4 THE FINDS

The following reports are in some cases abridged versions of more comprehensive reports which include tables of numerical data. All this additional data will be accessible in the site archive deposited with RCAHMS.

4.1 Prehistoric pottery, by Melanie Johnson

Four sherds of handmade prehistoric pottery were recovered, weighing 29g in total. Three of the sherds are rims and one is a fragment of a base. The minimum number of vessels is three, as two of the rim sherds join.

Rim sherd 1 (fill of post-hole 069 in Structure F; illus 9a) is thick and coarse with a flattened top and would be a simple bucket- or barrel-shaped vessel. The fabric is generally coarse, with inclusions of sub-angular grits of granite measuring up to 13mm, quartz, mica and other small stones, all of which are locally available or would have been present already within the clay.

Rim sherd 2 (occupation layer 034 in Structure C; illus 9b) comprises two joining pieces of a fine, well-fired vessel with an everted rim and containing tiny mica flakes. The rim is very small and the vessel's profile cannot be reconstructed. These sherds have a small amount of charred organic residue adhering to their outer surface, indicating that the vessel was used for cooking.

It is difficult to suggest a date for these sherds; however, their form and fabric compare well with so-called 'flat-rimmed ware', a body of currently poorly-defined wares of the Mid to Late Bronze Age and Iron Age, found across much of mainland Scotland; vessels which could belong to the 'flat-rimmed ware' tradition are found throughout Scotland on a range of domestic sites. Good comparisons for this rim sherd can be found, for example, at Deer's Den, Kintore, Aberdeenshire (Alexander 2000) where ring-ditch houses have been dated to the Mid and Late Bronze Age (spanning 1600–700 BC), and Wardend of Durris, Aberdeenshire (Russell-White 1995), dated to between 400 BC and AD 260.

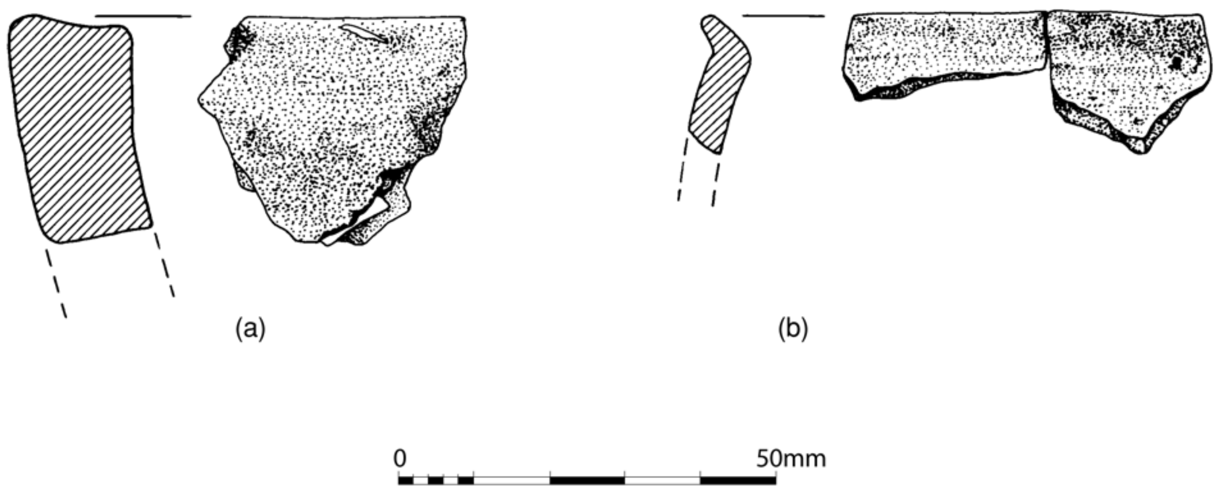
It is impossible to suggest a date for a flat base sherd from post-hole 175 ('Structure I'), or to say anything meaningful about the vessel's form.

There is no evidence for any organic temper in any of the sherds, and the surfaces of the vessels may have originally been wet-smoothed. The assemblage has suffered a high degree of abrasion. A full catalogue of the pottery is lodged in the site archive.

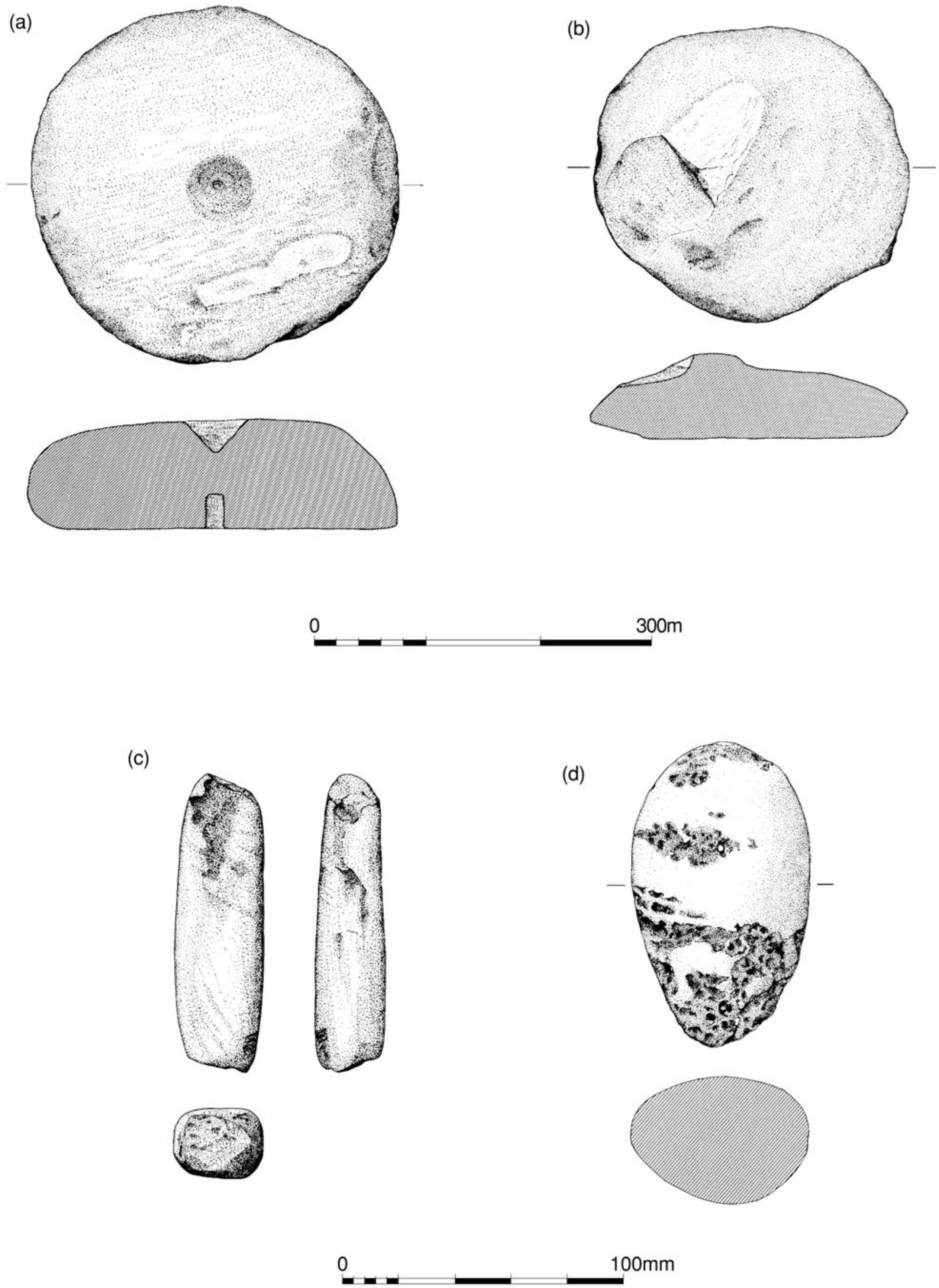
4.2 Coarse stone artefacts, by Ann Clarke

There are four stone artefacts from the site including two unfinished rotary querns (illus 10a and b), a whetstone (illus 10c) and a large battered hammerstone (illus 10d). The whetstone is made on a pebble with the shape formed by the two smoothly-worn, skewed faces. The upper rotary quern stone (10a) has an unfinished central perforation and the base is completely unworn but there appears to be no physical reason, eg breakage, why this stone was not finished for use as a quern. A sub-circular slab (illus 10b) is similar to 10a but apart from the rough outline shaping there is no other evidence that it was worked and it may be a blank for a rotary quern.

