence from Ceann nan Clachan for the preferential selection of non-gneiss sources, as has been observed by Russell-White in the context of 'burnt mound material' found on Western Isles settlement sites (1990, 87). Visual inspection of the mound material produced no obvious evidence for the residue of fuels used to heat the stone, although post-excavation sample processing and micromorphological analysis yielded evidence for the remnants of blanket peat used as fuel.

This mound material was sealed by a grey silty deposit (002) which overlay the whole site and seems not to be derived from the mound material specifically. The burnt mound was also clearly truncated by the wall of Structure 2, showing that its formation pre-dated the construction of this Phase 2 building. It was not possible to determine the exact relationship of the burnt mound to Structure 1 in the excavated section as the fabric of the building did not survive in this area (having presumably been removed in the building of Structure 2). However, there was no indication of burnt mound material under or within the structural components of Structure 1, suggesting that the mound formed around the building after its construction.

Trench 5 provided a second section through the mound. This revealed that the burnt mound had been built on the edge of a former natural stream



ILLUS 8 Section across part of Trench 5, showing the structure of the burnt mound and soil micromorphological sampling location

channel, into which it had subsequently eroded. Although the lowest deposits could not be fully excavated due to waterlogging, the broad sequence of deposition was reasonably clear. The in situ elements of the burnt mound surviving in Trench 5 (illus 8) produced a complementary picture of its formation to that derived from Trench 4. In general the deposits here had a higher soil content and more visual evidence of discarded fuel waste (especially in the lowest deposits, 208 & 209). The lack of the voided, unstructured burnt stone piles seen in Trench 4 might suggest that this part of the mound formed more slowly. It was this part of the mound that was sampled for soil micromorphological analysis (Carter, below): the sampling location is indicated on illus 8.

To the west of the burnt mound was a series of deposits filling the former stream course. The upper part of the channel was filled by a peaty deposit, at the base of which lay a deposit of boulders (145) which appears to have collected in the channel as it infilled. This deposit may represent an eroded outer revetting of the burnt mound. Such a revetting would presumably have been necessary to prevent the structureless burnt mound material from simply slumping into the channel as the mound formed.

A programme of coring was conducted around the burnt mound in order to determine the local palaeotopography, and particularly to identify the course of the stream channel identified in Trench 5. The results supported the interpretation that the site was established on the east bank of a now-relict

stream channel, and demonstrated that otherwise the immediate vicinity was relatively level. Trench 6 was excavated to confirm the course of the former stream channel (illus 3). The channel was identified but no deposits were excavated. Samples taken at various points for possible palaeoenvironmental analysis proved unsuitable.

The burnt mound and its associated structure: nature and function

The near-complete absence of pottery, the lack of coarse stone tools and the very low density of plant macrofossil remains (Church, below) from Structure 1, mark it out as distinct from most excavated later prehistoric settlements in the Western Isles. This might support the hypothesis that this was a specialist structure, the use of which involved the heating of the stones which were then deposited to form the burnt mound. It is clear from both the plant macrofossil and soil micromorphological analysis, however, that the stones which formed the burnt mound were not heated on the same hearth that produced the ash dumps excavated in Structure 1. The carbonized fuel associated with the burnt mound material suggested that the stones had perhaps been heated in a pile of peat fuel, in which there was little control over oxygen flow, while the internal ash dumps had come from a well-tended fire, probably from a small hearth within Structure 1. Even the fuel used was different: the stones had been burnt using weakly humified blanket peat

(Church, below), while the internal ash derived from a damp grassland turf (as well as, apparently, seaweed, indicated by the marine mollusc remains). The internal hearth was also associated with an (albeit tiny) assemblage of burnt bone, which might suggest that it was used for food preparation, and a concentration of quartz which might suggest in situ quartz-working (Finlayson, below).

The blanket peat used to heat the stones had clearly been imported onto the site, as it differed significantly from the local, well-humified peaty soil below the burnt mound (Church, below). This might suggest that the gathering of fuel for the activities which generated the burnt mound involved the cutting, drying and transport of significant quantities of blanket peat from some distance. By contrast, the internal hearth may have been a rather more expedient affair, using whatever fuel source was to hand, including seaweed, which is not otherwise represented as a fuel source on the site. In this respect it is worth bearing in mind that, given the rigorous floor cleaning detectable during the usage of Structure 1, the hearth, with which most of the excavated internal deposits were associated, may have been a 'terminal' deposit associated with the abandonment of the structure or a brief hiatus between the disuse of Structure 1 and the construction of Structure 2. The internal hearth may not, therefore, be relevant in interpreting the activities associated with the formation of the burnt mound.

As the stones of the burnt mound were not heated on this hearth, this was presumably done outside the building. Any evidence for a pyre or hearth associated with the heating of the stones must either lie beyond the excavated area or, more likely, in the area lost to tidal erosion.

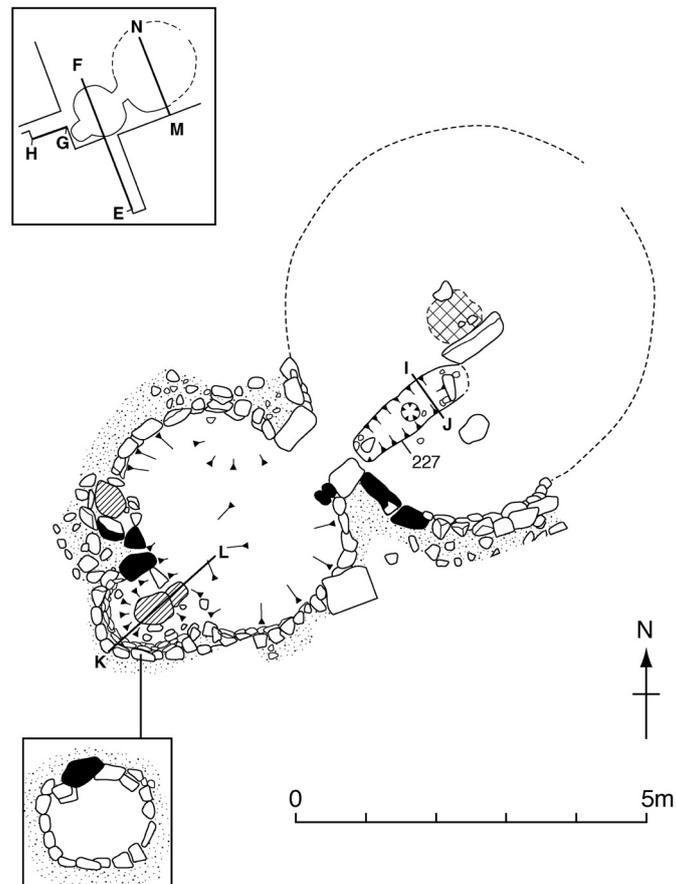
In the absence of any tank or other water-retaining structure, or even of a pit which could have held a timber-lined tank, it is difficult to argue that Structure 1 and, by extension, the associated burnt mound, were associated with the large scale cooking and consumption of meat, as is often suggested for burnt mounds. It is always possible that a free-standing wooden tank could have decayed entirely without trace, but this seems a rather unlikely option in an area where timber was scarce. Of course, it may be that Structure 1 was a simple shelter, while the main activities of cooking and consumption occurred outside, in areas now lost to tidal erosion. However, the buildings associated with burnt mounds in the Northern Isles, for

example, Liddle (Hedges 1975) and Tangwick (Moore & Wilson 1999), are clearly dominated by large internal tanks, suggesting that, if Ceann nan Clachan had a similar function, we should expect to see evidence of a tank inside the structure. Both of these sites are rather earlier in date than Ceann nan Clachan (see below) and this, together with the geographical distinction, should make us wary of attempts to impose a function based on the northern evidence, although a late literary reference suggests some post-medieval tradition of cooking meat by a similar technique in the West Highlands (Burt 1754, 271–2).

Instead, the presence of an apparently roofed structure, of small size, and with a particularly small and narrow entrance, might favour the interpretation of the site as a sauna or sweat-lodge, an interpretation of certain burnt mounds proposed by Barfield and Hodder (1987). In this scenario, the stones would presumably have been heated on an external fire, then brought into the confined structure, where water would be applied to them to create steam. The drain in the floor would act to lead the condensing water back out under the threshold of the building. The cracked and burnt stones would then have been dumped around the building to form the burnt mound. The small internal hearth would thus be a 'terminal' deposit, not directly associated with the primary use of the building.

PHASE 2: THE CELLULAR BUILDING (STRUCTURE 2)

Structure 2 was a cellular building revetted into the burnt mound and overlying the denuded remains of Structure 1. The largest of the three cells was the substantially eroded north-east cell which, if reconstructed as roughly circular, may have been some 5m in diameter with a central hearth (illus 9). Assuming this calculation to be broadly correct, some 25% of the floor area of this largest cell survived. The north-east cell was connected by a narrow entrance to an oval middle cell measuring some 3.2m N/S by 2.2m. This in turn gave access to the tiny west cell, around 1m in internal diameter. A small niche, some 0.8m in diameter, opened onto the west arc of the middle cell. The main axis of the building ran roughly NE/SW across the hearth in the north-east cell, through the connecting entrance to the middle cell and into the south-west cell.



ILLUS 9 Plan showing Phase 2 features (inset of Structure 3 plan)

The walls of the various cells were neatly formed of relatively small angular coursed stones (illus 10) revetted into the remains of the burnt mound (illus 7). The wall survived up to eight courses high in places, and to a height of around 1m. It seems likely that all of the walls had been robbed to some degree. Larger stones flanked the connecting entrance between the middle and north-east cell. An orthostat formed the north-west side of the opening into the south-west cell, and it is possible that another had been removed from the south side where there was a slight gap running from top to bottom of the surviving walling (illus 11). Alternatively this gap could have been intended to accommodate some form of shuttering or 'fire-guard'. The south part of the surviving walling of the small niche was formed of two upright slabs (illus 11). The constricted area between the north-east and middle cells was formed

of double-faced walls packed with mixed material deriving in part at least from the burnt mound and perhaps from the cleared debris of Structure 1.

