
SUAT Ltd

*A Watching Brief and Excavation
at
Meadows Business Park
DORNOCH*

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Abstract

A watching brief was commissioned by Highland Council Archaeology Service (HCAS) and carried out jointly by Resurgam! and SUAT Ltd in May 1997 on the development of a new business park in Dornoch. The watching brief, in accordance with a specification prepared by HCAS, involved monitoring ground works and, in particular, topsoil stripping, which revealed numerous features including a building, ditched enclosures and evidence for ironworking, all sealed beneath an artefact-rich medieval cultivation soil. Rapid salvage excavation was quickly agreed and carried out over a period of five days. A small assemblage of finds was recovered from the excavation including quantities of iron slag, bog iron ore, fragments from a clay-lined furnace, whale bone, a bone counter and bone pin beater.

Numerous other finds were recovered independently from the topsoil (and submitted to Treasure Trove) by a local metal detectorist including iron slag and burnt clay, coins, buckles, buttons harness fittings and nails, of medieval and post-medieval date together with animal bone, pottery and shell.

Radiocarbon dates obtained place the main period of activity here in the late 1st millenium AD. The evidence recovered also suggests a long tradition of ironworking here from the early medieval period continuing through to the medieval period.

The post-excavation analysis and reporting of the results was funded by Historic Scotland.

Introduction (Illustrations 1 and 2)

A watching brief was commissioned by Highland Council Archaeology Service and carried out jointly by Resurgam! and SUAT Ltd between Monday 19th May and Tuesday 27th May 1997 on the development site of a new business park in Dornoch (SUAT Site Code DH01). The site lay immediately to the south of the former Bishop's Palace (part of which is now the Bishop's Hotel) on the southern edge of the old burgh and just outside the area of archaeological interest as defined in *Historic Dornoch: The Archaeological Implications of Development* (Simpson and Stevenson 1982).

The development was already in progress when a local resident, Charlie Miller, identified archaeological features both cut into the natural subsoil and visible in sections exposed for service trenches. A local metal detectorist, Mike Gallon, had also recovered numerous small

finds from soil heaps. On reporting the finds to Highland Council, a watching brief was rapidly commissioned.

The watching brief involved monitoring ground works associated with the development, in particular the topsoil stripping of a new access road, which revealed numerous features including a building, ditched enclosures and evidence for ironworking, all sealed beneath an artefact-rich medieval cultivation soil. Originally commissioned as one or two days work to a specification prepared by Highland Council Archaeology Service, an extension was subsequently agreed in consultation with Highland Council, as the developer, and Highland Council Archaeology Services, as curator, to allow salvage excavation. Over the Bank Holiday weekend the Tain Archaeology Group and students from the Aberdeen University, Certificate of Field Archaeology course kindly helped out. Finds, many of which were recovered by Mike Gallon from spoil taken off site and dumped on an adjacent field, included large quantities of iron slag, burnt clay, medieval pottery, medieval and post-medieval buckles, horse fittings, coins and nails, together with animal bone and shell. Of these finds, most were submitted to Inverness Museum and subsequently to the National Museum of Scotland for Treasure Trove, some were retained by the finder and some were handed over to SUAT/Resurgam! on site.

Radio-carbon dates obtained indicate the first activity on the site in the 8th, possibly 9th century AD but with the main phase of occupation in the 10th century, possibly extending into the 11th century. There was also some later activity in the form of a hearth, again with slag present, attributable to the 15th century by radiocarbon dating.

The post-excavation analysis and reporting of the results was funded by Historic Scotland.

Site Location (Illustration 2)

The site lies on the south side of The Meadows (NH 797 895), the road that runs parallel with, and to the south of, the main thoroughfare of the burgh, Castle Street. The former Bishop's Palace lies immediately to the north, part of which still stands and is now the Bishop's Hotel. The development area has been under grass since at least the First Edition OS map of the burgh when it was known as The Glebe. The former manse, now the Highland Council offices, stands at the south-west corner of the site, while on the east side stands a recently closed abattoir, now partly in use as a joinery and garage. On The Meadows frontage stands the newly built Dornoch Heritage Trust 'Historylinks' centre, with adjoining car park. To the south of the site, the low-lying fields and machair stretch uninterrupted to the Dornoch Firth. Portmohomack, currently the subject of a major archaeological research project, lies on the south side of the Dornoch Firth.

Historical and Archaeological Background

The Dornoch Firth was a crucial place in the emergence of the Scottish nation in the early Middle Ages. The Norse and Celts in northern Scotland, led by their respective political rulers the earls of Orkney and the Mormaers, struggled to control Easter Ross which lay

between the earldom of Caithness (which included Sutherland) and the mormaerdom of Moray (Crawford 1995a, 2).

The Dornoch Firth seems to have been the boundary between the two cultural groups and has been the subject of much discussion (Crawford 1986; Crawford, 1987; Crawford 1995a). Though later (13th century) Icelandic saga writers refer to the *Ekkialsbakki* (thought to be the River Oykell which flows into the Dornoch Firth) as the extent of the conquests of some of the early Earls of Orkney (Sigurd the Mighty and Thorstein the Red), there was, however, no geographical reason why the Norse should have contented themselves with the Dornoch Firth as the southern limit to their expansion (Crawford 1986, 33-5). The attraction of good land led the Norse to attempt to control land further south both politically and territorially. The Earls of Orkney and Caithness also attempted to rule in the Hebrides and control of the firthlands ensured free access to the Great Glen and a through route to the south-west, thus avoiding a long and difficult sea voyage. South of the Dornoch Firth also offered access to rich resources of timber in Easter Ross which they must surely have exploited for the maintenance of their existing fleet and the building of new vessels (Crawford 1995a, 11-17).

Place name evidence is especially useful here and there has been much work done in the field of linguistics (Nicolaisen 1976; Fraser 1986; Watson 1993; Crawford 1995b; Bangor-Jones 1995, for example). The place-names of both Picts and Norse intermingle in what must have been a zone of contact between the two peoples, with a later, Gaelic element being introduced as Pictish power declined in the 9th century (Fraser 1986, 23). Pictish place-names indicating settlement are relatively infrequent around the Dornoch Firth, Norse names are more common and distributed fairly evenly and Gaelic names have by far the largest proportion of the settlement place-names in the area (Fraser 1986, 23-29).

The distribution of Viking graves also fits well with the place-name evidence with a concentration around Dornoch (McNeill and MacQueen 1996, 64-5 and 71; Batey 1993, 148-172). There is also a strong relationship between grave finds and the location of the best arable land – in north-east Caithness and the Dornoch area of Sutherland (Crawford 1987, 118).

The first direct reference to settlement in Dornoch is, however, not until the early 12th century. Contained in a writ by David I (1127 x 1153), recorded in the Dunfermline Abbey register, it orders Rognvald, Earl of Orkney to respect the monks at Dornoch and has led to the suggestion that monks from Dunfermline had established a cell in Dornoch (Cowan and Easson 1976, 203-4). Dornoch is traditionally associated with St Barr or St Finbarr (died AD 610), a disciple of St Ninian of Whithorn, and it is possible that a community of Celi De monks had established a cell there (Cowan and Easson 1976, 52 and 61). The remains of this early monastery are claimed to have been found during excavations for the Public School in the mid 19th century (Scott 1915, 24).

The *see* was probably founded by David I c 1147 x 1151 as part of a deliberate policy of detaching this remote and partly Norse-speaking province which had been under the political influence of the Earls of Orkney and may have been ecclesiastically under the Bishops of Orkney from Norse loyalties (Barrow 1981, 68). David's first bishop in Caithness was Andrew, a Benedictine monk at Dunfermline. He appears to have taken fellow monks with

him to Dornoch with the intention of establishing a monastic cathedral. This never seems to have come to fruition and the location of the church in Dornoch under the early bishops is still unknown. It was not until the 13th century, in fact, that the *see* was moved from Norse-dominated Halkirk to the more southerly church of Dornoch in the Gaelic-speaking part of the diocese. With the establishment of the Scottish lines of Earls of Caithness after 1231, and during the episcopate of Bishop Gilbert, the church at Dornoch was built or rebuilt, and developed as the cathedral of the diocese. It was largely destroyed by fire in 1570 and remained roofless until it was restored in the 19th century (Simpson, 1924, 227-38).

The Bishop's Palace, which stands to the south and directly opposite the cathedral, is basically late 15th-century in date with some mid 16th-century reconstruction (MacGibbon and Ross, 1887-92, 336-7). Extensive rebuilding and renovation was carried out in 1813 as part of the Countess of Sutherland's reconstruction of Dornoch to achieve its present appearance. The palace is thought to have comprised three towers and formerly extended across what is now Castle Street towards the cathedral. Like the cathedral, it was largely destroyed in a raid on the town led by the Earl of Caithness and chief of the Mackays in 1570 (Simpson and Stevenson, 1982, 2 and 4). The palace of Bishop Gilbert, the builder of the cathedral, may have been on the same site.

Other than the cathedral and Bishop's Palace, little is known of medieval settlement here, and the town was not officially recognised as a burgh until it received its charter from Charles I in 1628. The principal thoroughfare of the town is Castle Street, leading onto The Square, but these are late alterations to the town plan and date to the early 19th century. Many, if not all, of the buildings in High Street, the original thoroughfare and market place in the medieval period, which runs east to west on the north side of the Cathedral, were demolished around this time.

Previous Archaeological Work

Prior to the watching brief reported on here, no other archaeological work has been carried out in the burgh and very little archaeological work has been undertaken since. A watching brief was carried out in 1997 on a cable trench in High Street during which three human burials were found close to the cathedral (Kendrick 1997). A shell midden was also identified along with undated features which predated the laying out of High Street itself.

In recent years, numerous small finds have been recovered by the local metal detectorist, Mike Gallon, in and around Dornoch and submitted to Inverness Museum. The finds, largely of lead, silver and copper-alloy and of medieval and post-medieval date, include buckles, brooches, pins, seals, seal matrices and horse harness equipment but also includes a Romano-British trumpet brooch. The range of finds is indicative of a market site (DES 1995, 47; DES 1996, 61; DES 1998, 50 and DES 1999, 53).

Methodology

Topsoil, and what was later identified as medieval cultivation soil, was stripped off by machine down to the natural sand subsoil and dumped on the adjacent field to the south of the site by a

fleet of tipper trucks. It was from this field that many of the small finds were recovered by, Mike Gallon, a local metal detectorist.

The watching brief concentrated on monitoring the topsoil stripping of the access road, an area measuring approximately 70 m in length and varying in width from between 10-15 m at its narrowest point at the western end, widening to *c* 30 m at the entrance from The Meadows. The main part of the site, where the business units were to be sited, had already been stripped but showed no features in either base or section. This phase of groundworks did demonstrate, however, that the topsoil progressively thinned out towards the south. Once the topsoil had been removed, the floor of the trench was shovel-scraped and inspected for features. Due to constraints on time, and working within the contractors' timetable, the site was divided into three sectors of roughly 20 metres in length each, as work progressed from the west end of the site towards the entrance off The Meadows. All features were planned at scale 1:50, related to OD and photographed. Slots were rapidly excavated through each feature to obtain sketch profiles, soil descriptions and finds, with information recorded on context sheets. Soil samples were taken from a number of features, including pit fills, ditch fills, possible hearths and occupation layers. Once a basic record had been made, as many features as possible were rapidly excavated and bulk sampled to retrieve finds.

The Stratigraphic Sequence (Illustration 3)

The topsoil stripping revealed a scatter of largely isolated ditches and cut features at the west end of the site in contrast to a fairly dense concentration of intercutting ditches and pits at the east end of the site, all of which could only be rapidly excavated and recorded. The radiocarbon dates obtained, in association with the better understood stratigraphic relationships, have allowed a basic sequence to be established. A number of features are undated and difficult to ascribe to a particular phase of activity. The earliest phase of activity seems to date to the 8th or 9th century with the second and main phase of activity in the 10th, possibly extending into the 11th century; there was one isolated feature dating to the 15th century.

Phase 1 : 8th–9th Centuries AD

Ditches and Evidence for Ironworking (Illustration 5)

The eastern end of the main trench was stratigraphically the most complex with a number of inter-cutting gullies and pits concentrated in one small area. The earliest datable feature was a narrow, north to south aligned gully (57) which had been truncated by a more substantial ditch (27) to the south and by a pit (59) ascribed to Phase 3. The upper fill (56) comprised silty sand and like many of the other features it was packed full of charcoal, cockles and whelk shells but also included a whale vertebra, fish bone of the cod family, two fragments of animal bone, one of sheep the other of pig, and charred barley grain. The charred barley grain provided a radiocarbon date of 1247 +/- 32 BP (OxA-9353) giving a date in the 8th, possibly 9th century AD. The lower fill contained pieces of a clay furnace or hearth, large

lumps of slag and a fragment of iron. At the north end of the gully was a shallow oval shaped post-hole (51), measuring 0.88 m by 0.48 m and surviving to a depth of 0.14 m.