All the pieces are standard late Iron Age (or later) artefacts. The whetstone was found in the fill of the



Illus 9 Pottery: a) post-hole 069, Structure F; b) layer 034, Structure C



Illus 10 Coarse stone objects: a) & d) layer 033, Structure B; b) post-hole 084, Structure F; c) ditch 004, Structure B

palisade ditch in Structure B, close to the entrance. The upper rotary quern and the large hammerstone were found in the demolition layer (033) associated with Structure B. The other rotary quern blank was recovered from a post-pit feature (084) in Structure F. The quernstones may have been reused as structural elements, eg as post-pads, but it is possible that the placement of one in the post-pit was a deliberate act of ritual. It is becoming increasingly clear that the deposition of quernstones, which are most commonly found redeposited in structural contexts on Iron Age sites, is more than a simple act of reuse of a suitably shaped building stone. Hingley has noted the instances of quernstones in boundary contexts of hill forts and in late Iron Age cist burials (Hingley 1992, 32, 38). On settlement sites it is not unusual to find querns incorporated into walls or floors: a rotary quern found in the primary paving of the floor from the broch at Fairy Knowe (Clarke 1998) and single querns found in the fill of a pit and in the paving both associated with the entrance to the structure at Cnip, Lewis (Clarke 2007) are recent examples. Such deposits are clearly invested with deeper meanings for community and landscape and may be compared with the inclusion of grain and tools of tillage in the walls of earlier prehistoric houses in Shetland and in burial mounds in the Northern Isles (Clarke 1996).

4.3 Metal and glass objects, by Fraser Hunter

4.3.1 Copper alloy dolphin-type brooch from Structure B (illus 11a)

Polden Hill brooch with Dolphin profile. Most of the pin is lost and there is some damage to the footplate and bow. The 8-turn spring with broken internal chord is held by an iron axis through the closed ends of the spring cover – the characteristic Polden Hill fastening mechanism – although an internal rather than external chord is unusual, rendering non-functional the hook on the head which would normally retain it. The head is humped over the spring in the Dolphin style, with low curved mouldings on the sides. The bow is plano-convex in section, decorated with a central recessed spine running its length which contains a poorly formed zig-zag design created by V-shaped incisions along one side of the channel. It terminates in an expanded conical foot knob with a ridged collar. The catchplate meets the bow in a long, concave curve. L 82mm; W 23mm; H 20mm. Alloy: both bow and spring are leaded bronze (by non-destructive X-ray fluorescence).

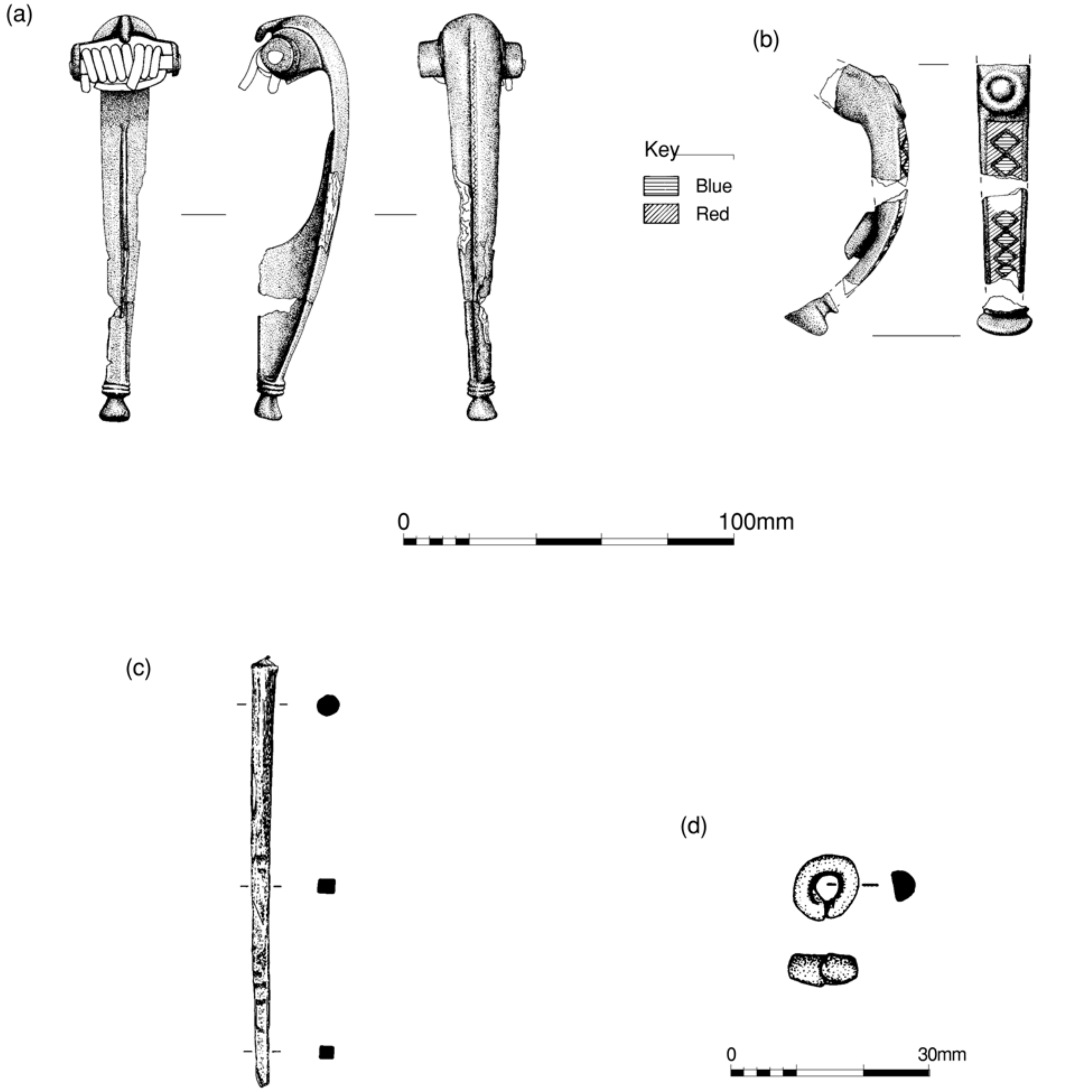
There is some confusion over such brooches in the literature. Mackreth (1996a, 300–1) classes them in the broad category of Colchester Derivative with individual discussion as required, but this is a very diverse group and more refinement is required. The defining characteristic of Polden Hill brooches is the unusual pin fastening as defined above, but there is debate over whether this should refer to a brooch type or just a specific fastening method used on a variety of brooches (Hattatt 1985, 82). The most useful discussion is by Webster (1981, 169–71; 1995, 74–82), who distinguishes several different Polden Hill types based on the bow form; this is an example of her Polden Hill with Dolphin profile. The debate is largely terminological: the type is intimately related to Dolphin brooches (characterised by a bow humped over the spring), but with a Polden Hill spring fitting. Such brooches are rare in Scotland; considering Dolphins and Polden Hills together, the writer knows of parallels from only three Roman sites: Newstead (eg Curle 1911, pl LXXXV, 5); Milton (unpublished; Dumfries Museum); and Birrens (unpublished; Dumfries Museum 1984.27.75). From non-Roman contexts, there are only three others: a Dolphin brooch from Whitekirk, East Lothian (Robertson 1970, table V), a very fine Polden Hill with Dolphin profile from Polmaise, Stirlingshire (Callander 1918), and another from Berscar, Dumfriesshire (unpublished; Dumfries Museum 1990.49.1). The date range of the type is *c* 60–150/175 AD (Webster 1995, 74; Mackreth 1996a, 301). The distribution is primarily southern (ibid), although with a northward spread (eg Snape 1993, 9–14).