There is no indication of the position of the entrance to the building, although if it lay on the main axis of the building it would have faced north-east within the eroded portion of the north-east cell. There was no evidence for the roofing, although it may very well have been erected on timber rafters set behind the revetted walls, as is commonly suggested for revetted prehistoric buildings in the Western Isles.

The north-east cell

The truncated remains of the north-east cell were dominated by a central hearth which reused the paved entrance passage of Structure 1 (illus 12).



ILLUS 10 Structure 2 from east

That these basal features within Structure 1 were clearly visible to the builders of Structure 2 suggests that there was no significant gap between Structure 1 falling into disuse and the construction of Structure 2. Indeed Structure 1 may have been dismantled specifically to make way for Structure 2. The soil micromorphological evidence (Carter, below) provides further support for the lack of any significant hiatus between the two episodes of use of the site. The central hearth was used throughout the life of Structure 2, its latest deposits (004) being associated with the formation of the uppermost occupation deposit (119, see illus 12).

Within the north-east cell, a gritty sand deposit (129/137) appeared to have been laid as a floor or levelling deposit across the remains of Structure 1 (with the exception of the stone features re-used as the Structure 2 hearth). Micromorphological analysis noted the close resemblance of this material to deposits within the burnt mound, suggesting that parts of the mound may have been quarried to provide flooring material (Carter, below). Subsequently a series of occupation deposits formed,

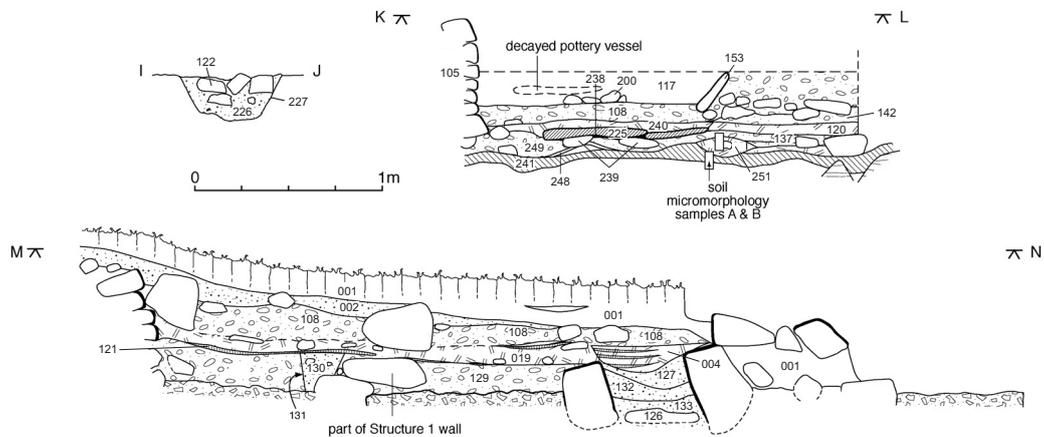
made up of mixed ash and silt, presumably associated with the use of the north-east cell. Underlying the upper of these occupation deposits (119), but apparently cutting through the lower deposit (121), was a stone-packed slot (227) incorporating a post-hole at its base. This may have formed the foundation for a timber partition running NE/SW across the north-east cell, and terminating at the hearth, but its stratigraphic position suggests that it was not primary to the occupation of the structure (illus 9, 12). There may, of course, have been other internal divisions and features within the eroded parts of the east cell. A possible post-hole (130, 131: illus 12) was also recorded in the eroding section.

The middle cell

The levelling/laid floor deposit (129/137) extended through the connecting entrance and into the middle cell, where it lay to a depth of around 0.2m in some places. Within the cell it was again overlain by a distinctive thick, dense red/black ash deposit



ILLUS 11 Detail of the south-west cell of Structure 2



ILLUS 12 Structures 2 and 3, sections

(120, 134), which covered the entire floor of the cell to a depth of around 0.05m, and banked up around the parts of the sides of the cell to an even greater depth (although not on the portion recorded on the section, illus 7). A gritty sand deposit (142)

appeared to have been laid to level up this ash layer across the south-west and central part of the cell, and over this were the slight remains of possible stone furniture or partitions (101, 141), and further occupation debris banked up around the walls (139,

140) which lack the obvious ash content of the lower deposits (120/134).

The south-west cell

The levelling deposit (129/137) did not extend into the south-west cell, the deposits of which lay directly upon disturbed burnt mound material (249). This cell contained two superimposed hearths (illus 12). The lower comprised an area of disturbed paving of smaller angular stones, with indications of a former kerb of small edge-set stones (238, 239). This was overlain directly by a second hearth comprising two large slabs (225) covered with peat ash (240).

The niche

The levelling deposit (129/137) also did not extend into the niche off the west arc of the middle cell. The floor of this niche was around 0.1m lower than the rest of the building and was covered by a single paving slab (illus 9) which was integral to the walling of the cell and laid directly over burnt mound material. The fill of the niche comprised a brown peaty soil (229).

Structure 2: nature and function

The remains from Structure 2 are complex and suggest that each of the cells was used in a rather different way. The north-east cell was dominated by a central hearth and may have had internal timber partitions, although its limited survival inhibits interpretation. It is the area most immediately suggestive of 'domestic' activity. Aside from its paved niche, the middle cell seems to have been fairly featureless, at least initially, and subject to the accumulation of substantial ash tips. It seems reasonable to link these accumulations of ash to the hearths which all but filled the small south-west cell, both of which were stratigraphically contemporary with the main ash formation in the middle cell (illus 12, K–L, 120 & 240). The siting of a hearth in a separate cell at one end of the building seems without parallel in a Hebridean context and may suggest some specialist function for the building, although there is little to suggest what that function might be. The recessing of the hearth in this way, and the peculiar nature of the entrance to the south-west cell which contained it (the flanking orthostat and vertical gap in the walling visible in illus 11), might suggest that it was intended that the hearth

should be sealed off in some way. This may have facilitated the drying or smoking of produce, although there is nothing in the excavated evidence, including the copious ash dumps, to suggest what that produce might have been. Nothing in the debris from Structure 2 suggested that the activity within the building was necessarily associated with the formation of the burnt mound.

The different use-patterns of the various cells are reinforced by the curious and clearly non-random distribution of artefactual material within the building. For example, the surviving portion of the north-east cell contained 63 potsherds (including 21 from the hearth), the middle cell only nine sherds (seven of which were from the secondary laid floor, 142) and the south-west cell contained none (Johnson, below). Three sherds came from the small niche off the middle cell. Some 112 fragments of quartz and one flint flake came from the north-east cell, while none at all derived from the remainder of the building (Finlayson, below). The north-east cell thus contained 84% of the pottery and 100% of the flint and quartz recovered from Structure 2. Coarse stone tools were absent from all surviving elements of the structure.

These patterns are reflected in the distribution of ecofacts. Small fragments of burnt bone were associated with hearth deposits in the north-east cell, but there was no bone whatsoever from the multiple superimposed hearths of the south-west cell.

Overall, the evidence from Structure 2 is sufficient to identify it as a structure built to serve some special function, but insufficient to determine what that function might be. If its predecessor, Structure 1, was indeed some form of sweat-lodge, then it is possible that Structure 2 served a similar purpose. If so, it was clearly designed to operate in a rather different way. One possibility is that direct heat from the fire in the south-west cell was used to generate a high temperature in the middle cell. When the desired temperature was reached, the south-west cell was then shuttered off and the middle cell used as a dry sweat-bath. A separate flue/chimney for the south-west cell should presumably be envisaged for any such reconstruction of this building (otherwise the middle cell would simply fill with smoke).

Other options should also be considered. The processing, perhaps smoking or drying, of food

products is one possible alternative. As with Structure 1, however, the absence of a tank suggests that the interpretation of Structure 2 as a cooking or feasting site is unlikely.

PHASE 3: ABANDONMENT AND REUSE

A gritty, compact deposit (108) extended across the various cells of Structure 2, sealing all earlier deposits, its extent and uniformity suggesting perhaps that it represents the remains of collapsed turf or thatch roofing material.

Structure 3, the latest construction on the site, was formed by blocking off the south-west cell with a low orthostatic revetment dug into context 108 (illus 9 & 12). The new walling associated with Structure 3 was a simple revetment of upright slabs (153) set against the fill of Structure 2, and around five courses of the original south-west cell walling survived above the base of these slabs. The effect was to create a shallow walled pit some 1m in diameter. Deposits within Structure 3 comprised a peaty deposit (117) overlying a layer of burnt stones (200). The peaty deposit contained the remains of a possibly complete pottery vessel placed rim downwards but squashed flat and heavily distorted by post-depositional processes (see Johnson, below).

Following the disuse of Structure 3, a uniform blanket of topsoil and turf overlying a leached topsoil (002/102/202) formed across the whole surviving area of the site. It is not clear whether the robbing of stone from Structure 2 occurred shortly after it fell into disuse or in more recent centuries. Nothing of the structures remained visible on the ground surface prior to excavation, however, other than the distinctive crescentic burnt mound.

FINDS

Given the volume of excavated deposits, the finds assemblage from the site was distinctly impoverished by Hebridean standards, and comprised only a small pottery assemblage, a meagre collection of quartz and a single flint flake. This may support the view that the site was, in all its phases, a specialized activity site. The absence of coarse stone tools, such as querns and hammer-stones, otherwise ubiquitous on later prehistoric Hebridean settlements, is particularly noteworthy, although the absence of bone artefacts may simply be a factor of local soil conditions (unburnt bone did not survive on the site).

POTTERY

M Johnson

Introduction

A total of 390 sherds, fragments and crumbs of hand-made prehistoric pottery, weighing 3.442kg, was recovered from the site, including a quantity of unstratified material, largely from eroded beach deposits (although the overall size of the assemblage is distorted by the presence of 170 sherds of a single vessel, SF9). This translates into a minimum of 12 vessels if only the diagnostic sherds are taken into account, and increases to approximately 34 vessels if the plain body sherds are included. The assemblage is generally very poorly preserved, suffering from a great deal of abrasion, and flaking and cracking due to damage by tiny rootlets. The site was also regularly inundated by high tides, which has compounded the problem.