Gully (57) was not stratigraphically the earliest feature as it truncated two other ditches or gullies which may have been part of a more substantial feature. Cut (34) comprised two intercutting ditches or a ditch which branched off in two directions (Cuts 32 and 60). One fragment of slag was recovered from the fill.

Cutting ditch (34), and possibly contemporary with gully (57), was a shallow pit (32). It was found to contain (fill 31) burnt and unburnt bone, charcoal, flecks of burnt clay, sheep/goat bone, shell, charred matter and heather twigs.

At the western end of the site, and possibly contemporary with activity at the eastern end, was further evidence for ironworking. An area of disturbed natural sand subsoil (23), which seems to have filled a hollow in the underlying natural, was found to contain large quantities of smelting slag and hearth or furnace remains partly vitrified. A fragment of a *tuyere* was also recovered from this layer during initial cleaning.

Within this area were several undated features which may have been associated with, or been contemporary with, ironworking. Cut (22) had four depressions in the base of the cut, which may have supported a structure of some sort. Further east, was a hearth-like feature (14), 1.6 m long by 0.8 m wide. It had sharp, almost vertical sides and at its maximum depth it measured 0.20 m. The base of the cut was on two levels with a smaller cut in the centre. The lower fills comprised successive layers of burnt sand with shell fragments, charcoal fragments and an occasional fragment of burnt animal bone. A layer of fire-cracked stones marks either its final phase of use or its abandonment.

Immediately to the east of the hearth was what appeared to be the remains of a turf bank (28), comprising reddish orange sand, with mussel shell, bone, charcoal and one flax seed present, between 1.2 m and 1.8 m wide and running north-south across the floor of the trench. To the west of the bank, were several features difficult to ascribe a date for; these features may equally belong to Phase 1. To the south-east of the bank was cut (36), possibly a post-pit, which extended beyond the south section. It could conceivably represent the northern end of a ditch or gully. The pit measured some 0.6 m by 0.65 m and was cut to a depth of 0.6 m. It had near vertical sides and a flat base. The upper fill, dark brown sand with occasional charcoal flecks, also contained large packing stones. Close by was another oval pit (30). Only 0.18 m deep, with a concave base, and measuring 0.4 m by 0.35 m, it contained dark brown sand with the occasional large sandstone, with signs of burning, and a patch of burnt animal bone.

Phase 2 : 10th Century AD

Building, Enclosures, Pits and Ironworking (Illustrations 6 and 7)

Although it is possible that the earlier activity in Phase 1 could have continued into Phase 2, the calibrated radiocarbon dates suggest there may have been a break. In Phase 2, an enclosure was established within which, or attached to which, a building or structure was erected. Large

quantities of iron slag, fired clay and bog iron recovered from numerous features associated with this phase indicate that ironworking was an important activity.

Enclosure and Ditches

At the western end of the main trench, and cut into the layer producing the iron slag and furnace lining were three linear features. The most substantial of these was cut (18), a curvilinear ditch 0.35 m wide and 0.2 m deep with a concave base. Thought to be an enclosure, it was only partially exposed in the floor of the trench, the rest extending beyond the north section. The upper fill (17) comprised dark brown sand with frequent shell inclusions (small fragments and flecks), fragments of animal bone, including sheep/goat (burnt) and one fragment of a young calf bone, and frequent small pieces of slag. In parts, the fill was almost pure shell. Occasional charred grains of barley were present, a sample of which provided a radiocarbon date of 1139 +/- 37 BP (OxA-9349).

To the south-west lay a similar feature, cut (20). It lay on a north-south axis but was curving to the south-east as it reached the main south section. At the north end it appeared to be shallowing out and at its deepest it only measured 0.1 m. Its fill, (19), comprised dark sandy silt and contained shell fragments, burnt clay and small pieces of slag and a small number of unidentifiable fish bone fragments.

To the north-west was a third linear cut (16), 0.17 m deep, filled with dark sandy silt containing patches of mussel shell.

Enclosure (Illustration 5)

Presumably dumped against the possible turf bank was a spread of midden (45). The midden was found to contain a massive lump of top quality bog iron ore, charcoal, pieces of slag and burnt bone. Larger fragments of cattle and sheep/goat bone were also recovered, together with cockle and snail shell, charred barley and oat grains. Charred barley grain in layer (45) provided a radiocarbon of 1121 +/- 35 BP (OxA-9351).

Cutting through the midden was the western end of a large, possibly sub-rectangular, ditched enclosure (25), within which, or attached to which, was a building or structure at its east end. The west and north sides of the enclosure ditch were traced in plan in the floor of the trench, but the remainder lay beyond the south section. The ditch itself was flat-bottomed and measured 0.65 m across and 0.2 m deep. It contained a single fill (24), a grey-brown fine sand with occasional inclusions of animal bone, cockle and mussel shell, charcoal, charred oat and hulled barley. A rodent tooth, burnt, and a small number of fish bone fragments were also recovered, identified as haddock and of the cod family. The north arm of the ditch appeared to terminate close to the building.

Building (Illustration 7)

At the east end of the enclosure, partially exposed and continuing beyond the main east section and south sections was a possible building. The building, if contemporary with the large enclosure ditch, lay *c* 16 m from the western edge of the ditch. Although disturbed by later features, the structure was represented by a pair of closely spaced, parallel ditches (42/44) on the north side with a single ditch on the south side only just visible (any second ditch would have lain beyond the south section). The outer of the two ditches on the north side (44) may have functioned as a drip trench. Some charcoal fragments and a small piece of slag were found in the fill.

Internally the building, which appeared to be sub-rectangular, would have measured *c* 5 m from north-south and at least 4 m east-west. Both ditches had vertical sides and flat bases and were *c* 0.4 m deep, and 0.45–0.55 m wide. The fill (41) of the inner ditch, comprised sandy silt and contained a large lump of slag or iron and one smaller fragment of slag. The fill (43) of the outer ditch was more organic in content, and a curved strip of iron was also recovered. There was a gap through these ditches on the west side surfaced with a series of flat stones (52). The largest slab lay at the centre with smaller stones laid around it. The packing between the stones comprised pebbles in a dark soil matrix (53). Cockles, mussels, charcoal, small pieces of slag and charred barley grain were also found between the stones which may have also been used as packing or alternatively may have been later trampled over the threshold and somewhat similar to layer (37) within the outer enclosure. Charred barley grain from layer (53) provided a radiocarbon date of 1129 +/- 33 BP (OxA-9352).

At the north end of the entrance was a small, sub-square post-hole (55) with a large stone in the fill. There may have been a matching post-hole on the south side but this would have been truncated by pit (49).

Pit (59), sub-rectangular in plan and which lay roughly centrally within the building, may have been a roof support. It was found to be packed full (fill 58) of charcoal, numerous fragments of clay furnace or hearth lining, numerous small fragments of slag and hammer-scale, a fire-cracked stone, small fragments of shell and barley grains and two iron objects, possibly nails, all in a blackened sand matrix. The charred barley grain produced a radiocarbon date of 1055 +/- 55 BP (OxA-9513). The pit seems to have been backfilled in the late 10th century/early 11th century, presumably after the building itself went of use (see Phase 4).

Phase 3 : 10th – 11th Centuries AD

Ditch and Pits

The most substantial feature uncovered during the work was a large curvilinear ditched feature (27), a 12 m long stretch of which was visible in the floor of the main trench at the eastern end. The ditch measured some 1.5 m wide and 0.4 m deep, with a concave base. The fill (26) comprised dark brown and grey sandy silts with cockle, buckie and otter shells in the upper level

and large lumps of smelting slag and lumps of bog iron ore in the basal fill. A stone disc with one slightly convex surface was also recovered from this fill.

During excavation, this ditch was thought to be post-medieval in date and to have been the southern end of a similar feature observed in a section, cutting through the cultivation soil (02). What was thought to be the northern end of this same ditch was traced in plan cutting through natural sand further to the north, close to the road (The Meadows). However, the contents of the ditch were entirely consistent with other features on the site which prompted a re-examination of its position in the stratigraphic sequence. It still remains one of the latest features on the site, as it cuts through all but one of the features at the east end of the main trench including the building, but is now thought to pre-date the medieval cultivation soil. Whether this ditch is the same as that close to the road, forming one large enclosure is not clear.

There were other cut features, unfortunately little understood, which may post-date the building. Cut through the east edge of ditch (27) and through the flagstone threshold was an oval pit (49), 1.75 m by 1.0 m and 0.4 m deep. The upper fill (48) comprised laminated silts and sands with cockle shells, fragments of animal bone and a piece of slag. Further analysis of this fill yielded important evidence on the local environment with concentrations of cereal grain, chaff fragments and weed seeds (see Plant Report below). Grains of barley and rye were predominant with a smaller concentration of black oat and weeds common to cultivated fields also present. Interestingly, there was also a large concentration of heather indicative of heaths and moors and probably collected for use as a building material (bedding, thatching, flooring for example) and small fragments of hazelnut shells, either collected for food or accidentally brought to site with fire wood. A bone weaving tool, possibly of sword beater type and widely known from Anglo-Saxon sites, was recovered from the fill (see Artefacts Report below). The lower fills comprised bands of charcoal separated by bands of silty sand.

Phase 4 : Medieval and Post-Medieval Features

A thick, homogeneous deposit of possible cultivation soil (02) was extensive across much of the site, but progressively thinned out towards the south, and on average measured between 0.55 m and 0.75 m in depth but in places reached 1.1 m. This deposit, which was rapidly machined off and loaded directly onto a fleet of tipper-trucks during the initial site strip, was largely recorded from sections. An assemblage of predominantly medieval and post-medieval finds was recovered from this layer, most of it off-site by a local metal detectorist, as this soil was dumped on an adjacent field to create a bund. These finds were submitted to Treasure Trove and no funding could be secured to include an analysis or discussion of the assemblage within this report. An itemised list of the finds was available and shows that the assemblage included coins, tokens, brooches, buckles, buttons, pins, a bone counter, a mirror case, pottery, a leather shoe sole, glass, slag, bog iron, burnt clay, animal bone, shell, fish bone and clay pipes. The pottery assemblage included three sherds of East Coast Redware and two sherds of Yorkshire ware, which suggests a 13th to 14th century date for the earliest working of these soils and with activity clearly continuing through to at least the 17th century. There were, however, finds of potentially early medieval date including one sherd of coarse pottery, a whale bone counter and a decorated copper alloy bell.

The only medieval feature, probably 15th century in date, from the area excavated was a small rectilinear cut (39). It measured 0.42 m by 0.54 m in plan and 0.2 m in depth, with a concave base. It was filled with (38) comprising densely packed charcoal, over a litre in volume, slag, hammer-scale, a fragment of furnace or crucible wall, cockle shell, a hazelnut shell, two iron nails both with circular heads, and a possible iron saw blade. The hazelnut shell provided a radiocarbon date of 513 +/- 31 BP (OxA-9350). Surrounding the southern edge of the pit was layer (40), with a large concentration of hammer-scale, cockle shell and with one legume seed also present.

Filling an east-west hollow in the underlying natural sand subsoil, but confined within the enclosure, was (37), a grey-brown sand. It extended some 11 m, possibly more as it had been truncated by ditch (27) and measured some 4 m across. An iron nail with a circular head was recovered from this layer.

Radiocarbon Dates

Six samples were submitted to the Radiocarbon Accelerator Unit, Oxford University. The dates are uncalibrated in radiocarbon years BP (before present – AD 1950) using the half life of 5568 years. Calibrated dates referred to in the ‘stratigraphic text’ and ‘discussion’ have been calculated using the Oxcal computer program (v3.3) of C Bronk Ramsey (Proc 15th Internatl 14C Conf, Radiocarbon 37(2), 425-430), using atmospheric data from ‘INTCAL98’ (Stuiver et al Radiocarbon 40, 1041-1083).