The brooch was found in a trial section across the palisade trench 004 of Structure B2. This opens up the possibility that it may have been a deliberate deposit, perhaps as a foundation deposit at the house boundary. The use of Roman brooches in this way can be paralleled at Carronbridge, Dumfriesshire, where an unusual trumpet brooch came from the upper fills of the terminal of a penannular ditch round a house (Johnston 1994, 250); Roman brooches are also found in other ritual contexts (eg Lamberton Moor, Berwickshire (Anderson 1905); Inchyra, Perthshire (Hunter 1996, 117–8)). As only a few sections of the palisade were excavated, it is impossible to assess whether this was a unique deposit or part of a pattern.

4.3.2 Copper-alloy headstud brooch from Structure C (illus 11b)

Enamelled headstud brooch (Collingwood & Richmond (1969, 296) group Q), broken into four main fragments (see A, B, C and D below) and innumerable flakes, found in Structure C layer 034. The four fragments include the following elements:

A) Headstud and part of bow.
The headstud is an integral part of the casting, comprising an outer ring and a raised centre; it is unclear if enamelling was ever present in the channel between the two. The bow is hollowed on the underside. Nothing survives of the wings or the fastening mechanism. Below the headstud the bow bears a rectangular strip enamelled in two colours. The champlevé design comprises a row of central blue lozenges surrounded by cells of red triangles (now highly discoloured). L 19mm; W 8.5mm; T 7.5mm.



Illus 11 Metal finds: a) ditch 004, Structure B; b) layer 034, Structure C; c) pit 431, near Structure D; d) pit 152, east of Structure D

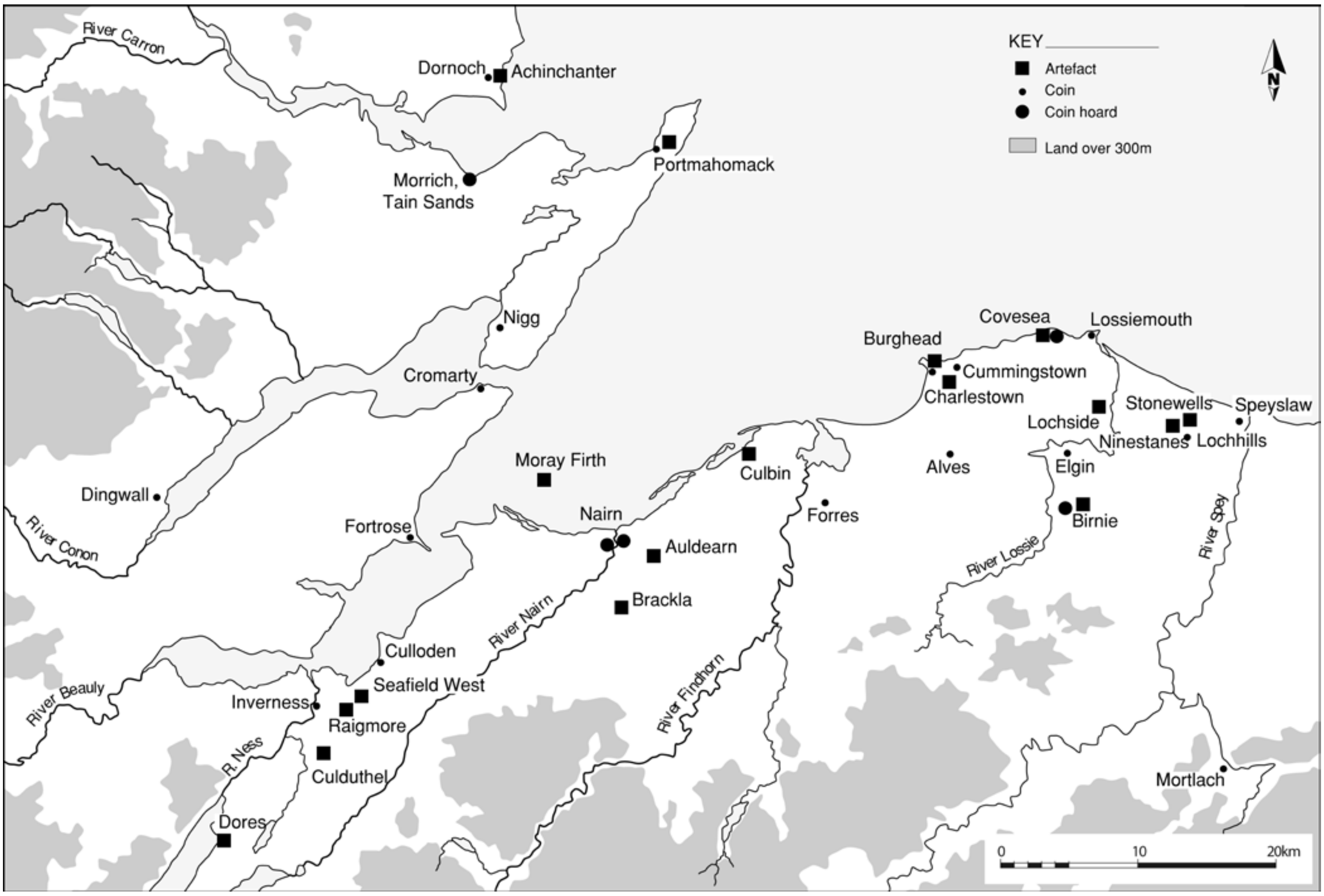
B) Enamelled bow fragment, continuing the lozenge and triangle design of (a).
The bow tapers slightly along its length, and probably joined directly to (a), but the ends are now too corroded for certainty. A curved rod fragment, sub-rectangular in section, is corroded to the underside, and is probably part of the pin. L 18mm; W 8.5mm; T 4mm 5.5mm with pin.

C) Expanded circular footknob fragment, 9mm in diameter, demarcated from the bow by a collar and channel.
The collar bears corrugated decoration. L 6.5mm; W 9mm; T 6mm (incomplete).

D) ?Arm fragment, with a slight step on its vertical edge. The fragment is too small to be certain of the identification. L 8mm; W 6mm; T 4.5mm.

The overall dimensions of the brooch provide a minimum length of 45mm. The bow is gunmetal. Analysis of the enamels was not possible due to their small size, decayed nature and interference from the metal substrate.

Headstud brooches are the second commonest Roman brooch type found on native sites; it has been argued elsewhere that this is due to their similarity to local decorative habits, given the presence of enamelling on most specimens (Hunter 1996, 122–3, fig. 6). The enamelled headstud was fully developed as a type by the time of the Agricolan invasions, and continued throughout the 2nd century AD (Snape 1993, 14–15).



Illus 12 Distribution of Roman finds within the Moray Firth region

4.3.3 Miscellananeous small finds

Structure B2: Fragment of gilt sheet copper alloy.
Distorted, with no original edges. Medieval or later. 10.5 × 6.5 × 0.2mm. Context 010, clean-up layer of machine-disturbed charcoal-rich soil, remnant of the occupation layer (033) over the southern half of the structure.