The majority of the pottery was recovered from deposits relating to Structures 2 and 3, with the remainder coming from unstratified deposits. Only one sherd of pottery (SF25 from context 233) was recovered from a context relating to Structure 1.

Form, fabric & distribution

The fabric is typical of Hebridean prehistoric and later pottery, being manufactured from local clays and thus having very similar components. The main constituents of the fabrics derive from Lewisian gneiss, namely quartz/quartzite, mica, feldspars, and occasionally other rock and mineral fragments, and these elements are either already present within the clays or can be added during manufacture through crushing gneiss rocks. The fabrics are very gritty, containing a large amount of small (<3mm) quartz inclusions, with stones up to about 12mm across occasionally recorded. There is no evidence for organic temper but the high degree of abrasion may prevent its identification.

Due to the poor preservation and generally small size of the sherds, there is very little evidence for forming techniques. There are several sherds which show tongue-and-groove construction (eg SF1, 13 & 16), and, where the sherd surface survives well enough, there is evidence of finger marking and smoothing by self-slipping with water. Colour and friability indicate a short firing in a simple pit kiln or bonfire.

TABLE 1
Catalogue of pottery assemblage

Pot no	Context	Description
1	Topsoil (001)	1 thick, rounded rim sherd, rim almost completely worn away. Possible tongue-and-groove construction.
2	Topsoil (001)	4 featureless body sherds.
3	Structure 2 hearth deposits (004)	7 featureless body sherds.
4	Structure 2 hearth deposits (004)	6 featureless body sherds. Very soft and friable, all belong to the same vessel.
5	Structure 2 hearth deposits (004)	8 featureless body sherds.
6	Upper fill of Structure 2 (108)	1 basal angle, unable to determine form as basal plate is missing and outer surface is very poor. Thick charred residue on interior.
7	Upper fill of Structure 2 (108)	12 featureless body sherds.
8	Unstratified walling in erosion face (110)	1 featureless body sherd.
9	Peaty material in Structure 3 (117)	Complete vessel, which has been squashed flat and largely survives as a featureless lump, along with about 170 poorly preserved sherds and fragments heavily damaged by roots. A number of rim and base sherds are distinguishable, comprising a rounded, in-turning rim and a slightly footed base which has pinching along the exterior edge. Some sooting on surfaces. Tongue-and-groove construction. It would have probably been a simple barrel shape.
10	Peaty material in Structure 3 (117)	1 square, flat-topped rim sherd, bucket-shaped vessel. Diameter at least 28cm. Charred residue on exterior.
10	Upper fill of niche in Structure 2 (213)	1 flat-topped, upright rim sherd, bucket-shaped vessel. Diameter c28cm. Most of inner surface missing. Charred residue on exterior.
11	Floor deposit in E cell of Structure 2 (119)	3 decorated body sherds belonging to the same vessel, all sherds join. Decorated with an incised zigzag with dots placed in the angles. Probably forms a continuous pattern running around the vessel. Some rough wiping on exterior may have been intended to have a decorative effect. Charred residue on exterior.
12	Floor deposit in E cell of Structure 2 (119)	1 base sherd. Unable to determine form as only a little of the wall survives and the surfaces are very worn.
13	Floor deposit in E cell of Structure 2 (119)	1 rounded rim sherd, tapers slightly, and 1 body sherd which belongs to the same vessel. Slight sooting on exterior. Tongue-and-groove construction.
13	Beach erosion (124)	1 pointed rim sherd, slight internal bevel, and 20 body sherds. Diameter c19cm. Sooting on exterior.
13	Beach erosion	3 everted rim sherds with slight internal bevel at tip, broken along angled joint with vessel's body, and 11 featureless body sherds. Possibly has a very worn cordon in the rim angle. Rim sherds join, diameter c19cm. Charred residue on exterior. One rim sherd conserved with Paraloid B72.
14	Floor deposit in E cell of Structure 2 (119)	1 base sherd, slightly footed, pinched on the exterior wall. Inner surface missing. Slight sooting on external wall.
15	Floor deposit in E cell of Structure 2 (119)	12 featureless body sherds.
16	Ash deposit in middle cell of Structure 2 (120)	2 featureless body sherds. Tongue-and-groove construction. Sherds join
17	Floor deposit in E cell of Structure 2 (121)	8 featureless body sherds.
18	Stony fill of partition feature in E cell of Structure 2 (122)	1 featureless body sherd.
19	Beach erosion (124)	50 featureless body sherds.
20	Floor make-up of Structure 2 (129)	1 sub-rounded upright rim sherd, and four fragments. Slight sooting on exterior. Sherds join.
21	Secondary laid floor in middle cell of Structure 2 (142)	7 featureless body sherds.
22	Burnt stone deposit within Structure 3 (200)	2 featureless body sherds.

23	Upper fill of niche in Structure 2 (213)	2 featureless body sherds.
24	Slot in E cell of Structure 2 (226)	2 featureless body sherds.
25	Laid floor in Structure 1 (233)	1 rounded, simple rim sherd, bucket-shaped vessel.
26	Unstratified	2 featureless body sherds. Sherds join.
27	Old ground surface (210)	1 featureless body sherd.
28	Below Topsoil (002 or 017)	1 very thick, flat-topped rim sherd, expanded on each side. Slight sooting on both surfaces.
29	Below Topsoil (002/017)	4 featureless body sherds.
30	Unstratified	13 featureless body sherds. Very soft and friable.
31	Unstratified	3 featureless body sherds
32	Unstratified	6 featureless body sherds.
33	Unstratified	1 rounded rim sherd, slightly bowl-shaped. Thick charred residue on exterior.
34	Unstratified	14 featureless body sherds.

A number of the sherds have charred organic residues adhering to one or more of their surfaces, indicating that the vessels had been probably used as cooking pots, and the residue from the interior of a base sherd (SF6) was analysed and radiocarbon dated. The residue analysis suggested a substance derived from sheep as the most likely source (Taylor, below). A number of sherds also have iron pan encrusted on their surfaces, as a result of post-depositional processes.

The vast majority of the assemblage consists of plain coarse body sherds, with only 17 sherds, representing 12 vessels, exhibiting any diagnostic features, plus an apparently in situ squashed vessel (SF9: illus 13). This means that any statements about the character of the assemblage, and the search for parallels, are necessarily circumspect. A further problem with this assemblage is its poor state of preservation which makes it very difficult to determine rim diameters, and very little profile survives from many of the vessels.

Of the sherds exhibiting diagnostic features, the vessels consist of simple bucket or barrel-shaped vessels with rounded or flattened rims. The rim sherds represent only six different vessels. Two (SF1 & 25: illus 13) are simple rounded rims, while one (SF10: illus 13) has a square flat-topped rim, each from bucket-shaped vessels. SF20 is a sub-rounded upright rim, again probably from a bucket-shaped vessel. SF33 (illus 13) appears to have come from a bowl with a rounded rim. The slightly more unusual rim sherd of SF28 – a thick, flattened rim expanded on each side – is from a vessel of unclear profile. Five of the rim sherds belong to SF13 (illus 13) and consist of an everted rim with a slight internal bevel at the tip. Some of these rims have an angled break

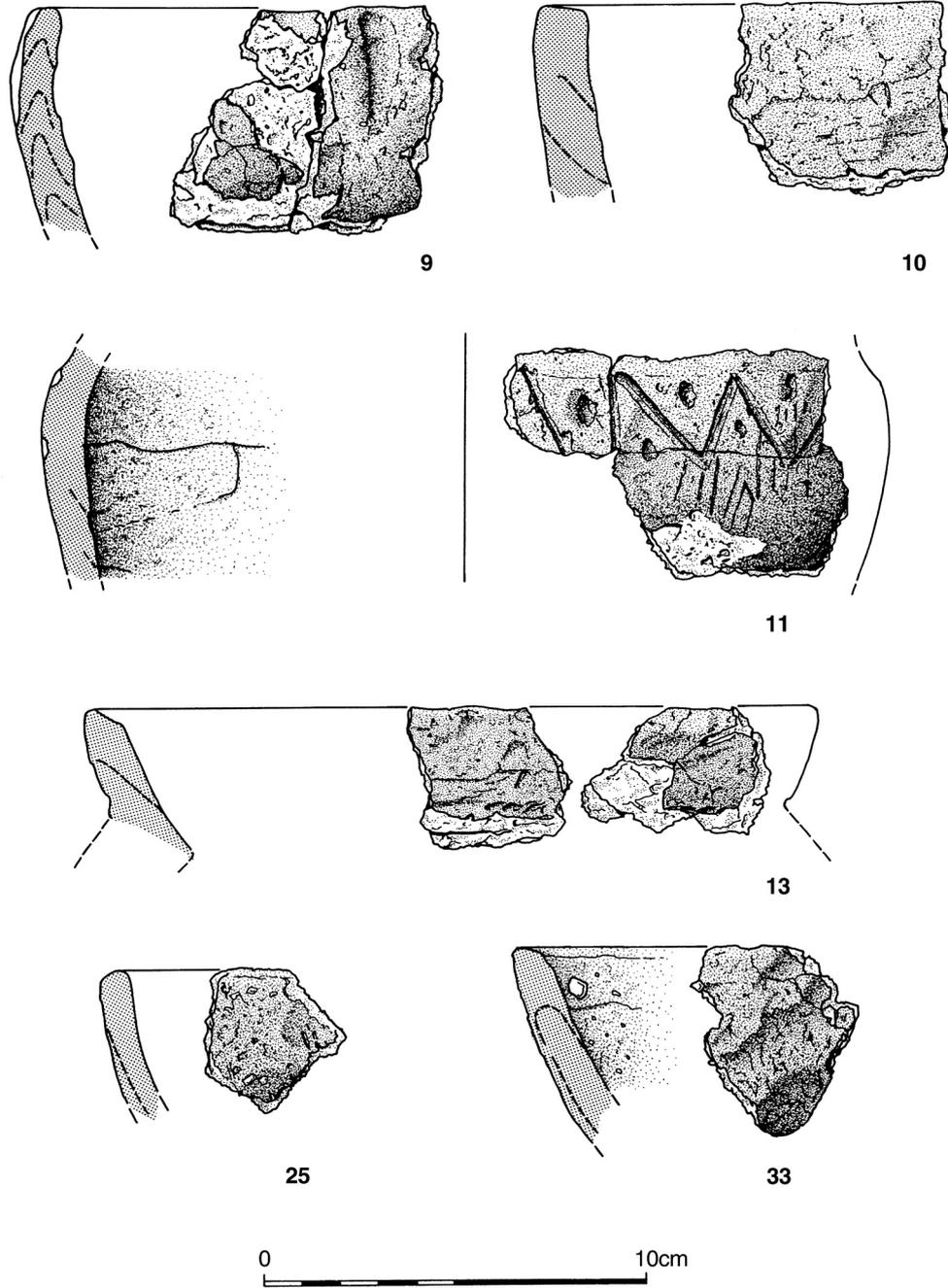
where they would have been attached to the body of the vessel. There are indications of a very abraded cordon set into the angle of the rim, but as this is where the sherds have broken it is very difficult to be sure. The only rim diameters measurable were 19cm (SF13) and 28cm (SF10), which are fairly large vessels (both illus 13).