Uncalibrated Dates

Lab No	Sample	Material	d13C (%)	BP
OxA-9349	Context 17	Charred barley grain	-24.8	1139 +/- 37
OxA-9349	Context 38	Charred hazelnut shell	-23.3	513 +/- 31
OxA-9351	Context 45	Charred barley grain	-24.1	1121 +/- 35
OxA-9352	Context 53	Charred barley grain	-23.6	1129 +/- 33
OxA-9353	Context 56	Charred barley grain	-23.0	1247 +/- 32
OxA-9513	Context 58	Charred barley grain	-22.9	1055 +/- 55

Calibrated Dates

Lab No	68.2 % Probability	95.4 % Probability
OxA-9349	780 AD (0.9%)790 AD	780 AD (95.5%) 990 AD

	880 AD (67.3%) 980 AD	
OxA-9349	890 AD (68.2%) 980 AD	780 AD (1.8%) 800 AD 810 AD (93.6%) 1000 AD
OxA-9351	890 AD (11.6%) 905 AD 910 AD (56.6%) 980 AD	780 AD (2.3%) 800 AD 810 AD (93.1%) 1000 AD
OxA-9352	690 AD (63.8%) 810 AD 840 AD (4.4%) 860 AD	680 AD (95.4%) 890 AD
OxA-9353	890 AD (14.7%) 930 AD 940 AD (53.5%) 1030 AD	870 AD (88.7%) 1070 AD 1080 AD (6.7 %) 1160 AD
OxA-9513	1407 AD (68.2%) 1434 AD	1320 AD (7.6%) 1350 AD 1390 AD (87.8%) 1450 AD

The Pottery Derek W Hall

This watching brief produced 30 sherds of pottery which have all been examined by eye and, where possible, assigned a recognised fabric name. No petrological analysis has been undertaken.

East Coast Redware

Twenty years of archaeological excavations in the Scottish east coast burghs have identified this fabric type as forming a tradition of native pottery production apparently dating from the 13th to the 15th centuries (Hall, 1996, 126). The Dornoch material is of interest because although it shares many of the standard characteristics of this fabric it appears to be much grittier than normal. Ongoing excavations at Portmahomack are recovering a similar material from the medieval levels and there would appear to be the implication that an as yet unidentified production centre or centres for this fabric must exist somewhere in this part of the Highlands (Hall 1999, 17-19). Chemical sourcing work carried out on some of the sherds from this site has confirmed that they appear to be from a possible local production site, they are noticeably different from Redware fabrics previously recovered from excavations in Inverness and Elgin (see report by Simon Chenery in Appendix).

Scottish White Gritty ware

Recent work has identified three potential production centres for this fabric in Lothian, Borders and Fife regions (Haggerty, 1984; Hall, 1997). It has been found in Perth in association with 12th century fabrics, appears to predate the Redware industry and may have ceased production by the 15th century. It is most commonly highly fired to a white or grey colour and contains quartz inclusions. There are only four sherds present in this assemblage.

Yorkshire Type wares

Vessels in these distinctively glazed fabrics are the most common imports in the east-coast burghs in the 13th and 14th centuries (McCarthy and Brooks, 1988, 227-52). There is a small group of this fabric (six sherds) which includes an unusual small vessel which may be a container for pigment or unguent.

Modern Ceramic

There are four sherds of Victorian china and earthenware included in this assemblage.

Conclusion

Although there are only 30 sherds of pottery in this assemblage the redware fabric is of interest as it may suggest that there are production centres for this material slightly further north than has been previously assumed. This assemblage would seem to date to the 13th or 14th centuries as there is certainly nothing present to suggest a later date.

Table 1

Fabric Key: ECR = East Coast Redware
WG = White Gritty ware
Yorks = Yorkshire Ware
Unid = Unidentified

Context	ECR	WG	Yorks	Unid	Modern
U/S (Metal detected off bunds)	0	0	4	0	0
U/S (Car park area)	1	0	0	0	0
U/S (assorted finds from sewage)	7	1	0	0	2
U/S (West End)	1	0	0	0	0
U/S	2	1	0	0	2
U/S (Main Area)	1	1	0	0	0
2	3	0	2	1	0
6	0	0	0	1	0
Total per column	15	3	6	2	4

Total sherd count = 30 (234g)

Introduction

The assemblage recovered from the excavation at The Meadows Business Park consists predominantly of copper-alloy and iron artefacts. The finds span a wide date range, reflecting long-term activity on the site or in its vicinity, from the early medieval period until recent times.

Unfortunately, few finds were recovered from stratified contexts. Most are either from the extensive cultivation soil deposits or from unstratified contexts. This, along with the small size of the assemblage, allows only very limited conclusions to be drawn from the artefacts about the nature of activities on the site. The finds reported on below do not represent the total assemblage recovered from the site; only those recovered from the excavation itself. Many finds, including several coins, were also located by metal-detecting, and should be considered, along with the excavated finds, as components of a single site assemblage, although they are outwith the scope of the present report.

The excavated artefacts are discussed below within material categories. Measurements are generally expressed to the nearest 1 mm, except where they are less than this, when they are expressed to the nearest 0.1 mm.

Copper-alloy objects

A diverse range of copper-alloy artefacts was recovered, although all apart from No 11 (a perforated sheet fragment) are from unstratified contexts. No 1 is a clapper bell of faceted conical form, with a trapezium-shaped suspension loop. Its full height does not survive, as it is broken above the rim. The surface is decorated by ring-and-dot motifs, especially in a zone immediately above the broken edge.

Parallels for this bell come from Norse contexts, for example in Keoldale, Sutherland and Iceland. A fine example, surviving more completely than the Dornoch bell, was found at Freswick Links (Batey, 1988). This bell has very similar facetting and decoration, and incorporates small, downward projections, equally spaced around its rim; elements which may originally have been present on the Dornoch bell.

No 1 has an internal wire loop at its apex, indicating that it had a clapper. Some bells, though, including an example from North Elmham Park, Norfolk, had no provision for a clapper or a pea, and possibly rang by clashing with other bells (Goodall, 1980, 504).

Whilst rumbler bells containing loose 'peas' were worn as dress accessories, on horse harness and on the collars of pets and hunting dogs in the medieval period, earlier clapper bells such as this one may have had a slightly different range of functions. While some are interpreted as harness bells, others may have served an ecclesiastical function. Biddle and Hinton (1990, 725) note that bells of this size were used as mass bells from the 13th century onwards.

1 Bell. Surviving height 30 mm; max width 21 mm

Open bell of six-faceted, tapering form, broken above the base. At the apex is a trapezium-shaped suspension loop, with a small, circular perforation. Internally, remains of a wire loop for suspension of the clapper survive, although the clapper itself is missing. Decorative ring-and-dot motifs are visible on the exterior surface, below the apex and immediately above the broken edge, although much of the decoration is obscured by corrosion products.

Unstratified; Find No 8

No 2 is part of the frame of an annular brooch, broken across the recess in the frame about which the brooch pin pivoted, and transversely across the frame. Both faces bear incised decoration. On one face this consists of a repeating zig-zag type design, within a border or panel. The design on the opposite face is less regular and resembles the tail of a fish, although this may also be part of a repeating pattern. Brooches of this type are described by Callander (1924, 169 and 179) as flat ring brooches, and he catalogues examples of copper-alloy, silver and gold. Examples of similar form to that of No 2 are generally dated by Callander to the 14th century, although he notes that this type of brooch remained popular in Scotland until the latter part of the 18th century, when larger and broader examples were fashionable (*ibid*, 178). Although none closely parallels the Dornoch example, a group of annular brooches was among the assemblage recovered from Urquhart Castle between 1912 and 1922 (Samson, 1982, 573, Fig 6, Nos 82-3).

A brooch of openwork design, incorporating claw settings (No 3) may date from the later part of the 19th century, when both brooches and buckles of ornate, openwork design were fashionable (Johnson, 1994, 15). The upper and lower ends of this brooch were formerly connected by a wire or pin, now missing, and the brooch was secured by means of a pin or clasp (also missing) which was aligned horizontally across its width.

2 Brooch fragment. Length 18 mm; width 7 mm; thickness 1 mm

Fragment of an annular brooch (projected external diameter *c* 35-45 mm), with a recess in the frame about which the pin pivoted. The frame is of sub-rectangular cross-section. Incised decoration appears on both faces.

Unstratified; Find No 32

3 Brooch. Length 44 mm; width 33 mm; max thickness 6 mm

Openwork brooch, approximately lozenge-shaped, incorporating four circular claw settings, each of which holds a sphere of pale blue glass paste (diameter 4 mm). (Not illustrated)

Unstratified; Find No 26

Only a single buckle is represented. No 4 is a fragment of a small buckle with an integral plate. Lacking its frame, this example is not closely datable on typological grounds, although buckles with integral plates appear to have been popular during the 13th and 14th centuries. Such buckles had a range of uses, including fastening spurs and a variety of clothing.

4 Buckle. Length (including pin) 26 mm; surviving width 17 mm; thickness 6 mm

Part of a buckle with an integral buckle plate, including the pin. The buckle plate, which has bevelled edges, is broken across a centrally-positioned rivet hole. The frame of the buckle is almost entirely missing.

Unstratified; Find No 13

Three buttons were recovered (Nos 5-7). Two (Nos 5 and 6) are of a similar type, with a circular face and the foot of the eye set within a conical boss. Both have a spyrograph-type, machine-turned design on their faces. This type of decoration dates from the early 18th century onwards. No 7, by contrast, has a plain face and its eye, now distorted, was probably attached by soldering.

5 Button. Diameter 16 mm; thickness 4 mm

Button with a circular face and the foot of the eye set within a boss. The eye itself has broken. A machined design appears on the face. The entire button has a white metal plating. (Not illustrated)

Unstratified; Find No 14

6 Button. Diameter 20 mm; thickness 7 mm

Button with a circular face and the foot of the circular eye set within a boss. A machined design appears on the face. (Not illustrated)

Unstratified; Find No 22

7 Button. Diameter 14 mm; thickness 3 mm

Button with a plain, circular face and a distorted circular eye attached to the rear.

Unstratified; Find No 15

Sexfoil mounts like No 8 are generally interpreted as decorative fittings on leather straps and clothing. Evidence from London confirms this, as examples have been found decorating perimeter tabs on a fragment of leather and lying equally spaced along a strap (Egan and Pritchard, 1991, 192, Illus 121, Nos 1028 and 1030). A variety of forms of sexfoil mounts, with different methods of attachment, has been recovered from London excavations (*ibid*, 186-92), and they appear to have been in common usage by the mid-14th century. Scottish examples of these flower-shaped mounts include sexfoil examples from Aberdeen (Stones, 1989, 157, Illus 96, No 109) and Ayr (Cox, forthcoming). An octofoil mount with embossed decoration was found at Tay Street, Perth (Cox, 1994, 483, Illus 9, No 4). In comparison with these, No 8 is smaller and less regular in outline.

No 9 is an openwork mount of zoomorphic design. Central to the design is a stag's head, with its antlers forming the sides of the mount. The mount was secured by means of three rivet or cord holes, one at the apex and two along the bottom edge.

A circular, discoid object made from very thin sheet and perforated through its centre is probably a mount. Small, lightweight mounts, including specific forms termed spangles, appear to have been sewn to clothing in the medieval period, and possibly worn in groups rather than singly.

8 Mount. Diameter 14 mm; thickness (including rivet) 6 mm

Slightly concavo-convex mount of sexfoil form. The segments are of unequal size. A rivet with a domed head pierces the centre of the mount.

Unstratified; Find No 25

- 9 Mount. Length 36 mm; width 28 mm; thickness 7 mm
Cast, openwork mount of zoomorphic design, with originally horizontal upper and lower edges (the lower edge is now broken). There is a centrally-positioned, circular perforation (diameter 4 mm) at the top of the mount and two smaller perforations (diameter 2 mm), one of which is broken, adjacent to the lower edge. The design in the centre of the mount may represent a stag's head and its stylised antlers form the curving sides of the object.

Unstratified; Find No 35

- 10 Mount? Diameter 16 mm; thickness 0.1 mm
Circular mount in two conjoining fragments, made from thin sheet, with a central, circular perforation (diameter 1 mm). Embossed decoration of pellets and hachures appears around the edge of the object and bordering the perforation. The object is broken across the perforation. (Not illustrated)

Unstratified; Find No 10

No 11 is a sheet fragment with two perforations. It is of unknown date but may be post-medieval. It must have been folded when in use, as the pattern of burring around the edges of the perforations is consistent with a rivet or nail being hammered in through one side and out through the other. Although distorted, the object has a slight transverse ridge, c 6 mm wide, lying between the two holes. It appears to have functioned as an edging or binding strip, attached to an object with a rectangular cross-sectioned edge.

- 11 Perforated sheet. Length 38 mm; max width 18 mm; thickness 0.2 mm
Sheet fragment with parallel long edges and irregularly broken ends, with two roughly square perforations (length 3 mm). It may have broken roughly across smaller perforations at either end.

Context 2; Find No 2

The form of the terminal of No 12 indicates that it is most likely to be the shaft of a pin rather than a needle. The top of the shaft, though not carefully finished, appears to represent a deliberate terminal rather than the site of a fracture, which would indicate that it is not a needle. Additionally, the upper 5 mm of the shaft is slightly discoloured in comparison with the remainder; a possible indication that this zone was covered or enclosed by a missing head. A strong possibility is that this shaft is from a large, globular-headed pin in which the upper 5 mm of the shaft was enclosed.

- 12 Pin shaft. Length (if straightened) 94 mm; max diameter 3 mm
Tapering, circular cross-sectioned shaft, probably from a pin. It is bent at mid-shaft, and the head is missing.