Post-hole 175 in Structure I: Fragment of a glass bead of Guido (1978, 87–9) class 14.
Deep blue body with inlaid yellow blob and an inlaid spirally twisted cable of opaque white and pale blue. The broken face preserves a trace of a yellow inlaid blob. Original dimensions uncertain – no trace of the perforation survives. 10 × 7.5 × 7.5mm. This find fits easily in the distribution of this bead type (Guido 1978, fig. 36), which indicates it is a product of north-east Scotland (see also Henderson 1989, 69–71). Recent stratified finds and scientific analysis of the glass used has expanded the likely date range from Guido's more precise estimate to 1st century BC–2nd century AD (Henderson 1994).

Pit 431: Iron tool (illus 11c)
The tang is square-sectioned, changing to oval just above mid-section; the working end is broken off, preventing identification. L 130mm; tang section 6.5 × 6.5mm; shaft section 8 × 6.5mm.

Pit 152: Located east of Structure D: Lead bead (illus 11d; recovered during wet sieving).
Formed from a D-sectioned strip bent into a circle, with one end slightly doubled under. External diameter 10 × 9mm; internal diameter 3–3.5mm; T 4.5mm. Context 149, upper fill of pit 152. Although this pit is undated, in the site context it is likely to be Iron Age. Lead is unusual in the Scottish Iron Age: while there are some pre-Roman finds, its use in any quantity starts with the availability of Roman lead as a raw material (Hunter 1998, 355–6). Rings of this size are most likely to have been used as beads: compare an example from Traprain Law (Curle & Cree 1921, 198, fig. 24.25). However, note that there was modern material in several of the surrounding features.

Structure B2: Fe lump.
Badly corroded and fragmented. Either a corrosion blister or a possible nail. Fill 351 of palisade trench 004. Not subjected to X-ray analysis as considered too friable.
Structure B2: Fe strip or bar.
Fill of post-hole 368.

4.3.4 Discussion of Roman finds distribution

Recent finds of Roman objects from the Moray Firth area have markedly expanded the picture of Roman contact in the area (illus 12 and Appendix 1); compare maps in Robertson (1970). Most sites have produced only one or two finds, but some richer sites are known, such as the settlement site of Birnie, or the ritual site of the Sculptor's Cave, Covesea (Benton 1931; Hunter 2007). The brooches are likely to have been valued as some form of status good (see Macinnes 1984, 241–5; Hunter 2001; Hunter 2007).

Roman objects in native society are generally interpreted as status goods (Macinnes 1984, 241–5). With the richer southern sites it is argued that contact with the Romans was controlled through chiefs, who acquired a wide range of material and passed smaller quantities on to clients, dependants or fellow chiefs. It is likely that such exotica were similarly valued in the north, and although the site assemblages are not particularly rich, two broad patterns may be noted in the distribution. A concentration of finds on the southern rather than the northern shore of the Moray Firth may arise from the better arable land, which would have made the inhabitants wealthier and therefore better able to acquire Roman goods, as well as a target for Roman diplomatic efforts and gifts. Secondly, there are hints of a cluster in the Burghead/Lossiemouth/Elgin area, which emerged as the heartland of Pictish Moray in later centuries (Shepherd 1993). This suggests that access to Roman material may have been focused on a power centre, which fits the model of elite social control over access to such exotica.

In sum, the presence of these two Roman brooches, one of them unusual in Scottish terms, suggests that the inhabitants of the Seafield West site were of some status.

4.4 Ironworking debris, by Andrew Heald, Gerry McDonnell and Ian Mack

A total of 8.7kg of slag was recovered. The majority of the debris is associated with ironworking, probably smithing. Although much of the slag was found in secondary contexts, such as ditch fills and post-holes, the majority was associated with the hearth feature (127) in Structure H. This is one of the few *in situ* dated ironworking features from Iron Age Scotland.

4.4.1 The ironworking process

The production of bloomery iron is essentially a four-stage operation: ore roasting; smelting (the extraction of the metal from its ore); bloomsmithing (working the iron bloom to remove further waste products (gangue)); and finally blacksmithing (the production of artefacts and their subsequent repair). The identification of these stages relies on the survival and recognition of the structures and tools used and the residues formed during the smelting and smithing processes. Of prime importance is the recovery and identification of the residues derived from each process.

4.4.2 The residues

Identification was based on the morphological study of the internal and external areas of the object, analysis of weight, density, colour, streak, texture, porosity and inclusions (after Bachmann 1982; McDonnell 1986). Scientific analysis was undertaken on representative pieces. General descriptions of the slag groups are given below and summarised by context in Table 1 and listed in Appendix 2.

Six fragments, totalling 380g, of hearth lining (HL) were recovered. While this material cannot be related specifically to ironworking, the contextual associations with other smithing material (Table 1) suggest that some of the material derives from the same process.

One piece of runned slag (RS) was found in the entrance gully of Structure B trench (fill 096), weight 122g. This has the appearance of tapped slag, the molten waste product from smelting. This slag runs off into bar-shaped channels where it solidifies, which gives it a characteristic dense, black, ropey appearance.

Seven plano-convex slag cakes (many fragmentary) were found, totalling 4923g. The outer surfaces were normally nodular in texture, with evidence of charcoal impressions. Many have areas of red oxide powder indicating active corrosion of an iron-rich zone. The slags come in a range of sizes. It is often difficult to be sure whether such cakes were produced during smelting or smithing; criteria are usually based on dimension and weight (eg McDonnell 1994, 230; 2000, 219). However, such differentiation of the Seafield assemblage is difficult as many cakes appear to be amalgams. The surviving cakes vary in size with the average dimensions: weight: 584g, maximum diameter 83mm, depth 40mm. That said, it is likely that the majority are smithing hearth bottoms (SHB), accumulations of slag that developed in the smithing hearth and were removed when they became too large and interfered with the efficiency of the hearth. This is supported by scientific analysis of one of the larger amalgams (see below).

Nine collections of fragmentary slag were found, weighing a total of 3027g. General characteristics, and the association with other smithing debris of some of the pieces, suggest that the material is best described as smithing slag (Smi).

Minute amounts of slag spheres (SS; 2g) and hammerscale (HS; 1g) were found, all in soil sample residues. These are surface-oxidised iron expelled during hammering and/or when reheated in the hearth. Slag spheres are ejected as spherical globules of molten slag, while hammerscale resembles flaked iron plates. Most pieces were dispersed within minute globules of other vitrified slag or fused silica. When found in large quantities, these slags are normally indicative of *in situ* working.

In total 256g of unclassified slags (Unc) were found. This group contains all the fragments that do not have sufficient of their external surfaces to place them in any of the above classes. Commonly, this is the slag that develops in the smithing or smelting process but is raked out before forming a hearth bottom. It is typical for unclassified slags to constitute between 20% and 50% of the total site assemblage.