Three base sherds were found, of which two are so abraded that their form cannot be determined (nos 6 & 12), while the third has a slight foot and shows pinching along the exterior wall at the junction with the base plate (SF14).

One of the vessels was found in a mass in context 117 (SF9) and appears to have been deposited as a complete vessel. It was apparently placed rim down and has been squashed flat and, due to water action, has largely solidified into a featureless lump, along with a quantity of poorly preserved sherds and fragments heavily damaged by roots. A number of rim and base sherds are distinguishable, comprising a simple rounded, inturning rim (illus 13) and a slightly footed base which has pinching along the exterior edge. It is impossible to physically reconstruct this vessel, but it would have probably been a simple barrel shape.

There are also three decorated sherds from a single vessel (SF11) found in context 119 (the upper occupation deposits in the north-east cell of Structure 2). The motif is an incised zigzag with large dots placed in the angles, which would probably have formed a continuous pattern around the circumference of the vessel (illus 13). The outer surface has also been roughly wiped in a manner which may have been intended as decorative.

Only one sherd derived from contexts associated with Structure 1 (SF25), and the vast majority of



ILLUS 13 Pottery

the pottery came from contexts associated with Structure 2. Much of this assemblage is undiagnostic, featureless body sherds, but does include the decorated sherds described above (SF11), three base sherds (SF6, 12, 14), and three rim sherds (SF10, 20, 25) which are flat, sub-rounded and rounded respectively.

From Structure 3, there were only two contexts containing pottery, 117 and 200, and from these were recovered a couple of featureless body sherds (SF22), a rim sherd (SF10: illus 13), and the large squashed vessel described above (SF9: illus 13). SF10 is a flat-topped rim of which a second rim from the same vessel came from the niche in Structure 2 (213), illustrating some residuality in the Structure 3 deposits.

In general there is no visible change in fabric between the pottery assemblages from the various structures, and the vessel forms are also identical, comprising simple rounded or flat-topped rims from bucket- or barrel-shaped vessels. However, one vessel (SF13: illus 13) is very different in both fabric and form: this comprises sherds recovered partially from context 119 (the upper occupation deposits in the north-east cell of Structure 2), and partially from eroded beach deposits (very probably deriving from the same context). This vessel is much harder, less gritty, and better fired and finished, and had an everted rim with a possible applied cordon placed in the neck angle.

There are only two examples of cross-context joins within the assemblage. These are: SF10, contexts 117 (peaty deposit in Structure 3) and 213 (uppermost fill of niche in Structure 2); SF13, contexts 119 (upper floor of the east cell in Structure 2), 124 (a discrete scatter of pottery on the beach front which probably derives from 119) and unstratified beach erosion deposits.

Discussion

The assemblage from Ceann nan Clachan contains only a few small sherds with diagnostic features, making the search for ceramic parallels problematic; this problem is further exacerbated by the lack of excavated sites of a comparable period. The general characteristics of the assemblage comprise a coarse gritty fabric, tongue-and-groove construction, simple bucket and barrel shapes with rounded or flat rims, and a general lack of decoration.

It is only through examination of larger Western Isles assemblages that any (often subjective) feel for fabric types can be achieved. There is a series of Bronze Age domestic plain coarse wares present at the settlement of Cladh Hallan on South Uist, where a sequence covering much of the first millennium BC traces a development from internally bevelled rims to flat rims to rounded rims (M Parker Pearson, pers comm). The vessel shapes there consist of flat-based plain bucket and barrel shapes, often with slightly inturning rims, and are coarse with large grit inclusions, which have very close similarities with the Ceann nan Clachan assemblage. Assemblages of broadly similar pottery, dated to the first millennium BC, were recovered from near Calanais, Lewis (Bohncke & Cowie, in prep), and Eilean Olabhat, North Uist (Armit et al, forthcoming).

Ceann nan Clachan includes both rounded and flat-topped rim forms and it is clear that both types are present within Phase 2 (the number of vessels associated with Phase 3 is so small as to be meaningless in this context). It is apparent that there is no sequential change in rim form at this site, though the presence of decorated sherds and an everted rim type along with the presence of flat rims (which Cladh Hallan suggests may be earlier) may suggest some longevity of occupation.

Ceann nan Clachan has been dated to the Early Iron Age, the period before the Atlantic Roundhouses with their abundant and richly decorated ceramic assemblages. It is possible that the incised decoration on SF11 is a forerunner to these later decorated wares, as incision and stabbing are also seen in Phases 1 and 2 at Eilean Olabhat in small quantities. No exact parallels have been found for this motif, possibly because no assemblages certainly associated with the earliest periods of use of Atlantic Roundhouses have yet been excavated, although it does bear close similarities with the decoration on SF43 from Phase 2 at Eilean Olabhat. The everted rim of SF13 may also belong to an Early Iron Age period of occupation if it does indeed have a cordon set within the rim angle, although such vessels continue into the Middle Iron Age.

ORGANIC RESIDUE ANALYSIS

M Taylor

A sample was taken from combined residue and powdered body fabric of one of the basal sherds

(SF6). Residue analysis using the technique of Gas Chromatography showed the presence of fatty acid deposits on the surface and in the pottery matrix of the vessel. The presence of these residues suggests that at some time in the life history of the vessel it had been used as a container for organic substances. Comparisons of the fatty acid component of the organics found to be present with modern day standards suggest that a sheep-based product is the most likely source. The closest sample match of the lipids was achieved with sheep's fat and old mutton fat reference lipids. These remain the two most likely origins for the source of the charred material and vessel content. However, as the archaeological sample did not contain specific diagnostic compounds other organic animal sources cannot be totally excluded as alternative sources. A full report on the methods and results of the analysis forms part of the site archive.

CHIPPED STONE

W Finlayson

A small assemblage of 245 pieces of quartz and one piece of flint was recovered from the excavated deposits. It is almost entirely made up of pieces less than 10mm in maximum dimension (n=240). In fact 206 of the pieces (84% of the assemblage) are less than 5mm in maximum dimension. Much of the material has been recovered from the flotation of bulk samples to recover environmental material. The assemblage has been analysed following a standard method developed to study quartz artefacts from Scottish sites (Finlayson 1998).

The significance of this material is hard to evaluate. It is possible that part, especially the fraction over 5mm in size, is the direct result of working the quartz in situ. Such small material is normally taken as good evidence for in situ working with flint assemblages. Unfortunately, the quartz used here appears to have a tendency to crumble. Many of the bags of larger artefacts contained a few minute crumbs probably detached from the larger pieces after they had been bagged. It is therefore possible that some of the small pieces recovered during flotation are simply the result of post-depositional, excavation, storage, and flotation processes. That said, the quantity of such material is very high, and it cannot be dismissed as entirely non-artefactual.

Nearly all the quartz appears to have a relatively good conchoidal fracture, and is fine-grained and homogenous. Although 236 of the pieces (96%) were catalogued as chunks, this is a reflection of the presence of the small fraction material. The five flakes, compared with only four splinter flakes, are perhaps a better reflection of the quality of the raw material. There are no cores present to indicate primary knapping took place on site, nor are there any retouched pieces. The assemblage contains one secondary, irregular flint flake.

Although quartz is associated with all three structures, there are notable concentrations and absences. For example, there is no quartz in the burnt mound itself, suggesting that any on-site quartz-working was not associated with the activities generating the burnt mound. Similarly, in Structure 2, all of the quartz came from the north-east cell, despite the much greater quantities of excavated material from the middle cell. The south-west cell, with its superimposed hearths, was also devoid of quartz.

ENVIRONMENTAL EVIDENCE

Soil micromorphological analysis of samples taken to address specific questions relating to site formation processes, and the analysis of bulk soil samples from excavated contexts, provided significant information regarding the formation and nature of the site. It is impossible to say with any confidence whether or not the site occupied a marginal location within the Early Iron Age landscape. The nature of the fuel used in the internal hearth, however, may suggest that the immediate environment of the site in the Early Iron Age did comprise a damp grassland, perhaps used for pasture on the fringes of the Vallay Strand machair zone.

Although small quantities of animal bone were recovered, no fragments identifiable to element or species were retrieved. Only two contexts (247 & 004) had any bone material larger than 4mm. Context 004 was part of the fill of the hearth within the north-east cell of Structure 2 (Phase 2), while context 247 was associated with the hearth in Structure 1 (Phase 1).

MARINE MOLLUSCS

R Cerón-Carrasco

The mollusc remains from Ceann nan Clachan were recovered by sieving through 1mm mesh. Three

contexts (247, 248 & 251) produced marine shells, which were identified using standard guides (Campbell 1989) and by comparison to a modern reference collection of marine molluscs. These were remains of the tiny species *Rissoa parva* (<4mm). The presence of this species is of particular interest in this small assemblage as it is found attached to seaweed.