Unstratified; Find No 34

No 13, made from a folded strip, was used on the end of a strap or cord. Its form and decoration indicate a probable medieval date. The type of incised zig-zag decoration appearing on this object is not uncommon on medieval belt fittings. Similar ornament appears on a buckle plate from Linlithgow (Stones, 1989, 159, Illus 99, No 223), for example.

- 13 Strap end. Length 34 mm; width 18 mm; thickness 4 mm
Rectangular strap end made from a folded strip. A rivet, positioned 8 mm from the open end, secures the two sides, and a fragment of textile appears to be enclosed. The edges of the upper face are decorated by an incised zig-zag design.
Unstratified; Find No 33

Lead alloy object

The single lead alloy artefact from the excavation (No 14) possibly represents a shot. Many of the indentations in its surface appear to have been made by punching rather than being a result of abrasion or the object impacting upon a hard surface. Possibly the shot was modified in preparation for being fired.

- 14 Shot? Diameter 12 mm
Roughly spherical object with numerous indentations in its surface. (Not illustrated)
Unstratified; Find No 27

Iron objects

The small assemblage of iron artefacts from the excavation consists of three nails and three other artefacts (Nos 15-17). On two of the nails their roughly circular heads survive, and all three have square cross-sectioned shafts.

A heavily corroded fragment with a curving profile (No 15) came found from the fill of one of two parallel ditches in Phase 2. Recovered from the base of the cultivation soil deposit, No 16 consists of a nail and a circular washer, which appears to have been used on a substantial timber fitting, for example a door. The washer would have helped to fasten the head of the nail in position and may, additionally, have served a decorative purpose. In use, a second washer or rove may have been attached near the tip of the nail, and the tip then clenched over it, effectively forming a clench bolt. Clench bolts were used to secure double thicknesses of timber, and although commonly associated with ship- and boat-building, as outlined by McGrail (1973, 102-3), also had a wide range of structural uses within buildings. Also from the cultivation soil deposits, No 17 is probably a fragment from a slender-bladed saw, of post-medieval date.

- 15 Curved fragment. Length 28 mm; width 26 mm; thickness 4 mm
Curved fragment of even thickness, with all edges irregularly broken. Heavily corroded. (Not illustrated)
Context 56; Find No 3

- 16 Door nail or clenched bolt. Length 67 mm; width of nail head 24 mm; width of washer *c* 40 mm
Probable door nail or clenched bolt, consisting of a nail with a circular head and a square cross-sectioned shaft, pushed through a roughly circular washer, which rests immediately below the nail head. The nail tip is clenched at an angle approaching 90°. Heavily corroded.
Context 2; Find No 21
- 17 Saw blade? Length 67 mm; width 10 mm; thickness 0.5 mm
Probable saw blade fragment, of slender form, with a straight back and a serrated edge. (Not illustrated)
Context 2; Find No 1

Glass

The only glass found during the excavation is a small fragment from the wall of a bottle in green glass, from an unstratified context. It is in an eroded condition, with a patinated surface.

Leather

Only a single fragment of leather was recovered. No 18 is probably from the waist section of a shoe sole, with small copper-alloy nails or rivets along its edges. It was recovered from the extensive cultivation soil deposits, which appear to have gone out of use at some time in the 17th century.

- 18 Sole fragment. Length 53 mm; max width 45 mm; thickness 3 mm
Probably part of the waist from a shoe sole, with edges irregularly torn. A series of circular cross-sectioned copper alloy nails or rivets perforates the leather at regular intervals (*c* 6 mm), along either edge. (Not illustrated)
Unstratified; Find No 5

Bone objects

Two artefacts of bone (Nos 19 and 20) were recovered. No 19, probably derived from whale bone, is a fragment from the edge of a discoid object, possibly a counter. It has not been finely finished, as it is of uneven thickness and exhibits paring marks on its outer edge. It may be of early medieval or medieval date.

A probable weaving tool fragment (No 20) was recovered from an oval pit which also contained an interesting assemblage of botanical remains, including heather, cereal grains and weed seeds (see The Plant Remains). The object appears to represent a weaving tool of probable early medieval date, although, given its fragmentary nature, an Iron Age origin cannot entirely be ruled out. It may have been residual in this context. Smooth, pointed tools like this one are

necessities in fine weaving on hand looms, being used to adjust single threads or groups of threads, before and after a throw.

Small, cigar-shaped pin beaters are widely known from Anglo-Saxon sites, such as Harston in Leicestershire (Dunning, 1952), and these tend to survive better than their larger counterparts, sword beaters, possibly because the latter may often have been made from wood (MacGregor, 1985, 188). The two types performed complementary functions, the pin beater being inserted between individual warp threads and used at right angles to the plane of the weft, while the sword beater operated parallel to the weft (*ibid*). This example seems more likely to have performed a sword-beater type role. The species identifications are by Catherine Smith.

- 19 Disc fragment. Length 37 mm; max width 10 mm; max thickness 10 mm
Worked fragment probably derived from whale bone. It appears to represent part of a discoid object (projected diameter *c* 45-50 mm), of slightly uneven thickness. One surface has a smooth curvature and is pored. The opposite surface is straight and flat, but is probably the site of a fracture.
Context 2; Find No 40
- 20 Weaving tool. Length 66 mm; max width 9 mm; thickness 8 mm
Probable weaving tool fragment, derived from a large ungulate long bone shaft (possibly from a bone such as a tibia). The object tapers at one end, although the tip is missing. The broader end is also broken. The surface is highly polished.
Context 48; Find No 16

Clay pipes

Two stem fragments (Nos 21 and 22) were recovered from unstratified contexts. Both are broken immediately behind the bowl, and No 21 bears rouletted decoration. Bore diameters are expressed to the nearest 0.05 mm.

- 21 Stem. Length 57 mm; bore diameter 2.00 mm (5/64")
Stem fragment with an off-centre bore, broken immediately behind the bowl and decorated by six rouletted lines encircling the stem. (Not illustrated)
Unstratified; Find No 6
- 22 Stem. Length 14 mm; bore diameter 1.85 mm (4/64")
Plain stem fragment, broken immediately behind the bowl. Slightly stained or fumed. (Not illustrated)
Unstratified; Find No 7

Animal bones found at the site

Remains of mammals, fish and marine mollusca were amongst the finds that were rescued from the site by hand excavation. The mammal remains were mainly those of domestic animals (cattle, sheep, pig, horse and dog) although one bone from a marine cetacean, a medium-sized whale, was also recovered. Table 2 shows the numbers of bones identified from each species, recovered by hand retrieval. Sheep bones from a garden soil layer, Context 002, are omitted from the table, since they represent two partial skeletons.

On the basis of the fragment count of the hand-excavated sample, the most common mammalian species found at the site were cattle (35 fragments), and sheep (two partial skeletons and 12 fragments from other individuals). Pig and horse bones were not so numerous as those from either sheep or cattle. A single bone from a dog was also recovered.

A summary of the mammalian species identified in the surviving sieved residues is presented in Table 3. Apart from numerous tiny unidentified fragments of both burnt and unburnt bone and marine mollusc shell, bones of horse, sheep/goat and large mammal (possibly cattle) were noted in the samples. One rodent incisor tooth was also recovered (Context 011, Sample 002).

Size and type of animals

With the exception of some of the cattle bones from Context 002, most of the remains appear to be of the small size usually associated with the medieval period, or earlier. The remains of at least two sheep skeletons were recovered from Context 002, a garden soil layer that may contain material of relatively recent date. Only one skull was associated with the sheep skeletons: this was from a naturally hornless, or polled, sheep. Anatomical measurements made on the long bones of these sheep in order to estimate the animals' stature indicated that the taller (and more robust) of the two animals stood at approximately 64.6 cm at the shoulder while the shorter was approximately 61.8 cm high (Teichert, 1975). The withers height range for medieval sheep from the large assemblage recovered from 75-77 High Street in Perth has been estimated at between 46.7 to 65.8 cm (Hodgson *et al*, forthcoming). Interestingly, the range for Iron Age and Later Iron Age (Pictish) sheep from Howe, Orkney shows similarities to that of the medieval period, ranging from 51.9 to 64.5 cm (Smith 1994, Table 20mf; 1:D6). The Dornoch specimens thus fall within the upper part of the distribution for medieval animals while the taller individual only slightly exceeds the range for Iron Age animals from Howe. However it has been noted elsewhere that the effects of agricultural improvement on the body size of domestic animals was not marked in Scotland until the mid-19th century (Smith, 1996). On the basis of size, therefore, these animals may have been medieval, post-medieval or early modern in date.

Butchery

A medieval or earlier date for the stratified material is also confirmed by the evidence of marks on the bones caused by the butchery implements, which were used at the site. These tools

appear to have been either cleavers or axes, which were the tools most commonly used in fleshing from the Iron Age until the early modern period. Saws were used only infrequently in butchery before this period. It is notable that saw cuts were observed on only one bone from the site, a cattle femur from Context 002, indicating a relatively modern date for this bone. Other bones from the same context had however, been chopped rather than sawn.

There was some evidence that one of the sheep in Context 002 had been pole-axed: a substantially complete skull bore evidence of a jagged hole in the right parietal bone, accompanied by a break in the bone leading across the frontal to the edge of the orbit of the eye. The right occipital condyle, part of the articulation with the first cervical vertebra, had sheared away from the skull, perhaps as a result of the same blow. There was no evidence to suggest that these marks were caused by recent damage during excavation, since the cut surfaces were stained to the same colour as the rest of the skull and skeleton.

Age at death

A pair of mandibles associated with one of the sheep skeletons in Context 002 was estimated to come from an animal of between six and eight years of age at death (Payne, 1973). The rest of the skeleton indicated that the animal was fully adult, since the epiphyses were entirely fused. Evidence from the other contexts was sparse, although a fragmentary mandible from a young calf (Context 17), an unfused femur from a juvenile sheep (Context 56) and an unfused distal epiphysis from a pig (Context 56) all indicated that young animals were present. The remainder of the bones probably came from adult animals.

Pathology

Several bones from the most complete sheep skeleton in Context 002 displayed arthritic changes, in particular the pelvis and sacrum. The acetabula of both the left and right innominates were surrounded by new bone growth (exostoses), while the centrum of the sacrum showed degenerative changes typified by pitting and slight bone extension. These changes are insufficient to provide a diagnosis of osteoarthritis, but are further evidence that the animal was of fairly advanced age.

A dog mandible (Context 002) showed some dental pathology. Despite the fact that the jaw was probably from a relatively young animal and displayed very little visible wear on the teeth, one tooth, the fourth premolar, had been lost during life. The empty socket (alveolus) had then become infilled with new bone. Although periodontal disease is often a factor in ante-mortem tooth loss, there was no evidence for a build-up of calculus on the teeth. Some other factor, such as trauma, may therefore have been responsible for loss of the tooth.

Marine resources

The most notable find of animal origin was the cetacean vertebra (Context 56). This had been chopped through the centrum in a dorso-ventral direction, and also showed evidence of hack

marks both on the lateral aspect of the centrum and near the surviving neural spine. It has not been possible to identify the species of whale which this bone represents, but on size indications the animal was larger than a pilot whale but smaller than, say, a sperm whale. It probably represented a beached animal found on the shore of the Dornoch Firth. Whale meat, bones and other by-products were utilised by coastal dwellers in all parts of Scotland from the earliest times, and a chance stranding may have provided a welcome addition to the diet, as well as providing a valuable source of raw material. It is notable that a broken bone artefact recovered from the sieved residues was also cetacean in origin (Context 002; Sample 001). The artefact was compared with modern specimens of both red deer and reindeer antler as well as a dorso-ventral section of mandibular bone from a Greenland right whale. The pattern of pores in the surface of the object was almost indistinguishable from that of the outer (cortical) layer of the whale bone sample, indicating its most likely origin.

Other marine resources were also exploited: a small number of fish bones, were recovered, as well as shells of marine mollusc. The fish bones came from haddock as well as members of the gadid family, which includes cod, ling, saithe and pollack (see Fish Bone Report, below). The marine mollusc shells all came from edible species: common periwinkle or wulk (*Littorina littorea*), buckie (*Buccinum undatum*), cockle (*Cerastoderma cf edule*), mussel (*Mytilus edulis*), limpet (*Patella* sp.) and common otter shell (*Lutraria lutraria*). Shells were particularly numerous in the sieved samples. Although it is probable that the shells were the remains of processing for food, they may also have been used for fishing bait. It is notable that the most abundant mollusc species was the cockle, which is more palatable to humans than the limpet, a far less common species in the Dornoch assemblage. Limpet flesh is fairly tough and it was common in Scottish fishing communities for the women to chew the flesh to a soft consistency before baiting the lines with them. In addition, some of the mollusc shells may have been imported to the site along with seaweed intended as agricultural fertiliser.