Table 1 Slag by type and provenence

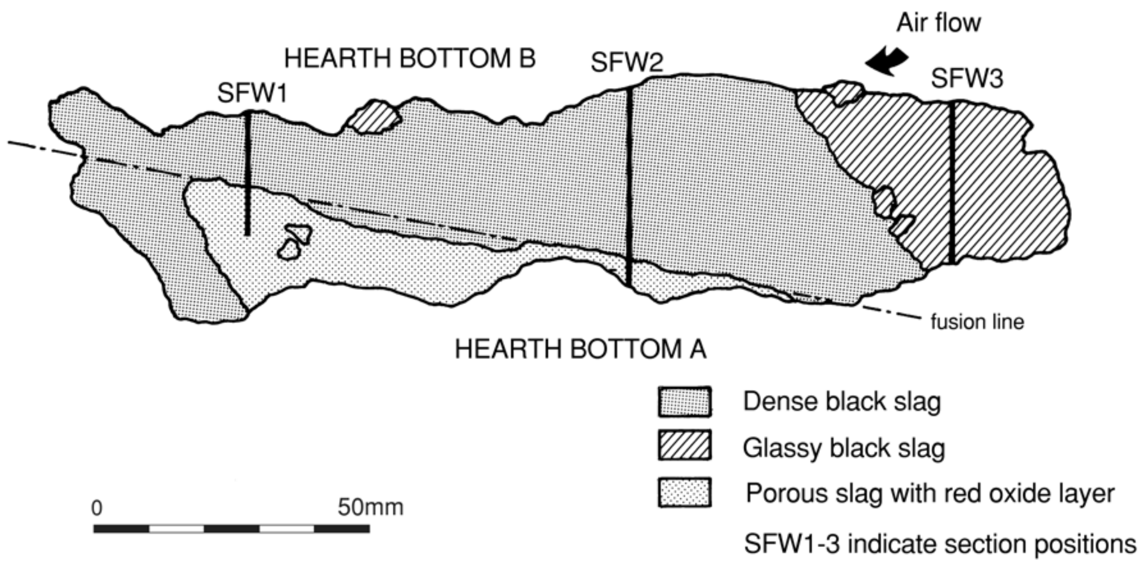
	SHB	Smi	HS	SS	Un	RS	HL	Total
Structure B1								
412 fill of post-hole 411	–	53	–	–	–	–	102	155
Structure B2								
005 fill of slot 004	589	385	–	–	–	–	–	974
096 fill of slot 004	272	–	–	–	–	122	–	394
097 fill of slot 004	–	–	–	–	11	–	–	11
363 fill of post-hole 364	–	–	–	–	–	–	36	36
367 fill of pit 368	–	178	–	–	–	–	–	178
Structure C								
034 occupation layer	–	–	–	–	3	–	–	3
153 fill of pit 154	–	–	–	–	6	–	–	6
161 soil layer	–	31	–	–	–	–	–	31
Structure F								
062 fill of post-hole 061	–	–	–	–	9	–	–	9
Structure G								
057 fill of post-hole 054	–	107	–	–	–	–	–	107
060 fill of post-hole 055	92	–	–	–		–	–	92
209 fill of post-hole 208	–	–	–	–	2	–	–	2
Structure H								
128 fill of hearth 127	3761	1920	1	2	–	–	53	5737
285 fill of hearth 124	–	–	–	–	5	–	–	5
117 fill of post-hole 115	–	–	–	–	43	–	–	43
Structure I area								
176 fill of post-hole 175	–	–	–	–	6	–	48	54
179 fill of post-hole 181	209	–	–	–	–	–	–	209
180 fill of post-hole 181	–	–	–	–	–	–	42	42
188 post-pipe in 181	–	108	–	–	–	–	99	207
Non-structural								
025 fill of 026 near Str A	–	–	–	–	1	–	–	1
093 fill of 094 near Str A	–	–	–	–	3	–	–	3
156 fill of pit 155	–	128	–	–	–	–	–	128
Unstratified	–	117	–	–	163	–	–	280
Total	**4923**	**3027**	**1**	**2**	**252**	**122**	**380**	**8707**

SHB= Smithing hearth bottoms; Smi = Smithing slag; HS = Hammerscale; SS = Slag spheres; Un= unclassified slag; RS = Runned slag; HL = Hearth lining.

4.4.3 Scientific analysis

As many plano-convex slags could not be ascribed to smelting or smithing on the basis of external characteristics alone, and as very little information exists on Iron Age slags in Scotland, a representative example (Cat 014) was subjected to scientific analysis in the Conservation and Analytical Research section in the Department of Archaeological Sciences, University of Bradford by Mack and McDonnell.

The weight of the largest plano-convex slag, over 2000g, suggested a high-density smelting slag. In order to determine whether the slag was derived from iron smithing or smelting a complete section was taken through the centre of the slag. This seemed to be fairly heterogeneous so three small transverse sections were taken to sample all areas of apparently different compositions. These three samples were mounted and polished using abrasive papers and diamond pastes, and analysed using optical light microscopy and scanning electron microscopy (SEM), with additional digital image



Illus 13 Analytical section through hearth slag

processing and analysis. Illus 13 shows the section positions through the centre of slag and reconstruction of hearth bottom formation.

Indicated by the thick black lines are the areas sectioned for micro-structural and chemical analysis (samples SFW1, SFW2 and SFW3 in illus 13). There were three recognisable zones of slag. Whilst much was fairly dense, the base of the slag contained a zone of high porosity with an abundance of red oxide powder indicating active corrosion of an iron-rich zone, and near one edge a zone of slightly glassier material could be seen. The three sections were positioned to sample these distinctive areas. Other noticeable features were that numerous charcoal impressions were spread throughout the slag, particularly near the base, whilst the top surface contained a few large silica grains (<10μm).

Under optical light microscopy all three sections appeared similarly composed of massive iron silicates with a small amount of a blocky phase likely to be hercynite. Free iron oxide existed as dendritic wustite, with all of the above present within a glassy matrix. The most noticeable difference between the three sections was that the amount of wustite was visibly less in SFW3 (5%) than in the other two sections (both 24%) and seemed to equate with the 'glassier' macroscopic qualities of this region. The specific amount of dendritic wustite was calculated using phase discriminative image analysis and the results corresponded well with the impression that this section contained less free iron oxide (FeO).

Samples SFW1 and SFW3 were also quantitatively analysed by SEM to determine specific chemical components. Bulk area analysis using raster scans at ×500 and targeted spot analysis were used to provide general compositional information and analyse specific phases. From the bulk analyses it is clear that the sections differ mainly in the ratio of iron silicates to free iron oxide, SFW1 having about 25:60 and SFW3 30:60. This may explain why SFW1 appeared 'glassier' and could be seen to contain less FeO as dendritic wustite. The dendritic wustite analysed predictably contained over 96% FeO, whilst in contrast the 'blocky' hercynite phase contained aluminium oxides as well as silica and potash.

The ratios of iron silicates to free iron oxides noted may be expected in both smelting and smithing slag. The levels of manganese, however, suggest that this slag is more likely to derive from smithing as levels in excess of 1% would be more likely in a smelting slag. A smithing origin also explains the presence of metal prills and silica grains, which are commonly found in smithing slags, and may also explain the production of discrete areas of morphological and chemical difference in the slag. Illus 13 shows the proposed reconstruction of the formation of the slag, which may be as a hearth bottom that has been fused or has agglomerated to an existing hearth bottom in the forge hearth. The tuyère position and proposed airflow were suggested by the position of the two major zones and the surface morphology. Hearth bottom A was deposited in the hearth first and hearth bottom B was formed during a second distinct use of the hearth.

Based on the micro-structural and chemical analyses (Table 2) it seems likely that this slag is a hearth bottom derived from blacksmithing processes. Furthermore it is likely that this has been formed by the fusion of two hearth bottoms, indicating two distinct smithing events.