Seaweed was used for fertilizing fields in the Hebrides (Boyd & Boyd 1996, 51), but could also be burnt as a fuel. As all three contexts relate to ash dumps associated with Structure 1, it appears most likely that seaweed was being burnt as a fuel during Phase 1 of the site's use.

PLANT REMAINS

M Church, with charcoal identifications by M Cressey

Twenty-three samples were submitted for analysis, covering all three structures as well as the burnt mound itself. Sixteen of these samples contained diagnostic carbonized plant macrofossils. In general the samples were relatively low in plant macrofossil density and charcoal in particular was extremely poorly represented. The quantifiable components per litre for most samples were lower than is usual in most assemblages from the Western Isles. This can be seen in Table 2, which compares the carbonized macrofossil concentration (QC/litre) from Ceann nan Clachan (excluding sample 47, which is rich in material derived from the fuel source) with occupation levels from some domestic sites excavated in Lewis, as part of the wider Calanais Archaeological Project (Harding 2000).

Ten samples were analysed from the body of the burnt mound, with only four of the samples yielding material in very low quantities. The material consisted of amorphous burnt peat fragments, a few

monocotyledon culm bases and a single fragment of ling heather (*Calluna vulgaris* L). This reinforced the findings from the soil micromorphology (see below) which suggested that the fuel source of the burnt mound was blanket peat with no peaty turf or fibrous material component in the fuel. No cereal remains were present which suggests that cereals played no part in any economic or cooking activity associated with the formation of the burnt mound. This is markedly different to the mixed economic practices that seem to occur on most 'domestic' sites in the Western Isles and their resulting mixed archaeobotanical and ecofactual assemblages (Church, forthcoming a).

Four samples were analysed from Structure 1, the archaeobotanical material presumably relating to ash spreads and hearth material. Again, no cereal remains were recovered; this would be extremely unusual for a later prehistoric 'domestic' site in the Western Isles. All the macrofossils seemed to be derived from hearth fuel, a hypothesis supported by the presence of numerous fragments of amorphous burnt peat fragments, a few pieces of ling heather (*Calluna vulgaris* L), and a single fragment of hazel (*Corylus* sp). Sample 47 (context 248) contained the greatest density of plant macrofossils on the site and was associated with the hearth in Structure 1. The sample contains high numbers of monocotyledon rhizomes, culm bases and culm nodes as well as a number of seeds of knotgrass (*Polygonum aviculare* L), bilberry (*Vaccinium* sp), sedge (*Carex* sp), grass (Poaceae undiff) and a couple of fragments of heather (*Erica/Calluna* spp) This represents the burning of damp grassland turf (Dickson 1998) or fodder/hay from damp grassland (Jones 1998) presumably taken from pastoral areas within the wider landscape. The plant macrofossils from the remaining Structure 1 contexts (samples 41, 46 & 48) were much lower in density with a few

TABLE 2

Comparison of macrofossil concentration for Ceann nan Clachan (CNC) and other domestic sites excavated in Lewis.

Site	Description	Average QC/litre
CNC		2.35
Cnip	Mid Iron Age wheelhouse and secondary occupation	4.92
Dun Bharabhat	Mid Iron Age Complex Atlantic Roundhouse and secondary occupation	59.34
Bostadh	Late Iron Age Ventral houses and Norse structure and associated midden	6.46
Galson	Late Iron Age and Norse domestic complex	21.47
Loch na Beirgh	Mid to Late Iron Age secondary occupation within the shell of a Complex Atlantic Roundhouse	9.67

monocotyledon rhizomes, culm bases and culm nodes and a few seeds of sedge (*Carex* sp), grass (Poaceae undiff) and Fat hen (*Chenopodium album* L) These all presumably represent the dispersal of ash from the hearth of material such as damp grassland turf or hay/fodder evidenced by Sample 47.

Eight samples were analysed from Structure 2; only one contained no plant remains. The samples were taken from floor, occupation and abandonment horizons within the structure where most of the carbonized material presumably derived from ash spreading from the hearth. The assemblage contained a number of cereal grains of barley (*Hordeum* sp), predominantly of the hulled variety but also a couple of naked grains. No chaff was recovered; this is required for conclusive species identification but a single twisted grain of hulled barley from context 108 (the upper fill of Structure 2), points to the presence of the six-row species (*Hordeum vulgare* L). Six-row hulled barley (*Hordeum vulgare* var *vulgare* L) seems to be the staple crop of the first millennia BC and AD throughout the region and the rest of Atlantic Scotland (Boyd 1988; Church, forthcoming a). The rest of the plant macrofossils included several monocotyledon rhizomes, culm bases and culm nodes, a few seeds of sedge (*Carex* sp) and grass (Poaceae undiff) and some fragments of ling heather (*Calluna vulgare* L) These presumably originate from the fuel source used in the hearth, but their small number and restricted diversity allows no definitive statements on specific fuel type beyond peat and/or turf being burnt.

One sample was taken from an ash spread in Structure 3, which contained a single barley grain (*Hordeum* cf hulled), a few monocotyledon rhizomes, culm bases and culm nodes as well as a few seeds of sedge (*Carex* sp) and sheeps sorrel (*Rumex acetosella* L). Again, this presumably relates to the spreading of ash from a hearth burning peat and/or turf.

In summary, the plant remains support the view that Ceann nan Clachan was a focus for special activities rather than being a simple 'domestic' site. The fuel from all phases included blanket bog peat, damp grassland turf or fodder/hay from damp grassland. The last two materials came from pastoral areas within the landscape that may suggest a link with animal husbandry. This reflects a similar range of fuel sources identified at a kerb cairn

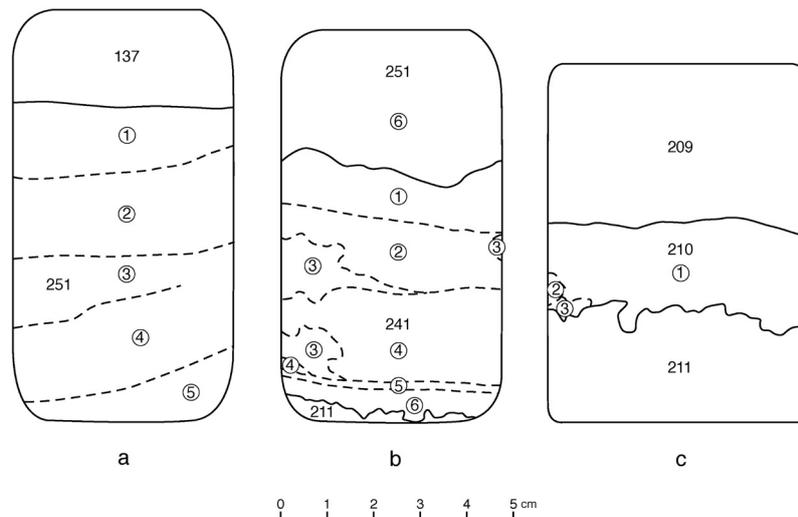
recently excavated at Calanais, Lewis (Church, forthcoming b) and suggests that a variety of fuel sources was used in the Early Iron Age. This contrasts with the evidence from several Middle and Late Iron Age sites throughout Lewis (Peters & Church, forthcoming) which points to a reliance on blanket bog/well-humified peat as the principal fuel source, following the accelerated spread of blanket bog throughout the first millennia BC and AD (Birks 1994). The plant remains from Structures 2 and 3 differ from those associated with the burnt mound itself and the associated Structure 1 in that they contain cereal remains and are more representative of what is usually retrieved from Iron Age 'domestic' sites in Atlantic Scotland, for example the floor deposits from Dun Bharabhat, Lewis (Church 2000). Thus, there seems to be a fundamental shift in site function between the burnt mound/Structure 1 complex (Phase 1) and the later structures (Phase 2/3). However, the density of material remains very low in comparison to most other later prehistoric 'domestic' sites (eg Dun Vulcan: Smith 1999).

SOIL MICROMORPHOLOGY

S Carter

Thin sections were obtained to examine sediments on the floors of Structures 1 and 2, and a buried soil that underlay both these structures and the adjacent burnt mound. Undisturbed block samples were collected at two locations for micromorphological analysis in order better to understand the nature of the excavated sediments. One Kubierna tin sample was collected from a possible soil profile (context 210) buried beneath the burnt mound (illus 8); and two samples were collected from a sediment sequence in Structures 1/2 (illus 12), interpreted as a soil profile (241) overlain by the Structure 3 hearth (251) and deposits associated with Structure 2 (137). The undisturbed sediment blocks were resin-impregnated and sectioned using standard techniques (Murphy 1986) by the Department of Environmental Science, University of Stirling. The resulting thin section was described using the terminology proposed by Bullock et al (1985).

All three thin sections proved to be stratigraphically complex (illus 14). The stratification visible in thin section can be reconciled with the site sediment contexts but it adds a level of detail not apparent in the field.



ILLUS 14 Soil micromorphology sketch sections

The buried soil

A buried soil profile was identified beneath Structures 1 and 2 (241), and beneath the burnt mound (210). Superficially, in this section, these two contexts are very different: 241 is a complex banded sediment, 5cm thick; 210 is a simple layer, 2cm thick.

Dealing first with 241 (illus 12; illus 14b), the lowest three zones (241, Zones 4, 5 & 6) can be readily interpreted as a shallow peat soil profile. The in situ weathered rock (211) was covered by a shallow layer of fine sand (241, Zone 6) deposited as numerous mineral and occasional organic laminae. This well-preserved, probably water-lain sediment, became increasingly organic and was capped by purely organic laminae (Zone 5) representing in situ vegetation – a stabilized turf. Organic matter accumulation continued forming a shallow, highly humified peat (Zone 4). Conditions appear to have been stable with mineral grains only rarely being deposited on the peat surface.