Some of the mollusc shells recovered from sieving of the ditch fills on the site were subjected to X-ray diffraction analysis (XRF) in order to ascertain whether they had been used in industrial practices involving the production of iron ore, but this was found not to be the case (Photos-Jones, archive report). There was however, some evidence that they had been subjected to heat (*ibid*), perhaps as a result of coming into contact with the residues from iron production, although their gross structure and appearance were not noticeably affected.

Discussion

Although the faunal sample was not large, it contained a diversity of species and showed that the people who occupied the site exploited both marine and domestic resources. Although bird bones were absent from the assemblage, this is unsurprising, given the relatively small sample size. It is very likely that sea-birds and their eggs were also harvested in the breeding season, since there would have been access by boat to coastal cliffs to the north of the site. The sheep skeletons recovered from the garden soil layer may have been of more recent date than the remainder of the assemblage, but it is notable that they came from animals which could be considered small by modern standards. One of these animals was rather elderly and this was probably the reason for culling it. With the exception of the sheep skeletons, which may

possibly have been associated with a relatively recent butcher's shop, the bone assemblage probably represents domestic rather than industrial refuse.

Table 2 *Numbers of hand-excavated animal bones recovered from the site, by species*

Species	Number of fragments
Cattle	35
Sheep	[2 partial skeletons]
Sheep/goat	12
Pig	3
Horse	4
Dog	1
Cetacean	1(omitting worked fragment)
Large ungulate	20
Small ungulate	6
Indeterminate mammal	77
Total	159

Table 3

Note:

Unidentified bone and shell fragments are omitted

+ indicates 10 fragments or less

++ indicates between 10–50 fragments

+++ indicates between 50-100 fragments

Table 3 *Summary of identified mammal and mollusc species recovered from sieved samples*

Context	Sample no	Type	Species	Details
002	001	Mammal bone	Horse	1 st phalange; abraded
002	001	Mollusc	<i>Cerastoderma</i> sp	++
002	001	Mollusc	<i>Littorina</i> sp	+
002	001	Mollusc	cf <i>Mytilus</i> sp	+
011	002	Mammal bone	Rodent	Incisor tooth
011	002	Mollusc	<i>Cerastoderma</i> sp	+
011	002	Mollusc	<i>Mytilus</i> sp	+
031	012	Mollusc	<i>Cerastoderma</i> sp	++
017	003	Mammal bone	Sheep/goat	Metatarsal shaft, burnt
028	004	Mollusc	<i>Mytilus</i> sp	+
031	012	Mammal bone	Sheep/goat	1 upper molar tooth 1 upper deciduous molar 1 lower molar tooth 1 deciduous incisor tooth 1 incisor (enamel shell only) 5 fragments enamel from molar/premolar R ulna: articulation only L calcaneum: epiphysis and articulation
038	005	Mollusc	<i>Cerastoderma</i> sp	++
040	006	Mollusc	<i>Cerastoderma</i> sp	+
045	007	Mammal bone	Cattle	L/R maxilla with molar tooth present R mandible fragment; oral; no teeth L/R mandible fragment; oral; no teeth 1 lower third molar tooth (in wear) 1 molar fragment (unworn)
045	007	Mammal bone	Sheep/goat	1 lower third molar tooth 1 lower second molar tooth 1 lower first molar tooth 1 lower fourth premolar tooth 1 lower third premolar tooth The above teeth probably represent a complete tooth row from a left mandible
045	007	Mammal bone	Large ungulate	Vertebra; abraded
045	007	Mollusc	<i>Cerastoderma</i> sp	+
045	007	Mollusc	Gastropod	+
053	008	Mollusc	<i>Cerastoderma</i> sp	++
053	008	Mollusc	<i>Mytilus</i> sp	+

Introduction

Five contexts from Dornoch contained fish remains. One sample was hand-retrieved during the excavation of the site, and four contexts were sieved. One sample derived from an unstratified context.

Methods

All the remains were examined and recorded and a catalogue is available for consultation. Where possible the remains were identified to species level or to family group. Identification of the fish remains was done using a modern fish bone reference collection. Nomenclature follows Wheeler and Jones (1989, 122-123).

The size of the Gadidae, the cod-family species, has been calculated by giving an approximate size range. This was done by matching the archaeological material to modern fish skeletons of known size based on 'total body length'. Therefore, the elements were categorized as 'small' (15-30 cm), 'medium' (30-60 cm) and 'large' (60-120 cm).

The recording of the state of preservation of the fish bone was based on two characteristics: texture on a scale of 1 to 5 (fresh to extremely crumbly) and erosion also on a scale of 1 to 5 (none to extreme). The sum of both was used as an indication of bone condition; fresh bone would score 2 while extremely poorly preserved bone would score 10 (after Nicholson 1991). Fragmentation was also noted in terms of bone completeness; this is expressed in percentages in the catalogue.

Results

Most of the fish bones recovered from Dornoch were quite eroded and fragile. Table 4 lists the fish remains representation per contexts by fragment count (NISP).

The only identifiable elements consisted of vertebra from immature haddock (*Melanogrammus aeglefinus*) of less than 30 cm Total Length and to cleithra from mature specimens of up to 60 cm Total Length.

Also present in this small assemblage were elements assigned to the cod-family group, Gadidae. These consisted of head elements, fragments of cleithra, subopercular, and branchiostegals from 'large' specimens of up to 120 cm Total Length; a fragment of pterygoid from a 'medium' size specimen of less than 60 cm Total Length and a posttemporal from a 'small' specimen of less than 30 cm Total Length.

Discussion

Due to the poor condition of the fish remains from Dornoch it is only possible to suggest that they are components of food refuse. There was not specific dating information at the time of writing this report, the contexts however appear to be early medieval in date.

Haddock was the only identified species in the assemblage. This species has been one of the favorite food-fishes in Scotland throughout time and is particularly found in assemblages dating from early medieval times. Castle Sween, Dairsie Castle, Carrick Castle, Chambers Street in Edinburgh, the Byre Theatre in St Andrews and Murraygate in Dundee (Phase 4) all contained haddock remains (Cerón-Carrasco 1992, 1995, 1997, 1998, 1999).

Haddock is a fish of the North Atlantic found mainly in deep-water although large shoals are occasionally found in mid-water. It therefore requires the use of boats and lines for fishing particularly for the capture of mature specimens although smaller specimens were also caught in inshore waters. This activity was in practice for most of the year around the east coast of Scotland but particularly in autumn and winter (Gray 1978). In the North Sea, haddock spawning takes place from late February to early May (Wheeler 1978).

Haddock size and quality vary with location, the best fish coming in the main from deep-water and in Scotland from the East Coast. It needs to be handled well and is generally gutted at sea; the skin is kept on to avoid tearing of the soft flesh and it is mainly cured by drying and by smoking (Lockhart 1997).

From medieval times in particular, haddock increasingly became one of the principal food-fishes and this appears generally to have been the case for both high status and urban communities. It must be borne in mind that fish resources have played a very important part in the religious, social and political history of Scotland.

Conclusion

Although this is a small assemblage, the presence of haddock and other cod-family species (Gadidae) give further evidence of the importance of fish in the diet of the inhabitants of Scotland. Haddock was the main species represented in the Dornoch fish bone assemblage outlining its importance in the economy and the diet of most of the Scottish population during the periods represented.

Table 4 Catalogue of the Fish Remains from Dornoch

Context	Retrieval method	Element	Number	Species	Size	Fragmentation	Texture	Erosion
2	Sieved	branchiostegal	1	Gadidae	M?	45%	3	4
2	Sieved	fragment	3	Unidentifiable	Unknown		4	4
11	Sieved	caudal vertebra	2	Haddock	S	90%	3	4
11	Sieved	posttemporal	1	Gadidae	S	Proximal/60%	3	4
19	Hand-retrieved	fragment	1	Unidentifiable	Unknown		4	4
56	Sieved	cleithra	1	Gadidae	L	Distal/50%	4	4
56	Sieved	subopercular	1	Gadidae	L	Medial/50%	4	4
56	Sieved	pterygoid	1	Gadidae	M	Proximal/70%	4	4
56	Sieved	branchiostegals	2	Gadidae	L	45%	4	4
U/S	Sieved	cleithra	1	Haddock	M	Proximal/50%	3	4
U/S	Sieved	branchiostegal	1	Gadidae	L	50%	3	4

The Plant Remains Mairie Hastie

Background

Archaeological excavations revealed a series of well-stratified deposits indicating occupation since the early medieval period. A number of features were recovered including a post-medieval ditch and pit and a homogenous deposit of medieval cultivation soil. Other potentially dark-age features included substantial metal working debris and a possible building with associated enclosure, ditches and pits. Environmental samples were taken primarily from ditch and pit fills, and from areas of industrial activity.

Method

Twelve un-processed soil samples were received from the Scottish Urban Archaeological Trust for assessment. These were subjected to a system of flotation and wet sieving in a Siraf style flotation tank. The floating debris was collected in a 250µm sieve and, once dry, scanned using a binocular microscope.

The majority of samples contained fragments of charcoal and occasional charred cereal grains identified as hulled barley and oat. One sample did, however, stand out due to the concentration of cereal grains, pit fill - Context 48.

This report, while focussing on the sample from Context 48 also incorporates material previously identified during the assessment stage of the project. The results are presented in Table 5 - the early medieval samples contained only small quantities of cereal grains and results are shown as either + = rare, ++ = occasional. All identifications were made with reference to the modern comparative collection of Headland Archaeology Ltd and seed atlases (Berggren, 1969 and 1989). Botanical nomenclature broadly follows that of the Flora Europaea.

Results

Early Medieval Ditch and Pits

The majority of the samples (Contexts 2, 11, 17, 28, 31, 40, 45, 53, 56 and 58) were removed from a series of ditch and pit features thought to be of early medieval date. The samples were dominated by metal working debris implying that the area was used principally for industrial activities. In addition, small quantities of cereal grain, primarily hulled barley with occasional oat were recovered. Both of these crops are typical of this part of Scotland for this period and the site fits into a well-established pattern for the east of Scotland (Boyd, 1988). The low concentration of grain, in many of the features, is a common observation on medieval sites and is probably indicative of small-scale domestic activities occurring on or near to the site.

Post-Medieval Pit

One sample was removed from a pit (Context 48) that cut into a post-medieval ditch. Both features overlay a spread of medieval cultivated soil (Context 2) and the ditch is thought to be from the early to mid 17th century. The pit is therefore likely to be of similar or later date.

Note

This pit (48), and the ditch it was initially thought to truncate (27), have been re-assessed since this draft report was prepared both may now be early medieval in date.

Context Composition

The pit was filled with a series of laminations that contained a concentration of cereal grain, chaff fragments and weed seeds.

Cereals

Grains of barley (*Hordeum* sp.) and rye (*Secale cereal*) were the most frequently encountered elements. Preservation of the barley grains was poor. A small number were identified as the hulled variety but more specific identification was impossible. Some barley rachis fragments

(12 in total) were also recovered but preservation of these was also poor and it was not possible to distinguish between the two-row and six-row variety. The presence of rye was reinforced by the recovery of a large quantity of rye rachis fragments.

Oat grains were also recovered, though not in the same numbers as the barley and rye. Most grains could only be identified to the level of *Avena* sp., however, a small number, still enclosed within their florets (lemma/palea) were present. This made it possible to identify *Avena strigosa* (small/bristle/black oat) with certainty, suggesting that the majority of the grains were also black oats.

Wild Species

The seeds of wild or weedy species were present in low concentrations. The most commonly encountered were the seeds of *Agrostemma githago* (corn cockle). Other seeds were present but only represented by one or two seeds - *Polygonum persicaria/lapathifolium* (persicaria/pale persicaria), *Rumex* sp.(dick) and *Stellaria media* (chickweed). Most are common elements of cultivated fields and corn cockle is specifically associated with cultivation. It is therefore certain that the seeds were growing as weeds in the fields along with the rest of the cereal crops and brought to the site as contaminants.

The sample also contained a large quantity of *Calluna vulgaris* (ling/heather) buds, florets and wood charcoal. These cannot grow as a weed of cultivation and their presence is indicative of more acid heaths and moors. Possible explanations are that it was collected and used for bedding, packing, tempering, thatching, flooring and general building materials.

Other Potential Economic Species

Small fragments of hazelnut shell (*Corylus avellana*) were present. Hazelnuts have been used as a food source since the Neolithic period and are commonly recovered from many archaeological sites. Their presence at Dornoch may suggest that the nuts were being collected specifically for human consumption but they could also have been brought accidentally to the site as part of wood collected for fuel.