4.4.4 Slag distribution

The slag distribution can be divided into two groups: slag from secondary contexts, such as post-holes

Table 2 **Quantitative chemical analyses by SEM (normalised to 100%)**

Sample	Scan	Na_2O	MgO	Al_2O_3	SiO_2	P	K	CaO	TiO	MnO	FeO	CoO	CuO
SFW1	Bulk 1	1.5	1.1	4.4	23.5	0.4	1.3	2.1	0.2	0.5	64.7	0.2	0.1
	Bulk 2	3.6	0.9	8.1	25.3	0.8	2.9	4.6	0.2	0.4	53.0	0.1	0.2
	Bulk 3	1.9	0.9	6.2	24.0	0.3	1.3	2.1	0.3	0.7	62.2	0.0	0.1
	Silicate	0.0	1.0	0.4	31.0	0.0	0.0	0.8	0.1	0.9	65.3	0.2	0.3
	Glassy	4.9	0.4	12.7	38.9	2.0	7.8	12.0	0.2	0.3	20.6	0.1	0.2
	FeO	0.9	0.1	0.5	0.6	0.0	0.3	0.2	0.5	0.3	96.4	0.0	0.4
SFW3	Bulk 1	3.9	0.6	11.4	31.1	1.3	4.7	4.0	0.6	0.4	39.4	0.0	2.7
	Bulk 2	0.7	1.1	5.6	29.2	0.5	1.8	1.8	0.2	0.5	58.6	0.0	0.0
	Bulk 3	1.6	1.4	6.6	30.4	0.0	1.8	2.2	0.3	1.1	54.3	0.3	0.1
	Silicate	0.7	0.3	0.5	30.8	0.0	0.2	2.2	0.0	0.6	64.6	0.0	0.2
	Glassy	2.0	1.2	18.0	54.3	0.4	19.8	0.9	0.4	0.0	2.1	0.8	0.1
	Hercynite	4.0	0.9	30.6	10.7	1.1	0.7	3.9	1.3	0.2	46.0	0.4	0.2

and pits, and slag from apparently *in situ* contexts (Table 1).

As with many sites, a significant proportion of the Seafield West material derives from secondary contexts, particularly fills of pits and post-holes. Such associations are fairly common. Excavations at Bannockburn, Stirlingshire produced slag from the ring-groove and the outer post ring of house 1 (dated to around the 6th/5th centuries BC) and other miscellaneous pits (Rideout 1996, 226–31). Excavations of an Iron Age homestead at Aldclune, Perthshire also recovered small quantities of slag in the fills of interior post ring pits (Hingley *et al* 1997, 423). Although such secondary associations obviously hinder reconstruction of *in situ* metalworking practices, the occurrence of slag is still informative as it aids the general recognition and mapping of ironworking evidence in Iron Age Scotland, at least on a broad level. But discussions can move beyond regional mapping. Hingley (1997) has suggested that the study of ironworking should consider its symbolic and social nature. This may be related to the location of metalworking and the deposition of debris in particular places. It is possible that the slag from Seafield can be interpreted within such a framework.

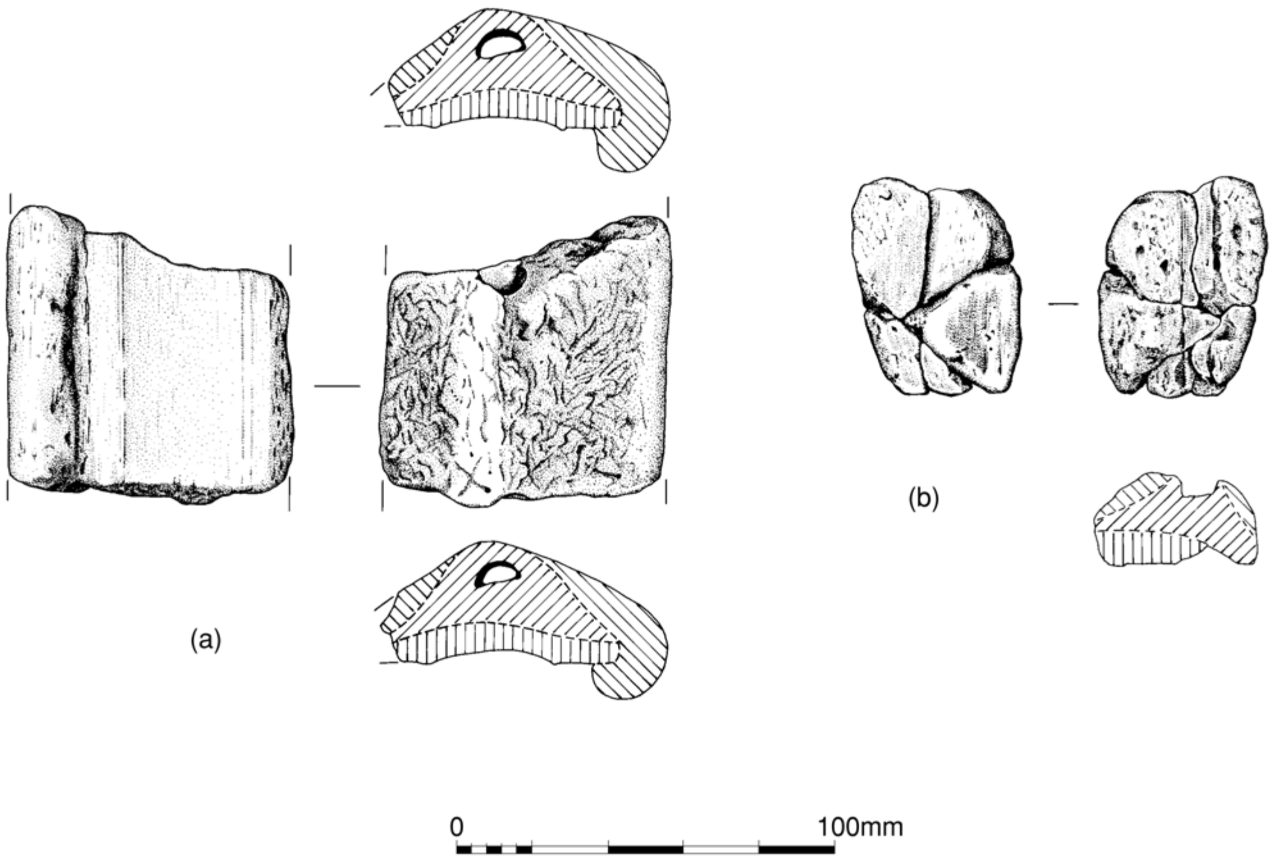
There is good evidence for *in situ* ironworking activity at Seafield. This is indicated by the association of a suite of macro- and microscopic ironworking debris and hearth lining in association with a structural feature interpreted as a hearth. In total, this accounts for 65% of the total slag assemblage. Excavation of Structure G/H revealed a later hearth (127) which was constructed from edge-set stones, with an internal fill (128) which contained abundant charcoal, ash and slag. Combined, this structural and artefactual evidence compellingly points to an *in situ* ironworking area, although the total quantity of hammerscale is small. This feature, radiocarbon dated to 180 BC–AD 70 at 2 σ (based on associated debris from the adjacent feature, GU-8032), represents one of the few dated *in situ* Iron Age ironworking episodes in Scotland.

4.4.5 Discussion

Placing the Seafield West ironworking debris into a wider context is difficult. There is no synthetic study of ironworking practices in Iron Age Scotland and attempts to build one are hindered by the wide variation in recording, interpretation and publication of past examples (see Hunter, Cowie & Heald 2007). While a broad picture can be constructed from older literature, we are reliant on recent excavations for a more detailed understanding. The on-going research of the multi-phased site at Old Scatness Broch, Shetland is a particularly good example of the information that can be obtained from systematic study (Nicholson & Dockerill 1998; McDonnell 1998).

Although there are no regional models for ironworking for northern and eastern mainland Scotland, recent excavations in and around the Seafield area have produced ironworking evidence of apparent similar date (eg Kintore, Aberdeenshire and Culduthel, Highland). The latter site is particularly important as, like Seafield, the slag is associated with *in situ* working areas. It is these primary features, with their metalworking debris, and their associated dates, that are critical for building up a picture of ironworking practices in Scotland. Analysis of this ever-expanding corpus must be a key future research topic.