The interpretation of the upper three zones of 241 is less straightforward. Zone 2 is composed primarily of amorphous organic matter, like Zone 4 below, but the coarse mineral content is much higher. Limited evidence for horizontal banding suggests that Zone 2 was an accumulating sediment but the process of deposition is not clear. Two options can be proposed: Zone 2 could reflect a

further period of peat accumulation but with significantly more local disturbance introducing mineral grains; alternatively Zone 2 may be a layer of disturbed, trampled peat created by activity directly on the surface of the peat (Zone 4). The interpretation of Zone 2 is influenced by the nature of Zone 1. Zone 1 is a dominantly amorphous organic layer, like Zone 4, although its structure is radically different. The difference in condition of the peat in Zones 1 and 4 appears to result from post-burial alteration of Zone 1, primarily its substantial decomposition. It is tentatively suggested that the sequence of Zones 4, 2 and 1 results from two periods of stable peat accumulation separated by a period of disruption, either direct or indirect.

This still leaves 241, Zone 3 to fit into the sequence. Zone 3, areas of poorly sorted sand, occur in three places interleaved with Zones 2 and 4. The shape of these sand pockets suggests that they did not form part of the original horizontal sedimentary accumulation represented by Zones 6, 5, 4, 2 and 1. It is therefore concluded that they are intrusive and that the date of the intrusion (assuming that it was a single event) must be after the deposition of Zone 2 and probably after the deposition of Zone 1. The irregular form of the sand pockets does not suggest burrowing by small mammals, and another process must therefore be considered. That the boundaries of the two larger

areas of Zone 3 involve an element of fracture along zone boundaries suggests that these may be peat shrinkage fractures. Shrinkage is most likely to have resulted from the drying out of the peat and sand was then washed into the open fractures. There is no evidence to suggest why the peat dried or what the source of the sand was. The sand is uncontaminated with any component that might suggest human interference although this must remain an option. The construction of a building over this part of the land surface is one possible context for the drying and shrinkage of the peat. Structures 1 and 2 have both in turn occupied this site and could be responsible for this phenomenon; it may also be suggested that the clean sand in 241, Zone 3 is part of a laid sand floor that has infiltrated the underlying peat. The absence of any ash component to 241, Zone 3 suggests that it was deposited before the accumulation of the ash layers 251 over the peaty soil 241. Given that 251 stratigraphically pre-dates Structure 2, it is most likely that the earlier Structure 1 is responsible for the drying out of the peat.

To summarize, 241 can be interpreted as a shallow peat soil developed in a thin layer of fine water-lain sand. Peat accumulation was interrupted by a period of disruption (Zone 2) before pure peat accumulation resumed. Subsequently the peat dried and cracked apart, allowing sand to wash into the fissures. This history includes three episodes of instability: deposition of the fine sand; creation of the Zone 2 peat; cracking of peat and infilling by clean sand. The last of these 3 episodes *may* be associated with the construction of Structure 1.

Turning to 210 (illus 8; illus 14c), interpretation of this possible soil rests on parallels that can be made with 241. The two distinct sediment fragments, 210, Zones 2 and 3, appear to be remnants of layers identical to 241, Zones 4 and 6 respectively. 210, Zone 3 is interpreted as a fragment of laminated fine sand still in situ on the surface of the weathered bedrock (211). 210, Zone 2 is an isolated fragment of amorphous peat. The remainder of 210 comprises a random mix of sand and amorphous organic matter, including many smaller fragments of amorphous peat. This is interpreted as a layer of trample derived from the mixing of a shallow amorphous peat with underlying sand. If this analysis is correct, 210 is a highly disturbed and partially eroded version of 241. The implication is that 210 lay closer than 241 to the focus of activity

before it was buried and therefore protected by the accumulating burnt mound 209. The absence of a stable turf on the surface of 210 indicates that the disturbance occurred only shortly before burial by the burnt mound.

The severe disturbance of soil 210 can therefore reasonably be ascribed to human activity associated with the burnt mound and Structure 1. The better survival of soil 241 probably results from its position within the footprint of Structure 1 which seems to pre-date the creation of the burnt mound. The survival of 241 indicates either that floor erosion within Structure 1 did not occur or that there was a substantial floor laid over the soil.

The burnt mound

The base of the burnt mound (209) consists entirely of coarse mineral grains (sand and larger rock fragments) with common fragments of carbonized peat (illus 8; illus 14c). This combination is typical of burnt mounds and apparently represents the degraded remains of heated rocks along with residues of the fuel used to heat them. The fuel residues are all peat fragments with no evidence for wood. The peat is a pure organic blanket peat, only weakly humified with obvious lamination and frequent tissue residues. This contrasts with the highly humified amorphous peat of the local soil 210/241. The dominance of carbonized fuel residues is striking and contrasts, for example, with the oxidized mineral ashes that constitute 251 on the floor of Structure 1. This may be because the hearth in which the stones were heated may have had a relatively poor oxygen supply; possibly a large quantity of stones buried within a pile of peat fuel. It would therefore have generated more carbonized (reduced) fuel residues than a small, well-tended, cooking hearth.

Floor deposits within Structures 1 and 2

Two sediment contexts were examined in thin section from the floors of Structures 1 and 2 which successively occupied the same position on the site (illus 12; illus 14a & b). The earlier sediment, 251, was interpreted in the field as a hearth on the floor of Structure 1. In thin section 251 is readily identifiable as ash, consisting of a mix of carbonized peat and oxidized ash with abundant biogenic silica. Six distinct bands of ash were apparent within 251 in thin section, distinguished by variable proportions

of carbonized to oxidized residues and different concentrations and composition of biogenic silica. This banding represents the successive deposition of ash derived from different fuels, burnt in variable conditions. All the fuels can be classified as peat *sensu lato* but they could include a wide variety of organic sediments (the plant macrofossil remains suggest that a damp grassland turf, rather than blanket peat may have provided most of the fuel for this hearth). Most of the bands include a mix of carbonized and oxidized residues, indicating that some mixing of the ash has occurred after it had cooled down. This suggests that these ashes are not actually within a hearth but represent successive deposits of ash from a hearth onto the floor.

The recorded site stratigraphy shows that ash 251 pre-dates the construction of Structure 2 and is most likely to form part of the floor of Structure 1. Context 137, a mixture of coarse mineral grains and carbonized fuel residues, which overlies it, is associated with the construction of Structure 2. The well-preserved sedimentary banding in 251 would not have survived a lengthy duration of near-surface pedogenesis, suggesting that the formation of context 137 (and thus the construction of Structure 2) must have occurred soon after the deposition of 251. 137 is very similar to 209, the basal deposit of the burnt mound, and it is possible that the burnt mound was quarried to produce material for the floor of Structure 2.

RADIOCARBON DATING

The nature of the fuel sources used on the site (predominantly peat and peaty turf), the paucity of charcoal and plant macrofossils, and the dearth of bone, all greatly restricted the potential for radiocarbon dating and few of the relevant, well-stratified contexts produced any suitable material. Nevertheless it was possible to identify charred cereal grains from a context associated with Structure 2. A charred organic residue adhering to

the interior of a basal pottery sherd (SF6, see above) was also analysed (Taylor, above) and radiocarbon dated. This also derives from a deposit within Structure 2 (108). Unfortunately, despite being a very tightly defined group, the dates span the particularly unhelpful Early Iron Age plateau on the radiocarbon calibration curve.

The interpretation of the excavated deposits does not suggest that the structures were used for any particularly lengthy period, and there is clear evidence from the soil micromorphological analyses that there was no significant gap between the use of Structures 1 and 2. The construction and use of the complex over a period within the span 770–400 BC is, therefore, highly probable. This date range places the use of the site in a period which is very poorly known archaeologically in the Western Isles (Armit 1996). The date ranges overlap with the earliest excavated phases of the islet settlement of Eilean Olabhat, which lies some 2km to the north-west (Armit, Campbell & Dunwell, forthcoming), although the balance of the dating evidence suggests that Eilean Olabhat is slightly later, and with the pre-roundhouse occupation at Dun Bharabhat, Lewis, although there are no structural associations for the date at the latter site (Harding & Dixon 2000).

It is worth noting that the two ceramic vessels which stand out as potentially later than the others, ie the everted rim (SF13) and decorated sherds (SF11), both derive from the upper floor deposits within Structure 2 (119). This material is later than the deposits from which the principal series of radiocarbon samples was derived (134), and was not among the deposits studied by soil micromorphological analysis. It is possible, therefore, that the final use of Structure 2 may extend slightly later than the radiocarbon dates suggest, although there is nothing other than the presence of these two groups of sherds to suggest any particular longevity for this structure.

TABLE 3
Radiocarbon dates

Lab no	Context	Material	Radiocarbon determination (BP)	Calibrated range (95.4% probability)
OxA-9831	134	<i>Hordeum</i> sp	2469 ± 37	770–410 cal BC
OxA-9969	134	<i>Hordeum</i> sp	2475 ± 50	780–400 cal BC
OxA-9970	134	<i>Hordeum</i> sp	2360 ± 50	800–200 cal BC
OxA-9985	108	Pot residue	2450 ± 34	770–400 cal BC

DISCUSSION

Ceann nan Clachan is an important site both in terms of Hebridean prehistory, where it occupies a chronological period which is extremely poorly understood, and in the study of burnt mounds in northern and western Britain. The interpretation of the site as a sweat-lodge or food-processing complex, rather than a communal cooking-place, is at variance with some recent interpretations of burnt mounds, although it has long been recognized that this umbrella classification may cover sites with a wide range of functions.

Ceann nan Clachan now forms one of a small group of excavated burnt mounds where there is good evidence for the presence of associated structures (see various contributions in Buckley 1990). In this it is comparable with Liddle and Beauquoy in Orkney (Hedges 1975) and the recently excavated site at Tangwick in Shetland (Moore & Wilson 1999), as well as a small number of Irish sites (cf O'Drisceoil 1988). As we have seen, however, the similarities between Ceann nan Clachan and the northern Scottish sites are superficial, at least as regards the nature of the structures themselves. Although variable in form, the northern structures tend to be dominated by a large tank or trough, presumably for the heating of water by the plunging of heated stones. The stones were subsequently discarded to create the surrounding burnt mound. These sites have tended to be interpreted primarily as cooking places, possibly for communal feasting. The lack of any water-retaining structures in the buildings at Ceann nan Clachan suggests that this site may have had a rather different function.