Interpretation of Assemblage

The assemblage contained a substantial quantity of cereal grain mixed with chaff fragments and a small quantity of weed seeds. Rye, hulled barley and black oat were all present. The ratio of grain to chaff seems to indicate that the rye may have been charred at a different stage to the barley and oat. Only small amounts of chaff fragments were recovered for the latter species yet 45% of the identified rye elements was chaff. This would tend to suggest that this cereal might have been charred while still on the ear.

The concentration of grains is such that some sort of accident concerning processing or storage seems likely. With the exception of catastrophic destruction of buildings by fire,

plant material in contexts such as this is most likely to have been charred by one of the following processes:

- a) small-scale corn drying on household fires
- b) bulk corn drying in a kiln
- c) domestic debris charred on the hearth.

The density of grain present in this case argues against purely small-scale domestic accidents. It is most likely, therefore, that the assemblage relates either to bulk corn drying or burning of a store/building. The evidence produced during excavation does not, however, enable us to distinguish conclusively between these two possibilities. There is no indication that a building or store had been burnt down within the immediate area and the fire in which the grain became charred probably lies out with the excavated area.

Significance of the Cereal Remains

Three of the primary post-medieval cereal crops are represented with hulled barley, rye and oat all being present. Documentary evidence for this area suggests that oat, especially black oat, and barley or bere were the most commonly cultivated crops (Bethune, 1793). The recovery of a large concentration of rye from Dornoch is therefore very significant.

Cultivation of rye tends to be confined to areas of poor quality land as it is usually less profitable when grown on good soils compared to other cereal crops. It can, however, fare better on dry and light land or upland marginal arable areas that produce inferior crops of oats, barley and wheat (Watson and More, 1962). Occasionally it was also grown as part of a mixed crop sometimes with barley and oats or as a maslin with wheat. This would generally produce a higher yield of grain than would be obtained from cultivating species separately (Grant, 1995).

During the last three centuries, improved farming techniques have allowed large areas of marginal land to be reclaimed specifically for cereal cultivation. The Scottish Statistical Accounts (Bethune, 1793 and Kennedy, 1833) indicate that these new crop husbandry processes were also being implemented in the Sutherland area. The presence of a large concentration of rye at Dornoch may, therefore, reflect the initial increase in the cultivation of these marginal areas and improved farming techniques.

Rye can be cultivated both for its corn and straw:

- a) The grain is used in the making of rye bread and a variety of beverages (Chambers and Jones, 1984)
- b) It may have been grown specifically for thatch or packing purposes, the straw being much longer, stronger and wearing better than other cereal straw (Watson and More, 1962)

- c) In some areas it was grown for non-human consumption (Green, 1981). The 'native' varieties of rye were more leafy and suitable for winter sowing which would produce a spring crop that was very appropriate for the use as fodder or foliage. It wasn't until after the Second World War that new improved grain varieties of rye were introduced from the continent (Watson and More, 1962).

The archaeological assemblage from Dornoch does not enable us to distinguish between these three uses primarily because it seems to have been burnt while still in the ear. It does, however, open up the possibility that what we are seeing here is direct evidence for cultivation of marginal land or for the growing of specialised crops that were destined for specific purposes such as fodder or thatching. Either way this find is of considerable interest and adds to our understanding of agricultural development in post-medieval Sutherland.

Wood Charcoal Identifications

Mairie Hastie

Method

Three samples were submitted for wood charcoal identification by the Scottish Urban Archaeological Trust. They were subjected to a system of flotation and wet sieving in a Siraf style flotation tank. The floating debris was collected in a 250 µm sieve and, once dry, scanned using a binocular microscope. Residues were wet sieved down to 1 mm and then sorted by eye.

The amount of charcoal recovered from Context 45 was small and the whole sample was examined. The other two samples, Context 38 and 58, contained over one litre of charcoal each. For ease of identification each sample was sub-sampled randomly using a riffle box and 25% of the charcoal examined. Using anatomical features observed under low magnification (x10 to x40), fragments from each sample were sorted into basic groups. Representative fragments of each group were then examined in more detail. Results are presented in Table 5. All identification were made with reference to wood atlases (Brazier and Franklin, 1961, and Schweingruber, 1982).

Results

The most common components were alder (*Alnus* sp.), birch (*Betula* sp.), hazel (*Corylus* sp.) and willow (*Salix* sp. In addition, small quantities of oak (*Quercus* sp.) and heather (*Calluna/Erica* sp.) were also recovered. All species present could have grown locally within the area and indicate that local woodland and heath were being exploited. Most of the taxa represent small scrub species and a large percentage of the charcoal suggests that branches and small twigs were predominately utilised. Nevertheless the presence of alder and oak implies that larger wood species were also being occasionally used and the presence of large amounts of alder within Context 58 may be of some significance. Small fragments of charred bark were frequently recovered. Unfortunately, bark lacks the detailed tissue structure and

thus cannot be identified to species level. It is, however, worth noting the large percentage of bark fragments present.

Geochemical Fingerprinting of Dornoch Pottery

Simon Chenery

Introduction

Five samples of redware pottery from an excavation at Dornoch were supplied by Derek Hall of the Scottish Urban Archaeological Trust Ltd. These samples were to be analysed for a wide variety of elements by ICP-MS and the result geochemical fingerprint compared to that of other Scottish redware previously analysed.

Samples Supplied

Supplied ID	Descriptive Code	BGS Lab. No.	Comments
DH01 sewage trench 1	Dorn1	6514-11	
DH01 sewage trench 2	Dorn2	6514-12	
DH01 02 3	Dorn3	6514-13	
DH01 02 4	Dorn4	6514-14	
DH01 02 5	Dorn5	6514-15	

Analytical Methodology

Physical Sample Preparation

The surface of the pottery sherd was lightly ground with a pure alumina grinding head to remove any surface contamination, alteration or glaze. The sherd was lightly crushed with a plastic coated hammer, then ground to less than 30 µm and homogenised, in an agate Tema mill.

Chemical Sample Preparation

For trace element determinations by inductively coupled plasma-mass spectrometry (ICP-MS) the samples need to be presented as aqueous solutions with a 1-5% nitric acid matrix. The pottery powders were dissolved as follows:

Accurately weigh 0.1g of powder into a PTFE test-tube.

Add 1 ml of concentrated HF acid, 0.4 ml concentrated HClO₄ acid and 0.4 ml concentrated HNO₃ acid and allow the samples to sit in a hot aluminium block at 50° C overnight.

Raise the temperature stepwise to 190 °C and maintain at this temperature for 6 hours. After cooling, dissolve the residual material in 10 mls of 5% HNO₃, and store in a clean HDPE bottle until the day of analysis. This method of preservation has been shown to be stable for a minimum of one year.

On the day of analysis the digested sample was further diluted by a factor of 40 and an internal standard element added.

Chemical Analysis by ICP-MS

The ICP- mass spectrometer used at BGS is a VG PlasmaQuad 2+ ICP commissioned in 1990. The samples were analysed with the ICP-MS in scanning mode. Calibration was performed using 50 ppb concentrations of four multi-element solutions obtained from Spex Industries Inc. These standards are traceable to NIST, USA.

Quality Control

Quality control (QC) was achieved using reference materials and blank digestions. Each type of QC has a separate purpose and together they provide both statistical information on the analytical quality and batch rejection criteria. The QC results are reported in Appendix 2 and a synthesis relevant to this report is given below.

The certified reference material SCO-1 was digested and analysed in duplicate with the batch of pottery sherds. This reference material is from shale rock and should have a similar composition to pottery material. The measured concentrations were mainly within $\pm 20\%$ of the certified values, which was considered acceptable. For SCO-1 the following failed to meet this criteria Y, Zr, Ag, Cd, Dy, Ho, Er, Tm and Hf failed this criterion. However, there was very good agreement with the values obtained in the previous redware and whiteware studies for this reference material. With only Ga, Cd and Hf being more than 20% different. The Ga difference being explained by correction this time for a spectral interference enhancing Ga previously and Cd by its very low abundance ie only marginally above detection limits. The difference for Hf is not explainable. Therefore ideally these elements should not be used in a comparison with previous data.

Results and Discussion

Simple Graphical Interpretation

In comparing the Dornoch pottery with previously investigated redware a number of element pairs were considered and bi-variate plots made. The elements pairs considered first were those used successfully previously: Rb v Ba; Sr v Ba; As v Mo etc. Probably the most useful of these element pairs proved to be Rb v Ba (Figure 3.2.a), where sample Dorn4 was clearly associated with the Elgin/Spynie redware and sample Dorn2 could be associated either with Elgin/Spynie or Perth. Sample Dorn 1,3,5 could not be clearly associated with any group.

The use of element ratio plots again proved more discriminating. Using a $\log(\text{Sr/Cr})$ v $\log(\text{Ba/Cr})$ plot (Figure 3.2.b) clearly grouped Dorn2 & 4 with Spynie/Elgin, while Dorn1 & 3 grouped with Dundee/Perth and Dorn5 was associated with West Pans. Another useful element to ratio proved to be Li. The use of this element to 'normalise' for the amount of

clay in a sample is common in marine sediment geochemistry. In this case it was tried as a method to correct for different amount of material possibly added as 'filler'. Various plot combinations of Sr/Li, Rb/Li and Ba/Li were tested resulting in essentially similar sample group distributions: Dorn2&4 associated with Elgin/Spynie; Dorn1&3 with Stenhouse/Dundee/Perth and Dorn 5 with Fife. Figure 3.2.c is given as an example.

Multivariate Statistical Analysis

A large number of elements were determined in the samples. However, not all elements were used in the multi-variate statistical analyses due to some high element correlations that disturb the analyses ie of the REEs only Y, La, and Lu were used and Zr & Nb used but not their analogues Hf & Ta. Lead was also not used due to its origin being most likely glaze.

Cluster Analysis

Two forms of the cluster analysis were used (i) the single linkage method with an Euclid measure of distance and (ii) the complete linkage method with a block measure. The second proved to be the more informative with the best grouping of the 'known' redware samples (Figure 3.3.1.a). It may be observed that the Dorn2&4 samples group with the Elgin and Spynie samples, while Dorn1&3 group with many of the Glasgow samples, but interestingly in a "super-group" of Elgin, Spynie and Glasgow samples. Dorn5 is in a mixed group but most closely associated with a Fife sample.

Factor Analysis

Principal components factor analysis was performed with seven factors being significant. Figure 3.3.2.a & b are plots of Factor 2 v Factor 1 and Factor 3 v Factor 1 respectively. Once again Dorn2&4 are clearly associated with Elgin/Spynie sample groups, whereas Factor 2 suggests Dorn1&3 may be associated with Glasgow or Dundee but Factor 3 suggests they may be associated with Fife or Berwick. Dorn 5 does not separate from a majority of samples.

Conclusion

The samples from Dornoch seem to divide into three groups on the basis of their geochemical fingerprints. These are Dorn2&4; Dorn 1&3 and Dorn5. Dorn2&4 have a fingerprint that is clearly related to that of the Elgin/Spynie group of redware samples. Unfortunately, Sample Dorn1,3&5 appear to have fingerprints with similarities to different groups depending on the statistical method employed, therefore we cannot currently assign them to any of the previously analysed groups. It is however, suggestive that they may form two 'new' groups of samples.

Discussion

Despite the conditions, essentially a watching brief which evolved into a rapid, salvage excavation, the results have at least established occupation to the south of the area later developed as the cathedral and Bishop's Palace complex in the medieval period in the 8th – 11th century AD. These dates would also lend support to the age-old tradition of a cell of Early Christian monks at Dornoch and it is possible that the features uncovered at the Meadows Business Park lay at the outer edge of a precinct around an early church complex.

However, it is not clear as yet whether the settlement and activity unearthed at The Meadows Business Park is Norse or Pictish, or both. Both the pre-12th century finds assemblage from the cultivation soil (the finger bell, pinshaft and bone counter), and the one diagnostic find from excavation (the bone pin beater) point to a Norse presence. The copper alloy bell, for example, has parallels from sites such as Freswick Links and Icelandic sites; the possible bone pin beater has both Anglo-Saxon and Norse parallels (see Finds Report).

The large numbers of cockle and mussel shells also has Norse parallels. Although it is not clear at Dornoch whether they were being used as food or bait, similar assemblages have been found at late Norse farms such as at Jarlshof, Sandwick and Freswick and were interpreted as being indicative of intensive fishing (Ritchie 1993, 122-124).

In support of the features uncovered at Dornoch being Pictish, there are again parallels from the recent excavations at Portmohomack, some 12 km south-east of Dornoch on the south side of the Dornoch Firth. Excavations in Sector 1, Intervention 25, (Sector 1 lies to the south of the early church), revealed somewhat similar structures and features (Tarbat Discovery Programme Bulletin No 4 1998). These were interpreted as an oval enclosure, possibly for habitation or funerary purposes, open at one end and c 15 m along its long axis. It overlay an earlier ditch forming a curvilinear enclosure. Immediately to the south-west was a group of intercutting gullies and post-holes which appear to define a sequence of structures. Unfortunately, no finds were recovered from these features. They lay just outside the enclosure around the 8th century monastery and initially they were thought to be prehistoric in date. Ongoing post-excavation analysis, however, now suggests that these features are more likely to be 8th to 11th century in date and could be Norse (Bulletin No 5, 1999).