At present, one useful approach is to consider the wider issue of the status of ironworking on such sites. A study of ironworking in central southern England has shown that it took place at many different types of sites, with smithing expected at most settlement sites (Salter & Ehrenreich 1984, 152). Thus, the numerous smithing episodes shown by the Seafield hearth bottoms may be indicative of such everyday



Illus 14 Fragments of BA leaf-shaped sword moulds

activity. Indeed, at face value the wide range of structural types from which slag derives may give this model some credence. However, this need not indicate prosaic craftsmanship. Norse sagas and Irish poetry clearly demonstrate the importance of smiths in these societies (see Scott 1990, 171–207; Gillies 1981), and the crafts of the smith underpinned many aspects of Iron Age society, from agriculture to warfare. There may have been different types of smith, from village blacksmith to specialist weapons smith, though it is not at present possible to distinguish them in the archaeological record. Thus, ideas that smithing was an everyday, prosaic activity often confined to the reuse of an abandoned building can be challenged: the presence of ironworking debris may be interpreted as evidence of high status, with the smithy at the heart of the settlement organisation (McDonnell 1998, 160). Along with the two Roman finds from Seafield West, it is tempting to suggest that the inhabitants were of some importance, with access to high status goods and craftspeople.

This is an area requiring much more work. The patterns are unlikely to be uniform and, as with much of the Iron Age, we should expect regional variation. The lack of in-depth study of ironworking production and consumption in Iron Age Scotland continues to hinder discussion. At present, it is difficult to decide whether ironworking was an activity common on most sites or whether smithing knowledge and skills were privileged information. The evidence of *in situ* ferrous metalworking at Seafield is an important building block in this developing picture.

4.5 Fragments of Bronze Age sword moulds, by Trevor Cowie with Katherine Eremin

Fragments of clay moulds (illus 14) were recovered from a post-hole (085, fill 086) within Structure E (illus 3) and from a possible non-structural pit (071, fill 072) within Structure F. To anticipate the conclusions set out below, they represent portions of one or more ceramic piece-moulds designed for the casting of Late Bronze Age leaf-shaped swords. The find represents a significant addition to the small number of sites in Scotland which have produced metallurgical workshop debris of the period (Cowie & O'Connor 2007, 325, fig. 28.11; Hunter *et al* 2007, 53, fig. 2). A charcoal sample from post-hole fill 086 produced a radiocarbon date of 1260–920 cal BC (2 σ; AA-35528), a date well in keeping with the current view that the insular leaf-shaped sword manufacturing tradition had fully emerged by the 10th century cal BC.

4.5.1 Mould fragment from post-hole 085 (illus 14a)

Context 085 lay physically within, but not necessarily contemporary with, the setting relating to

Structure E, and consisted of a post-hole, 0.7m in diameter and some 0.5m deep, with a charcoal-flecked sandy fill containing packing material (086). From this was retrieved a relatively intact portion of a complex clay mould unit. A tiny featureless detached crumb in a similar fabric was present among the associated loose soil debris, but is not discussed further.

This is a relatively intact portion of a clay mould unit composed of three principal layers: an inner valve, a backing layer which would have been combined with a reinforcing splint, and an outer wrap. Although the crumbly outer layer has broken away along one side, along the midline the full profile is available from metal contact surface to the apex of the outer wrap. Two features may be noted here, namely the unworn condition of the metal contact surfaces and, in spite of the softness of the fabric, the survival of the longitudinal void left by the reinforcing splint. These features tend to suggest that wherever the metalworking activity took place, this piece was exposed to only limited wear and tear following the casting process and prior to its incorporation into the post-hole fill.

The matrix and contact surfaces survive to their full width. Both are reduced to a light grey colour (Munsell 10YR 6/2 'light brownish grey'). The matrix clearly represents part of a mould for a blade with a curved profile and a width of 31–32mm. In the light of comparative metallurgical debris from other sites and the known inventory of Bronze Age metalwork, there is no doubt that this is part of a piece-mould for casting a Late Bronze Age leaf-shaped sword. Mainly along the middle of the matrix surface, there is a series of very fine longitudinal striations, which appear to be the result of the displacement of tiny mineral grains, possibly as the result of 'dragging' of looser material during the pouring of the metal. An alternative but less likely explanation is that the striations are the result of deliberate smoothing of the matrix surface preparatory to casting.

The inner valve contact surfaces are approximately 10mm wide. A slight rib demarcates the inner edge of the contact surface where it meets the edge of the actual matrix. It is likely that the low rib may have played a part in the registration of the opposing valves, assuming it keyed into a corresponding groove. This may explain the apparent absence of evidence of any more formal method of registration of the valves, such as the provision of tenons seen on a number of contemporary mould assemblages (eg Traprain: Cree & Curle 1922; Jarlshof: Curle 1933). However, the absence of such keying on this particular portion of the Seafield mould assembly is not conclusive and it could simply be the fortuitous result of the spacing arrangement.

The inner valve itself consists of a 7mm thick layer of finely prepared clay with fine mineral inclusions including quartz grains (< 1mm) and reddish-yellow (7.5YR 7/6) in colour. In view of the quality of preservation of this portion of mould, thin-sectioning was discounted but reference may be made to the results of analysis of the closely similar fabric of small fragments from pit fill 072 (see below). Under magnification especially, the building lines show clearly in the faces at either end of the mould.

As noted above, the full profile is available from metal contact surface to the apex of the outer wrap, and the method of construction of the mould is clear. The reverse of the inner valve appears to have been covered in a backing layer of clay into which has been pressed a supporting splint of organic material, presumably wood, its presence revealed by a D-shaped void 12.5mm in width and 7mm high. The splint appears to have been encased in its own rounded envelope of clay, prior to the application of an outer envelope or wrap of clay mixed with profuse organic tempering. Along the central spine of the mould this outer application may have been fairly thin, but around the sides it certainly consisted of a substantial layer up to 15mm thick which physically enveloped the opposing valves until broken open after casting. The outer wrap is much coarser in composition, with profuse organic tempering and a deeper reddish colour (5YR 6/6 'reddish yellow').

The overall dimensions of the fragment are as follows: L 77mm; W 75mm; T 47mm.

4.5.2 Mould fragment from pit 071 (illus 14b)

Lying approximately 5m to the east of post-hole 085, context 071 was a small sub-circular pit, 0.5m diameter and 0.27m deep, with a fill of dark brown orange sand containing packing material (072). The pieces of clay mould were retrieved from the surface of the feature.

Fifteen pieces of clay mould were presented for examination, but some of these are no larger than crumbs. Five of the largest pieces join to make up part of a double-layered mould unit (as illustrated). Three detached pieces may also be noted here: these do not actually refit, but their profile, fabric and colour, and the presence of small areas of reduced surface, suggest that these are almost certainly fragments of the inner valve of the same mould unit. Two of these detached pieces were submitted for thin-sectioning and fabric analysis by Dr Suzanne Miller (formerly Department of Geology, National Museums of Scotland). The sharply contrasting red-grey colour of a further two tiny slivers suggest that they derive from the face of the void left by the reinforcing splint, and these also were submitted for analysis. The remaining pieces are too small to comment on. To summarise, the petrological thin-sections showed that three of the four fragments were compositionally indistinguishable. All contained moderately or well-sorted quartz grains, mainly angular, in a very fine-grained well-mixed clay matrix, with minor mica and opaque grains; in each case, the reddish colour was due to extensive iron staining of the matrix.

In all probability therefore, all the pieces derive from the same mould unit. Owing to the extremely powdery nature of the surfaces and inherent softness of the fabric, it is not certain whether the fragmentation occurred in antiquity, or is the result of compression while in the soil. In any case, this portion of mould has clearly undergone considerably more abrasion prior to incorporation in the soil than the portion from context 086.