Assuming that the aim in heating the stones at Ceann nan Clachan was not the boiling of water, what possibilities does that leave? Perhaps the most likely is that rather than applying the heated stones to water, water was applied to the stones, to create steam. The use of burnt mounds as saunas or sweat-lodges has been proposed by Barfield and Hodder on

a combination of archaeological and ethnographic grounds (1987), although there is also literary evidence from Ireland for bathing as a secondary function on sites primarily intended for cooking and feasting (O'Drisceoil 1988). Barfield and Hodder (1987) identify a range of analogies from north and west European history and prehistory for bathing using either dry heat or steam. In either case, what is required is a confined space within which the heated stones are placed: they are then either simply left to produce dry heat (a proper 'sweat bath') or water is applied to produce steam. In some cases the stones may be heated inside the building, but in other cases the pre-heated stones may be brought from outside.

We have already noted how, as well as the absence of evidence for water-heating, the nature of Structure 1, with its small size, drainage, and narrow, constricted entrance, may have made it suitable as a sauna or sweat-lodge. There is less good evidence for Structure 2, which seems to have had an outer, east cell which was used for 'domestic' activities (ie the cooking and serving of food), and only the middle and innermost cell associated with some specialist function. While this structure lacked the drainage provision of its predecessor, the relative size of the superimposed hearths and the possibility that these were in some way controlled by shuttering, together with the absence of 'domestic' activity in the middle cell, suggest concerns with the production and control of heat.

It cannot be demonstrated archaeologically whether or not the burnt mound continued to accumulate during the occupation of Structure 2, but there is no indication of burnt mound material within the building. Given the friability of burnt gneiss, some such indications might be expected if the use of Structure 2 did involve the use of heated stones. Not all forms of sweat-lodge involve the use of steam, however, and it is possible that Structure 2 worked on different principles. The recessing of the hearth into a 'fire-box', that is, the south-west cell, and the relationship of this

'fire-box' to the middle cell, recalls the design of Maya sweat-baths, such as the Preclassic example at Cuello (Hammond & Bauer 2001). In this somewhat geographically distant example, the 'fire-box' generated heat for a small enclosed chamber, while an external flue drew smoke from the fire out to the rear of the building (*ibid*, fig 3). Structure 2 at Ceann nan Clachan may well have functioned along similar lines, although here the sweat-lodge, if such it was, was part of a rather larger, cellular building. If this reconstruction is accepted, it would imply a switch from the use of steam to dry sweat-bathing between Phases 1 and 2, with the associated changes in structural design and methods of supplying heat to the building. The presence of the seemingly 'domestic' north-east cell may also suggest a greater elaboration or formalization of the activities involved in the latter period, for example, formal preparation for bathing or the consumption of certain foods.

O'Drisceoil disputed the likelihood that bathing was a primary function of burnt mounds in general (although conceding that it may have been an important secondary function in some cases) citing the general lack of evidence for structures around the tanks or troughs of most Irish examples (1988). It may be, however, that among the burnt mounds of Atlantic Scotland, there is a group which should be recognized primarily as bathing sites or sweat-lodges. Barfield and Hodder have already pointed out the impracticality of using the Liddle tank for cooking (1987, 371). The production of vast quantities of steam for a prolonged period would have made it impossible to function within the building: it would have been a steam bath by default. The same would apply to Beauquoy (Hedges 1975) and Tangwick (Moore & Wilson 1999).

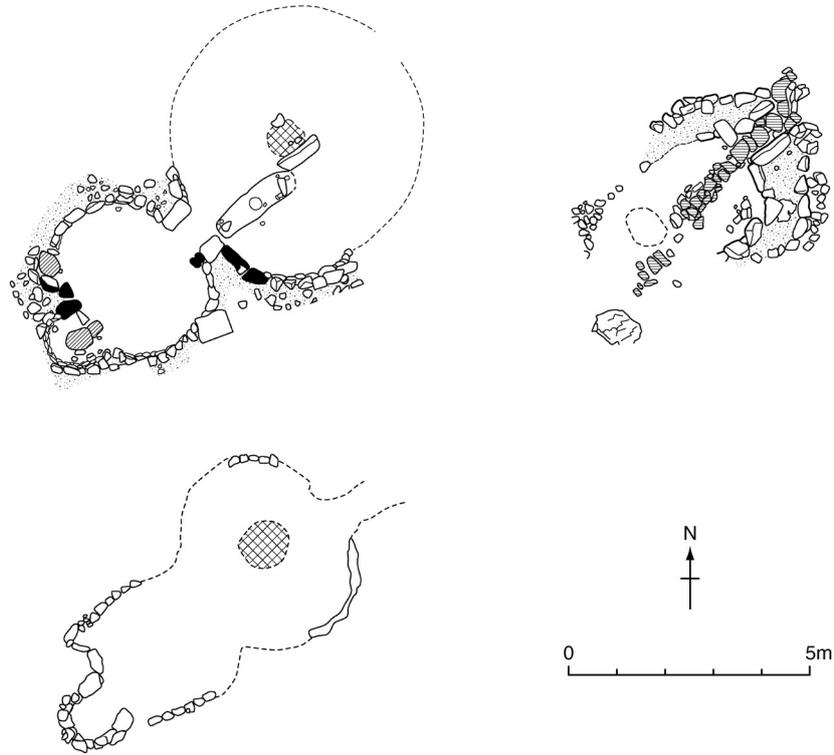
It may be best to see the prehistoric use of hot stone technology in northern Europe as associated with a range of functions, including both cooking and bathing (as suggested by the Irish literary sources), with one or other predominating at different times and places. While

bathing may have been a subsidiary function of the unenclosed Irish sites, it may have been a principal function of the Atlantic Scottish sites where there is evidence of substantial structures. The variety of building design and internal fittings on these sites suggests that a variety of specific approaches to the process were adopted, perhaps involving different combinations of dry and steam bathing.

The only sites in the Western Isles broadly contemporary with Ceann nan Clachan, and with good structural evidence, are Eilean Olabhat, North Uist (Armit 1996, 173–8; Armit, Campbell & Dunwell, forthcoming) and Cladh Hallan, South Uist (Parker Pearson et al 1995; 2000; Atkinson et al 1996; Marshall et al 1998).

There are no known parallels as yet for Structure 1 from the Hebridean Bronze or Iron Age. In structural terms, the sub-rectangular form and use of large boulder footings recalls earlier architectural traditions, seen at Beaker sites like Northton (Simpson 1976) and even Neolithic forms as at Eilean Domhnuill (Armit 1990). Such features are unlikely to be chronologically distinctive, however, and structural similarities can even be identified with the post-medieval buildings at Druim nan Dearcag, some 2km north-west of Ceann nan Clachan (Armit 1997).

The general constructional principles of Structure 2 can be broadly paralleled in the early phases at Eilean Olabhat, a small settlement set on a former islet or promontory within a small loch some 2km north-west of Ceann nan Clachan. The small size and general sub-oval shape of the cells in Structure 2 are similar to the Early Iron Age phases at Eilean Olabhat, while the use of neatly-coursed small angular stones for the walls, interspersed with orthostats to mark pier ends, provides a more detailed parallel. The disposition of internal features and the composition of the artefactual assemblage at these two sites, however, is entirely distinct. Although they may both have been built within the same architectural



ILLUS 15 Comparative structures (top left: Structure 2, top right: Structure 1, bottom left: Cladh Hallan House 640)

tradition, there is little to suggest that they served similar functions.

More striking is the correspondence both in plan and depositional history between Structure 2 at Ceann nan Clachan and House 640 at Cladh Hallan (Marshall et al 1998, 7–11; Rhodes 2001). Like Structure 2, House 640 at Cladh Hallan was formed of two main cells, the inner of which gave access to a smaller cell or niche, on the main axis of the building, and a smaller niche opening to the north-west of the inner cell (illus 15). Although the walls of House 640 had mostly been thoroughly robbed, the size and layout were clearly almost identical to Structure 2 at Ceann nan Clachan. The presence of a central hearth in the larger (north-east) cell, and the absence of a hearth in the inner (south-west cell) is a further detailed point of comparison

between the two buildings. Ceramic evidence suggests a broadly Early Iron Age date for House 640 (M Parker Pearson, pers comm), and this would be in keeping with the evidence from Ceann nan Clachan.

Equally striking is the evidence for the ways in which these two structures were abandoned. After the abandonment of Structure 2 at Ceann nan Clachan, the innermost cell alone was modified and re-used (as Structure 3); the last deposits included an upside-down pottery vessel and a deposit of peaty material. Some of the fill was clearly derived from deposits formerly associated with Structure 2. Similarly, at Cladh Hallan, the innermost cell escaped the systematic stone-robbing which removed the rest of the building and it was re-used for activities involving the deposition

of burnt stone (although there was no associated burnt mound at Cladh Hallan).

The parallels between Structure 2 at Ceann nan Clachan and House 640 at Cladh Hallan strongly suggest that the design and use of these two buildings was carried out according to well-defined principles, perhaps associated with some specialist function. The excavators of Cladh Hallan have suggested various possible interpretations of the structure including sweat-lodge and fish-smokery (M Parker Pearson & C Inghem, pers comm).

Whatever their specific function, these buildings seem to have been conceptually distinct from domestic buildings such as the numerous others excavated at Cladh Hallan (Marshall et al 1998). In both cases special significance seems to have been attached to the small south-west cell, even after the abandonment of the building. This might suggest that the buildings had ritual or religious associations, particularly focused on these innermost cells (which, in the case of Ceann nan Clachan at least, housed the 'specialist', or non-domestic hearth). Such associations are perhaps more likely to have been associated with sweat-lodges, where notions of cleanliness, healing, purity and spirituality might seem more 'naturally' to arise, than with smoke-houses associated with the processing of food (cf Vahros 1966 for the ritual/religious associations of pre-modern north European saunas, and Weir 1989, 13, for early modern Irish sweat-houses). Although it would be unwise to rule out either possibility, the sweat-lodge interpretation could be applied to both Structures 1 and 2, while the smoke-house interpretation seems possible only for Structure 2 (as it is unclear how such activities would have required the heating of stones to form the burnt mound which formed around Structure 1). Nonetheless, ethnographic evidence would suggest that a range of subsidiary functions including the smoking and drying of food are not uncommon where saunas or sweat-lodges are used (Barfield & Hodder 1987).