Of the four phases of occupation distinguishable at Dornoch, 8th–9th century AD, 10th century AD, 10th–11th century and later medieval period (15th century), all four indicate a tradition of ironworking. Evidence for all stages of the industrial process - iron ore, slag and hearths/furnaces – were present and a similar picture of the continuity of ironworking has been established from excavations at Portmohomack (Bulletin No 5, 1999).

The results stemming from the Tarbat Discovery Programme and from The Meadows indicate that the Dornoch Firth, and indeed Dornoch itself, was an important place in the early medieval period. The artefactual assemblage and the evidence for ironworking indicates that the settlement at Dornoch was also high status. The adjacent property to the east of The Meadows Business Park, a former abattoir with potentially shallow foundations and occupying a fairly large area, is likely to be subject to redevelopment in the near future; a

concerted effort should be made to manage the archaeological implications of such a development.

Appendix 1

Concentration of elements in Dornoch pottery samples (mg/kg or ppm)

BGS Lab No.	Sample	Li	Be	Mg	Sc	Ti	V	Cr	Mn
6514-11	Dorn1	40	2.1	7099	11	3459	107	61	218
6514-12	Dorn2	30	2.6	7084	13	4249	102	60	544
6514-13	Dorn3	35	1.6	3529	13	4399	68	67	70
6514-14	Dorn4	26	2.4	6987	13	3698	87	49	375
6514-15	Dorn5	88	2.8	7368	17	5200	114	105	390

BGS Lab No.	Sample	Co	Ni	Cu	Zn	Ga	As	Se	Rb
6514-11	Dorn1	10	29	21	79	19	5.3	<2	112
6514-12	Dorn2	13	40	27	71	20	5.6	<2	148
6514-13	Dorn3	8.6	24	24	58	16	6.8	<2	89
6514-14	Dorn4	12	33	21	84	19	1.8	<2	178
6514-15	Dorn5	18	61	32	55	26	5.4	<2	107

BGS Lab No.	Sample	Sr	Y	Zr	Nb	Mo	Ag	Cd	Sn
6514-11	Dorn1	117	7.7	47	16	2.8	0.4	0.1	3.1
6514-12	Dorn2	197	26	44	16	2.0	0.8	0.2	5.1
6514-13	Dorn3	101	14	74	20	1.0	0.3	0.1	2.4
6514-14	Dorn4	243	20	34	6.6	0.8	0.5	0.1	1.0
6514-15	Dorn5	112	22	55	15	0.6	0.3	0.1	4.0

BGS Lab No.	Sample	Sb	Cs	Ba	La	Ce	Pr	Nd	Sm
6514-11	Dorn1	0.6	7.3	512	25	49	5.2	18	3.0
6514-12	Dorn2	0.6	11	805	48	95	12	42	7.6
6514-13	Dorn3	0.5	7.7	446	36	73	7.9	28	4.8
6514-14	Dorn4	0.3	20	1034	41	83	10	35	6.6
6514-15	Dorn5	0.8	7.1	442	55	113	13	46	7.7

BGS Lab No.	Sample	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
6514-11	Dorn1	0.8	2.9	0.3	1.6	0.3	0.9	0.1	0.8
6514-12	Dorn2	1.8	7.5	1.0	5.1	1.0	2.7	0.4	2.4
6514-13	Dorn3	1.1	4.4	0.6	2.7	0.5	1.4	0.2	1.3
6514-14	Dorn4	1.6	6.4	0.8	4.1	0.8	2.1	0.3	1.9
6514-15	Dorn5	1.9	7.8	0.9	4.6	0.8	2.3	0.3	2.0

BGS Lab No.	Sample	Lu	Hf	Ta	W	Tl	Pb	Th	U
6514-11	Dorn1	0.1	1.6	1.2	1.1	0.9	904	10	1.4
6514-12	Dorn2	0.4	1.4	1.1	1.2	1.2	1131	12	2.4
6514-13	Dorn3	0.2	1.9	1.2	1.2	0.6	79	9.2	1.8
6514-14	Dorn4	0.3	0.8	0.5	0.9	1.2	4785	11	1.6
6514-15	Dorn5	0.3	1.6	1.0	1.1	0.8	635	14	2.6

Appendix 2

Concentration of Elements in Reference Material SCo-1(mg/kg or ppm)

	Li	Be	Sc	Ti	V	Cr	Co	Ni
6514-SCO1A	40	1.7	13	3231	132	59	11	28
6514-SCO1B	43	1.7	12	3019	132	58	11	26
Mean this batch	41	2	12	3125	132	58	11	27
Previous mean	47	1.8	13	3495	145	66	12	28
%Difference	-12	-5	-2	-11	-9	-12	-6	-5
Literature value	45	1.8	11	3768	131	68	11	27
%Difference	-8	-6	13	-17	1	-14	6	0
	Cu	Zn	Ga	As	Se	Rb	Sr	Y
6514-SCO1A	33	102	17	13	<2	104	157	17
6514-SCO1B	33	105	16	12	<2	105	160	17
Mean this batch	33	103	17	12		104	158	17
Previous mean	34	108	38	14		111	166	18
%Difference	-2	-4	-57	-13		-6	-5	-5
Literature value	29	103	15	12		112	174	26
%Difference	15	0	11	-1		-7	-9	-33
	Zr	Nb	Mo	Ag	Cd	Sn	Sb	Cs
6514-SCO1A	94	11	1.3	0.4	0.3	3.7	2.6	7.4
6514-SCO1B	91	11	1.1	0.4	0.2	3.3	2.6	7.7
Mean this batch	93	11	1.2	0.4	0.2	3.5	2.6	8
Previous mean	107	12	1.3	0.5	0.3	4.1	2.9	8.0
%Difference	-13	-7	-11	-11	-28	-14	-11	-6
Literature value	160	11	1.4	0.13	0.14	3.7	2.5	8
%Difference	-42	1	-15	218	59	-6	3	-4
	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd
6514-SCO1A	541	29	55	6.7	24	4.7	1.1	4.8
6514-SCO1B	552	28	54	6.7	25	5.0	1.2	4.8
Mean this batch	547	28	54	7	24	5	1	5
Previous mean	601	30	60	7.0	27	5.1	1.2	4.9
%Difference	-9	-5	-9	-4	-9	-5	-4	-3
Literature value	570	30	62	6.6	26	5.3	1.2	4.6
%Difference	-4	-4	-12	1	-6	-9	-3	4
	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf
6514-SCO1A	0.6	3.1	0.6	1.9	0.3	1.8	0.3	2.6
6514-SCO1B	0.6	3.3	0.7	2.0	0.3	1.9	0.3	2.6
Mean this batch	1	3	1	2	0	2	0	3
Previous mean	0.7	3.7	0.7	2.1	0.3	2.1	0.3	3.9
%Difference	-6	-13	-7	-9	-16	-11	-8	-33
Literature value	0.7	4.2	1.0	2.5	0.4	2.3	0.3	4.6
%Difference	-12	-23	-32	-24	-36	-18	-20	-44
	Ta	W	Tl	Pb	Th	U		
6514-SCO1A	0.8	1.6	0.6	40	8.9	2.6		
6514-SCO1B	0.8	1.6	0.6	29	9.1	2.6		

Mean this batch	1	2	1	34	9	3
Previous mean	0.8	1.4	0.6	31	10	2.8
%Difference	3	13	14	10	-7	-7
Literature value	0.9	1.4	0.7	31	9.7	3.0
%Difference	-14	14	-12	10	-7	-13

Bibliography

- Bangor-Jones, M 1995 'Norse settlement in south-east Sutherland' in B E Crawford (ed) *Scandinavian Settlement in Northern Britain*. Leicester.
- Barrow, G W S 1981 *Kingship and Unity: Scotland 1000-1306*. London.
- Batey, C 1993 'The Viking and Late Norse graves of Caithness and Sutherland' in *The Viking Age in Caithness, Orkney and the North Atlantic*, ed C E Batey, J Jesch and C D Morris. Edinburgh.
- Batey, C 1988 'A Viking bell from Freswick Links' *Medieval Archaeol* XXII, 213-6.
- Berggren, G 1969 *Atlas of seeds and small fruits of Northwest-European plant species with morphological descriptions: Part 2 Cyperaceae*. Berlings, Sweden.
- Berggren, G 1989 *Atlas of seeds and small fruits of Northwest-European plant species with morphological descriptions: Part 3 Salicaceae. Cruciferae* Berlings, Sweden.
- Bethune, J 1793 *The Statistical Accounts of Scotland*, Vol 8.
- Biddle, M and Hinton, D A 1990 'Copper-alloy bells' in Biddle, M *Object and economy in medieval Winchester: artefacts from medieval Winchester*. Oxford.
- Boyd, W E 1988 'Cereals in Scottish Antiquity' *Circaea*, vol 5/2: 101-110.
- Brazier, J D and Franklin, G L 1961 *Identification of Hardwoods*. Forest Products Research: Bulletin No 46.
- Callander, J G 1924 'Fourteenth-century brooches and other ornaments in the National Museum of Antiquities of Scotland' *Proc Soc Antiq Scot* 58, 160-84.
- Cerón-Carrasco R 1992 *The Fish Remains from Castle Sween*. Unpublished report.
- Cerón-Carrasco R 1995 *The fish bone remains from Chambers Street, Edinburgh*. Unpublished report.
- Cerón-Carrasco R 1997 *The fish remains from Dairsie Castle*. Unpublished report.
- Cerón-Carrasco R 1998 'The fish remains', in Ewart, G and Baker, F 'Carrick Castle: symbol and source of Campbell power in south Argyll from the 11th to 17th century'. *Proc Soc Antiq Scot* Vol 128, 937-1016.
- Cerón-Carrasco R 1999 *Report on the analysis of the fish remains from Murraygate, Dundee*. Unpublished report.

Chambers, F M and Jones, M K 1984 'Antiquity of Rye in Britain' *Antiquity* LVIII: no 224, 219 - 223.

Cowan, I B and Easson, D E 1976 *Medieval Religious Houses; Scotland*. London.

Cox, A 1994 'The finds' in Bowler, D P and Cachart, R 'Tay Street, Perth: the excavation of an early harbour site', *Proc Soc Antiq Scot*, 124, 481-4.

Cox, A forthcoming 'Copper alloy objects' in Perry, D R *et al* 'Excavations in Ayr, 1984-7'.

Crawford, B E 1986 'The making of a frontier: the firthlands from the ninth to twelfth centuries' in J R Baldwin *Firthlands of Ross and Sutherland*. Edinburgh.

Crawford, B E 1987 *Scandinavian Scotland*. Leicester.

Crawford, B E 1995a Earl and Mormaer: Norse-Pictish relationships in Northern Scotland. Rosemarkie.

Crawford, B E 1995b 'Introduction: The study of place-names' in B E Crawford (ed) *Scandinavian Settlement in Northern Britain*. Leicester.

DES 1995 *Discovery and Excavation in Scotland* 'Achinchanter', 47. Council for Scottish Archaeology.

DES 1996 *Discovery and Excavation in Scotland* 'Achinchanter', 61. Council for Scottish Archaeology.

DES 1998 *Discovery and Excavation in Scotland* 'Burghfield, Dornoch', 50. Council for Scottish Archaeology, 1998.

DES 1999 *Discovery and Excavation in Scotland* 'Dornoch, various sites', 53. Council for Scottish Archaeology, 1999.

Dunning, G C 1952 'Anglo-Saxon discoveries at Harston' *Trans Leicestershire Archaeol Hist Soc* 28, 48-54.

Egan, G and Pritchard, F 1991 *Dress accessories*. London.

Fraser, I 1986 'Norse and Celtic place-names around the Dornoch Firth' in J R Baldwin *Firthlands of Ross and Sutherland*. Edinburgh.

Goodall, I H 1980 'Objects of copper alloy' in Wade-Martins, P *Excavations in North Elmham Park, 1967-72 East Anglian Archaeol Rep* No 9. Norwich.

Grail, S 1973 *Ancient boats in N W Europe*. London.