As noted above, five pieces refit to form an incomplete portion of a double-layered mould unit. The inner layer survives on only one of the pieces, along with a small area of the matrix surface, approximately 24mm × 20mm. The profile is incomplete but clearly represents part of the matrix for a blade 25–30mm in width at this point, in all probability a sword blade, given the close similarity to the better preserved mould fragment from context 086. The question of whether the two finds represent elements of the same mould assembly is considered in the discussion. The metal contact surface is reduced to a light grey colour (Munsell 10YR 6/2). Although scored in places by subsequent abrasion, parts of the surface are relatively well preserved, retaining a number of fine longitudinal striations similar to the piece from 086. The valve contact surface is damaged and its original form is uncertain: a slight rib demarcates the edge of the actual matrix and running parallel to this is a narrow, slightly irregular scored line (0.5mm across). The functions of the rib and the scored line are uncertain, but as noted above, these features may possibly have a connection with registration of the opposing valves. The inner valve consists of a layer of clay approximately 6–7mm thick: the building line shows clearly in profile where the double layers are preserved, and where the inner wrap has become detached, the line of the junction survives as a smooth curve. The inner valve fabric consists of fine clay, with very fine inclusions (< 1mm); the surface is a reddish yellow (7.5YR 7/6).

Turning to the enveloping structure, a U-shaped channel represents the abraded remains of the void left by a supporting splint of organic material applied to the reverse of the inner valve and encased in clay. As in the case of 086, the splint appears to have been encased in its own envelope, prior to the application of the outermost envelope or wrap. Few traces of the outermost wrap now remain, probably due to abrasion of the extremely soft and powdery surfaces. The fabric of the outer wrap is profusely tempered with organic material. The surfaces are a deeper red colour (5YR 6/6 'reddish yellow').

As noted above, the fabric and colour of two tiny detached slivers suggest that they derive from the face of the void left by the reinforcing splint, where burning out of the splint has resulted in a reduced grey surface.

The overall dimensions of the fragment in its refitted condition are as follows: maximum length: 60mm; maximum width: 45mm; maximum thickness: 25mm.

4.5.3 XRF analysis of the mould fragments, by Katherine Eremin

In order to assist with identification of the casting alloy, the mould fragments were analysed by using energy dispersive X-ray fluorescence (XRF) without any preparation (Eremin 2000). Some alteration of the surface chemistry due to burial is expected.

Copper and lead were detected by X-ray fluorescence analysis of the central grey areas of both mould fragments. A number of elements were found in all areas detected and are constituents of the ceramic: iron, titanium, potassium, calcium, manganese, rubidium, strontium and zirconium. The presence of lead and copper in casting areas suggests casting of a leaded copper alloy. Although tin was not detected in the mould fragments, it may have been present in the alloy as tin is not a volatile element, hence is not strongly absorbed by the ceramic.

4.5.4 Discussion

The find represents an important addition to the small number of sites in Scotland which have produced Late Bronze Age clay moulds. These include the significant assemblages from Traprain Law, East Lothian and Jarlshof, Shetland and smaller groups recovered from Dunagoil, Bute and Loanhead of Daviot, Aberdeenshire (see Hodges 1959; Coles 1960, 89).

In keeping with finds from other sites in Scotland and further afield in Britain and Ireland, Seafield West shows careful preparation of the mould units, with the use of different recipes for the production of the inner valves and outer wraps. The clay for the inner valve had been carefully worked, while the outer layer was a coarser mix incorporating substantial quantities of plant matter. As noted above, the Seafield West moulds provide particularly clear evidence of the use of enclosed wooden splints. Such reinforcement of the mould assembly would have been required to prevent warping of the mould during the manufacture of long implements, such as swords. There is evidence of the use of reinforcing splints among the metalworking debris from Traprain Law (Cree & Curle 1922, 214, fig. 14.2) and Jarlshof (Curle 1933, 116; 1934, 279). In Ireland, there is evidence for broadly similar devices from Boho, Co. Fermanagh (Hodges 1954, 64); Lough Eskragh, Co. Tyrone and Whitepark Bay, Co. Antrim (Collins 1970, 34–6, nos 26, 30–31).

Tylecote (1986, 89) has noted the remarkably consistent form of Late Bronze Age moulds in Britain and Ireland, but it should be stressed that the precise method of manufacture of the mould varies in detail. Whereas the moulds from the above-mentioned sites have a two-part structure, the pattern of building joints shows quite clearly that at Seafield the mould assembly was tripartite, the splint being encased within a clay backing applied to the inner valve prior to application of the outermost wrap.

The structure gives the Seafield mould a bulkiness which contrasts with the neater lines of the mould units from Jarlshof and Traprain. Another contrast is the apparent absence of any formal method of keying to permit registration of the opposing halves of the mould assembly. It is unclear whether these simply reflect differences in technique or expertise (for example, as a result of more careful preparation of the clay) or technological advances achieved over time.

On the fragment from 086, the matrix indicates a segment of blade with relatively straight sides, 30–31mm in width, and with a gently rounded section, a combination of features which invites comparison with the neck portion of a leaf-shaped sword blade. The projected width and profile of the matrix on the less well-preserved mould fragment from 072 would also be in keeping with the neck of a sword. The close similarity of the two fragments may be noted, but owing to the incompleteness of 072, it is not certain whether they represent portions of the same original mould assembly. Similarly the incompleteness of the mould fragments precludes detailed classification of the sword type.

In the light of radiocarbon dating, the development of leaf-shaped swords was taking place in Britain during the period *c* 1150–950 cal BC (Needham 1996, 135–6; Needham *et al* 1997). The radiocarbon date of 1260–920 cal BC obtained from context 086 is thus well in keeping with the current view that the insular leaf-shaped sword manufacturing tradition had fully emerged by the 10th century cal BC, but evidence from the swords themselves suggests that they were not being manufactured in Scotland before the Ewart Park phase (9th century BC) of the Late Bronze Age (Cowie & O'Connor 2007).

4.6 Fired clay, by Fraser Hunter

Chunks of fired clay were recovered from the fills of a number of features spread across the site. Most were either unworn or only slightly worn, indicating that they had become incorporated into the deposits shortly after destruction as such friable material weathers rapidly. Although often described as burnt daub, it is unlikely they come from the burnt clay walls of houses: they have flat rather than curved faces, the temperatures indicated by the appearance of some, and the presence of slag adhering to another, suggests instead they derive from an industrial process. Insufficient survives to reconstruct their original form. The slag on one suggests metalworking, which is attested on site by fragments of LBA sword mould and Iron Age slag: they may come from structures associated with metal-working, such as hearths and casting pits. The lack of curvature indicates we are not dealing with furnace lining.

Impressions in the fragments indicate that a right-angled framework of wattles was used as a support, with wattles running parallel to and immediately behind the face; there is no surviving evidence for a three-dimensional framework. Wattle diameters vary from 10 to 25mm. As to morphology, a number of different features are indicated. Some are thin slabs, some 18–26mm thick. Where two faces survive they are generally perpendicular, although some are at a more acute angle and one has an obliquely rounded edge. One preserves a raised lip, suggesting it lay on the inside of an angle.

The material was recovered from features associated with six of the structures. A small post-hole (030) within the ring of Structure A contained a single, highly fired fragment; small slag fragments were found in other features situated adjacent to the ring-groove. The entrance post-hole 411 of Structure B contained both slag and highly fired clay, one piece with a wattle impression. Post-hole 459 within the ring of this structure also contained a small fragment. Within ring-ditch Structure C, six fragments of fired clay came from adjacent small post-holes 381 and 158, the former producing the largest (by weight) single assemblage from the site at 259g but also containing ?intrusive modern material. Post-holes 085 and 076 within the ring of Structure E (but possibly relating to Structure F) contained small quantities with parallel faces; 085 was the feature which produced the larger of the clay mould fragments (Cowie above). Features associated with the hearth in Structure H and nearby post-holes in Structure G contained a total of 25 pieces, including vitrified fragments, right-angled faces and wattle impressions. Potentially these fragments could be the remains of hearth lining and a dome over metalworking hearth 127.