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REFERENCES

- Armit, I 1990 *The Loch Olabhat Project 1989*. Edinburgh (= Dept Archaeol, Univ Edinburgh, Project Pap, 12).
- Armit, I 1992 *The Later Prehistory of the Western Isles of Scotland*. Oxford (= Brit Archaeol Rep, Brit Ser, 221).
- Armit, I 1996 *The Archaeology of Skye and the Western Isles*. Edinburgh.
- Armit, I 1997 'Excavation of a post-medieval settlement at Druim nan Dearcag, and related sites around Loch Olabhat, North Uist', *Proc Soc Ant Scot*, 127, 899–919.
- Armit, I 1998 'Re-excavation of an Iron Age wheelhouse and earlier structure at Eilean Maleit, North Uist', *Proc Soc Ant Scot*, 128, 255–72.
- Armit, I forthcoming a 'Floor formation and structured deposition: the Cnip wheelhouse, Lewis', in Alexander, D, Church, M & Taylor, M (eds) *Circular arguments; the archaeology of Scottish roundhouses*.
- Armit, I forthcoming b *Anatomy of an Iron Age roundhouse: the Cnip wheelhouse excavations, Lewis*.
- Armit, I & Braby, A 1995 'Ceann nan Clachan', *Discovery Excav Scot* 1995, 107.
- Armit, I & Braby, A 1996 *Ceann nan Clachan, burnt mound and later prehistoric structures, North*

- Uist: Excavations, 1996, Data Structure Report*. Unpubl report.
- Armit, I & Braby, A 1997 *Ceann nan Clachan, burnt mound and later prehistoric structures: Excavations, 1997, Data Structure Report*. Unpubl report.
- Armit, I & Dunwell, A J forthcoming 'Archaeological field survey in North Uist'.
- Armit, I, Campbell, E & Dunwell, A J forthcoming 'Excavation of an Iron Age, Early Historic and Medieval settlement and metal-working site at Eilean Olabhat, North Uist'.
- Atkinson, S, Mulville, J, Parker Pearson, M 1996 'Cladh Hallan, Daliburgh (South Uist parish). Late Bronze Age and Early Iron Age houses and settlement', *Discovery Excav Scot 1996*, 108–9.
- Barclay, G J 1985 'Excavations at Upper Suisgill, Sutherland', *Proc Soc Antiq Scot*, 115, 159–98.
- Barfield, L & Hodder, M 1987 'Burnt mounds and saunas and the prehistory of bathing', *Antiquity*, 61, 370–9.
- Birks, H J B 1994 'Floristic and vegetational history of the Outer Hebrides', in Pankhurst, R J & Mullin, J M (eds) *Flora of the Outer Hebrides*, 2nd edn, 32–7. London.
- Bohncke, S J P & Cowie, T G in prep 'Excavation and palaeoecological study of walls buried in peat near Callanish, Isle of Lewis 1977–1979'.
- Boyd, J M & Boyd, I L 1996 *The Hebrides: a natural tapestry*. Edinburgh.
- Boyd, W E 1988 'Cereals in Scottish antiquity', *Circaea*, 5.2, 101–10.
- Braby, A, Battley, N & Clarke, C 1996 'Oban Trumisgarry', *Discovery Excav Scot 1996*, 107.
- Buckley, V (ed) 1990 *Burnt offerings: international contributions to burnt mound archaeology*. Dublin.
- Bullock, P, Federoff, N, Jongerius, A, Stoops, G, & Tursina, T 1985 *Handbook for soil thin section description*. Wolverhampton.
- Burt, E 1754 *Burt's letters from the north of Scotland*, 1998 edn. Edinburgh.
- Campbell, A C 1989 *Seashores and shallow seas of Britain and Europe*. London.
- Church, M 2000 'Carbonised plant macrofossils and charcoal', in Harding, D W & Dixon T N, *Dun Bharabhat, Cnip, and Iron Age settlement in west Lewis: Volume 1: structures and material culture*, 120–30. Edinburgh (= Calanais Res Monogr, 2).
- Church, M forthcoming a '“The botany of brochs” 20 years on', in Alexander, D, Church, M & Taylor, M (eds) *Circular arguments; the archaeology of Scottish roundhouses*.
- Church, M forthcoming b Carbonized plant macrofossils and charcoal from Calanais kerb cairn.
- Close-Brooks, J 1995 'Excavation of a cairn at Cnip, Uig, Isle of Lewis', *Proc Soc Antiq Scot*, 125, 253–77.
- Crawford, I A 1977 'A corbelled Bronze Age burial chamber and beaker evidence from the Rosinish machair, Benbecula', *Proc Soc Antiq Scot*, 108, 94–107.
- Crawford I & Switsur, R 1977 'Sandscaping and C14: the Udal, North Uist', *Antiquity*, 51, 124–36.
- Dickson, C 1998 'Past uses of turf in the Northern Isles', in Mills, C & Coles, G (eds) *On the edge: settlement in marginal areas*, 105–10. Oxford.
- Dunwell, A J, Neighbour, T & Cowie, T G 1995 'A cist burial adjacent to the Bronze Age cairn at Cnip, Uig, Isle of Lewis', *Proc Soc Antiq Scot*, 125, 279–88.
- Finlayson, B 1998 'Worked flint and quartz', in McCullagh R P J & Tipping, R (eds) *The Lairg Project 1988–1996. The evolution of an archaeological landscape in northern Scotland*, 132–9. Edinburgh.
- Fojut, N 1994 'Sidhean Tuath', *Discovery Excav Scot 1994*, 95.
- Hammond, N & Bauer, J R 2001 'A Preclassic Maya sweatbath at Cuello, Belize', *Antiquity*, 75, 683–4.
- Harding, D W 2000 *The Hebridean Iron Age: twenty years' research*. Edinburgh (= Univ Edinburgh, Dept Archaeol, Occas Pap, 20).
- Harding, D W & Dixon T N 2000 *Dun Bharabhat, Cnip, and Iron Age settlement in west Lewis: Volume 1: structures and material culture*. Edinburgh (= Calanais Res Monogr, 2).
- Hedges, J W 1975 'Excavation of two Orcadian burnt mounds at Liddle and Beaquoy', *Proc Soc Antiq Scot*, 106, 39–98.
- Johnson, M in prep a 'Northton, Harris: the Bronze Age and later pottery assemblage'.
- Johnson, M in prep b 'Report on the pottery from Calanais Kerb Cairn, Lewis'.
- Jones, G 1998 'Distinguishing food from fodder in the archaeobotanical record', *Environmental Archaeol*, 1, 95–8.

- Lane, A & Campbell, E in prep 'Report on the pottery from Callanish Leobag', in Bohncke, S J P & Cowie, T G, 'Excavation and palaeoecological study of walls buried in peat near Callanish, Isle of Lewis 1977–1979'.
- Marshall, P, Mulville, J, Parker Pearson, M, & Gidlow, J 1998 'Cladh Hallan (South Uist parish). Late Bronze Age–Early Iron Age settlement', *Discovery Excav Scot* 1998, 103.
- Moore, H & Wilson, G 1999 'Food for thought: a survey of burnt mounds of Shetland and excavations at Tangwick', *Proc Soc Ant Soc* 129, 203–37.
- Murphy, C P 1986 *Thin section preparation of soils and sediments*. Berkhamsted.
- O'Drisceoil, D A 1988 'Burnt mounds: cooking or bathing?', *Antiquity*, 62, 671–80.
- Pankhurst, R J & Mullin, J M 1994 *Flora of the Outer Hebrides*, 2nd edn. London.
- Parker Pearson, M, Mulville, J, & Roper, T 1995 'Cladh Hallan (South Uist parish). Late Bronze Age house and settlement', *Discovery Excav Scot* 1995, 109.
- Parker Pearson, M, Marshall, P, Mulville, J, & Smith, H 2000 'Cladh Hallan (South Uist parish). Late Bronze Age and early Iron Age settlement', *Discovery Excav Scot*, new ser 1, 97–8.
- Peters, C & Church, M forthcoming 'The mineral magnetism of prehistoric Lewis', *Geoarchaeol*.
- Rhodes, S 2001 *Domestic activity and space: an interpretation of a double roundhouse, Cladh Hallan, South Uist, Outer Hebrides*. Undergraduate dissertation, Univ Sheffield.
- Rideout, J S 1995 'Carn Dubh, Moulin, Perthshire: survey and excavation of an archaeological landscape 1987–90', *Proc Soc Antiq Scot.*, 125, 139–95.
- Russell-White, C J 1990 'Synthesis', in Buckley, V (ed), 87–91, Dublin.
- Sherriff, J R 1988 'A hut circle at Ormiston Farm, Newburgh, Fife', *Proc Soc Antiq Scot.*, 118, 99–110.
- Simpson, D D A 1976 'The later neolithic and beaker settlement at Northton, Isle of Harris', in Burgess, C & Miket, R (eds) *Settlement and economy in the third and second millennia BC*, 209–20. Oxford (=Brit Archaeol Rep, Brit Ser, 33).
- Smith, H 1999 'The plant remains', in Sharples, N & Parker-Pearson, M, *Between land and sea; excavations at Dun Vulan, South Uist*, 297–335. Sheffield (= SEARCH, 3).
- Vahros, I 1966 *Zur Geschichte und Folklore der Grossrussischen Sauna*. Helsinki (=Academia Scientiarum Fennica Comm, 197).
- Weir, A 1989 'Sweathouses: puzzling and disappearing', *Archaeol Ireland*, 3.1, 10–13.

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