- Grant, I F 1995 *Highland Folk Ways*. Edinburgh.
- Gray, M 1978 *The fishing industries of Scotland, 1790-1914. A study of regional variation*. Oxford.
- Green, F 1981 'Iron Age, Roman and Saxon crops: the archaeological evidence from Wessex, in M Jones and Dimbley (eds) *The environment of man: the Iron Age to the Anglo-Saxon period* BAR 87, 129-53.
- Greig, J R A 1991 'The British Isles' in W van Ziest, K Wasylikowa and K Berhre *Progress in Old World Palaeoethnobotany*. A.A. Balkema Publishers, Rotterdam.
- Haggarty, G 1984 'Observations on the ceramic material from phase 1 pits BY and AQ' in C Tabraham, 'Excavations at Kelso Abbey' *Proc Soc Antiq Scot*, 114, 395-7.
- Hall, D W 1996 'Blind Date-Scottish medieval pottery industries' *Tayside and Fife Archaeological Journal Vol 2*, 126-128.
- Hall, D W 1997 'The pottery' in M Rains and D W Hall (eds) *Excavations in St Andrews 1980-89: A Decade of archaeology in a historic Scottish burgh Tayside and Fife Archaeological Committee monograph one*
- Hall, D W 1999 'Medieval pottery from the church excavation at Portmahomack' in Taret, Discovery Programme Bulletin no 4 1998, 17-19.
- Hodgson et al forthcoming Hodgson, G W I, Smith, C and Jones, A 'The mammal bone' in N Q Bogdan, G W I Hodgson, C Smith, A Jones, M Fraser, D Heppel, A S Clarke, A K G Jones, I H M Smart, R B Longmore and R Cerón-Carrasco *The Perth High Street Archaeological Excavation 1975-77. Fascicule IX. The Environmental Evidence*.
- Johnson, E 1994 *Fashion accessories*. Princes Risborough.
- Kendrick, J 1997 'Archaeological watching brief at Dornoch' Wordsworth Archaeological Services, unpublished archive report for Highland Council.
- **Kennedy, 1833 *The Statistical Accounts of Scotland*, Vol .
- Kennedy, A 1845 *The New Statistical Account of Scotland*. Vol XV - Sutherland. William Blackwood and Sons, Edinburgh.
- Lockhart, G W 1997 *The Scots and their Fish*. Edinburgh: Birlinn.
- MacGregor, A 1985 *Bone, antler, ivory and horn: the technology of skeletal materials since the Roman period*. London.
- McCarthy, M and Brooks, C M 1988 *Medieval pottery in Britain AD 900-1600* .

MacGibbon, D and Ross, T 1887-1892 *The Castellated and Domestic Architecture of Scotland*. Edinburgh.

Neill, P G B and MacQueen, H L 1996 *Atlas of Scottish History to 1707*, 6. Edinburgh.

Nicholson, R A 1991 *An investigation into variability within archaeologically recovered assemblages of faunal remains: The influence of pre-depositional taphonomic processes*. D. Phil. Thesis. University of York.

Nicolaisen, W F H 1986 *Scottish Place-Names, One*, 40-63. London.

Payne S 1973 'Kill-off patterns in sheep and goats: the mandibles from Aşvan Kale' *J Anatolian Studies*, 23, 281-303.

Photos-Jones, E 1999 'The scientific characterisation of the Dornoch metallurgical waste; also the technical characterisation of a select number of other materials (pottery glaze, shells and bone)'. Archive report, Scottish Analytical Services for Art and Archaeology.

Ritchie, 1993 *A Viking Scotland*. London.

Samson, R 1982 'Finds from Urquhart Castle in the National Museum, Edinburgh' *Proc Soc Antiq Scot* 112, 465-76.

Schweingruber, F.H. 1982 *Microscopic Wood Anatomy: Structural: Structure variability of stems and twigs in recent and subfossil woods from Central Europe*. 2nd edition.

Scott, A B 1915 'Chapters in the history of the church of the Picts (ii) – S. Finbarr of Caithness and Ulster' *Trans Gaelic Soc Inverness*, 27, 1908-11, 24. Inverness.

Simpson, A and Stevenson, S 1982 *Historic Dornoch: The Archaeological Implications of Development*, Scottish Burgh Survey Series.

Simpson, W D 1924 'Dornoch Cathedral: the High Church of Caithness', *Proc Soc Antiq Scot*, 58, 1923-4, 227-38. Edinburgh.

Smith, C 1994 'Animal bone report' in B Ballin Smith *Howe. Four Millenia of Orkney Prehistory*. Soc of Antiq of Scot Monogr Ser 9. Edinburgh.

Smith, C 1996 'Animal bone' in A Cox (ed) 'Backland activities in medieval Perth: excavations at Meal Vennel and Scott Street' *Proc Soc Antiq Scot*, 126, 792-5 and 812-3.

Stones, J A (ed) 1989 *Three Scottish Carmelite friaries: Excavations at Aberdeen, Linlithgow and Perth 1980-86*, Soc Antiq Scot Monogr Ser 6. Oxford.

**Stuiver et al 'Radiocarbon 40', 1041-1083.

Tarbat Discovery Programme *Bulletin No 4* 1998, University of York.

Tarbat Discovery Programme *Bulletin No 5* 1999, University of York.

Teichert, M 1975 'Osteometrische Untersuchungen zur Berechnung Widderisthöhe bei Schafen' in A T Clason *Archaeozoological Studies*. Amsterdam.

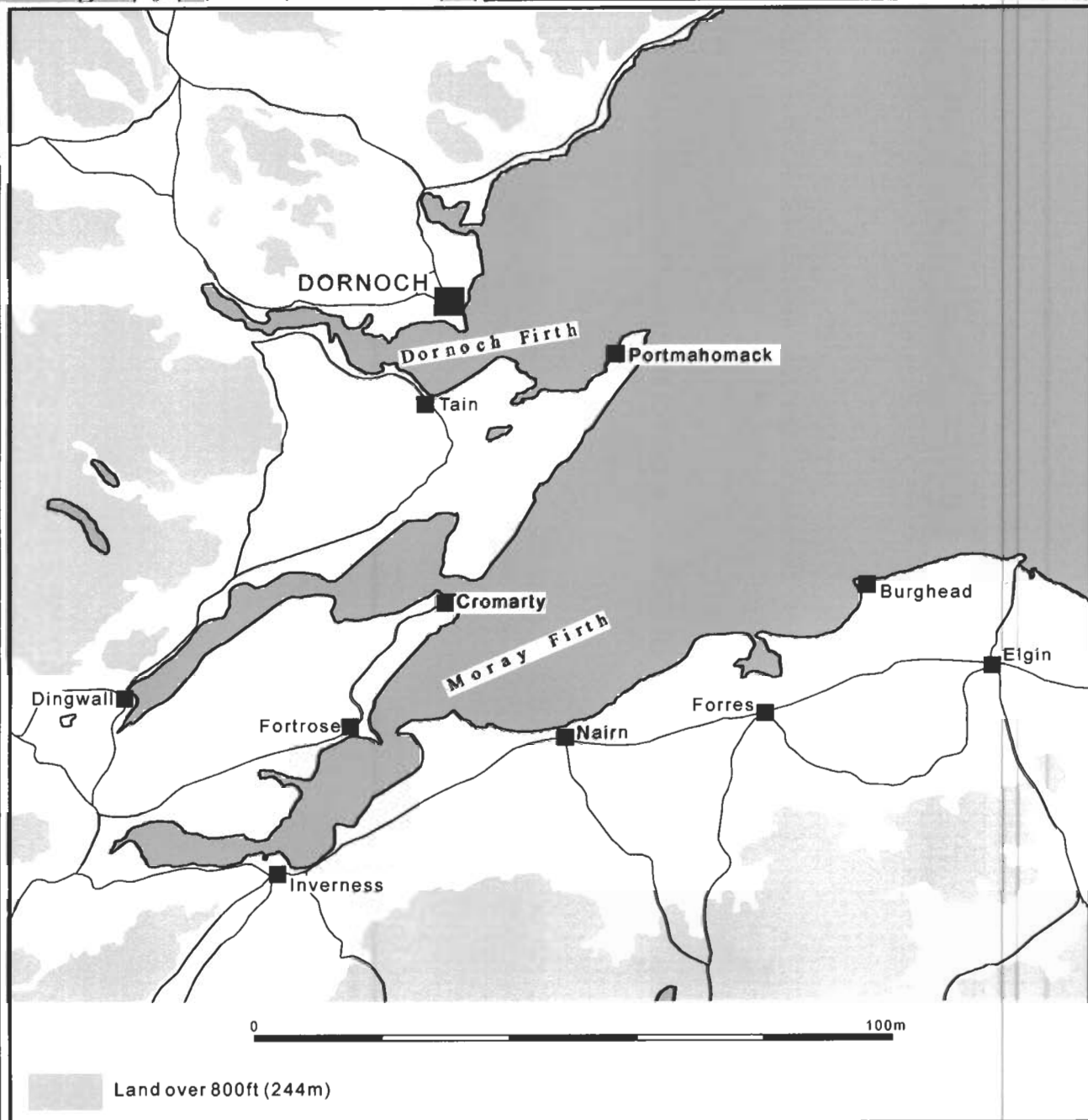
Watson, J A S and More, J A 1962 *Agriculture: The Science and Practice of Farming*. Edinburgh.

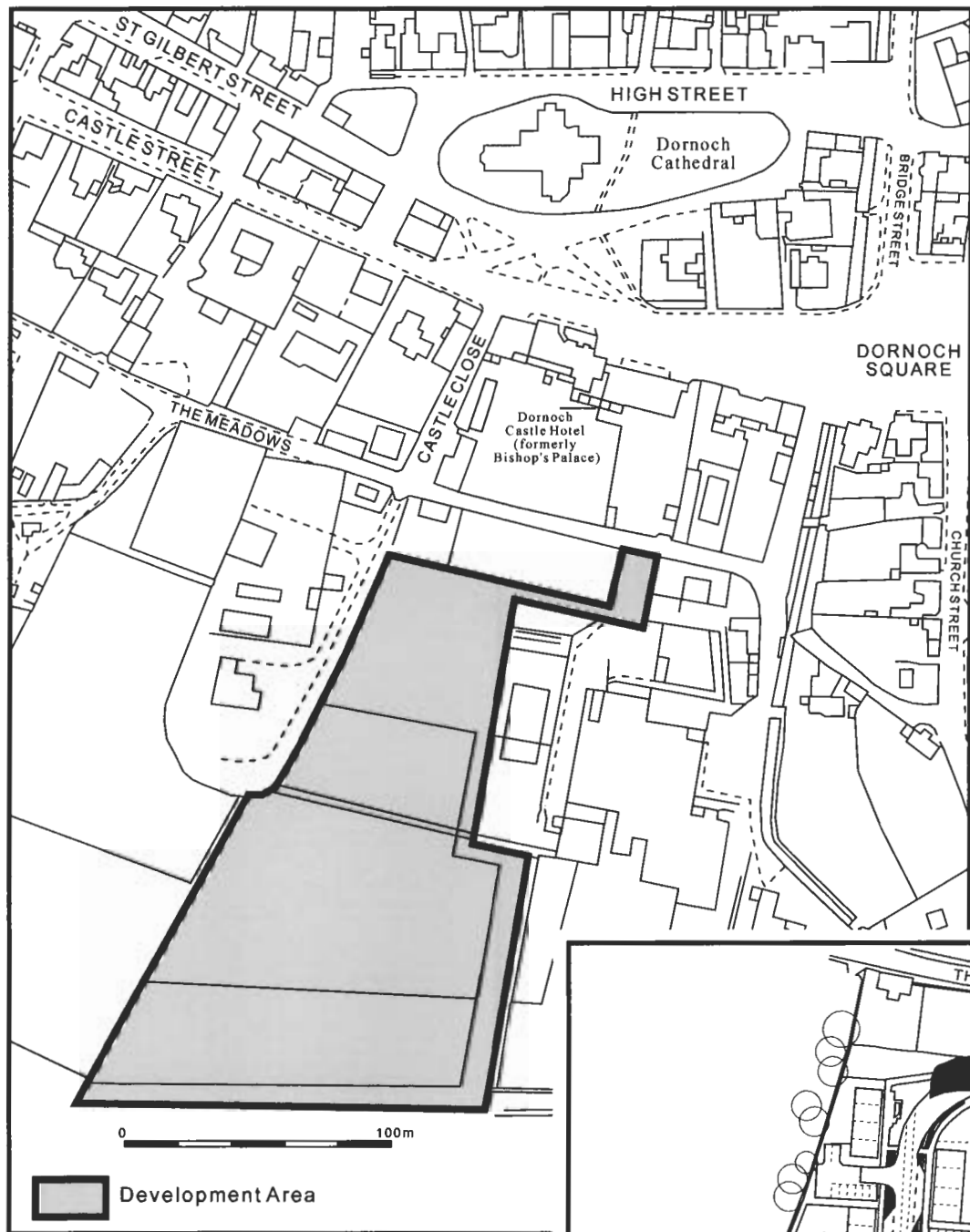
Watson, W J 1993 *The Celtic Placenames of Scotland*. Edinburgh.

Wheeler, A and Jones, A K G 1989 *Fishes*. Manuals in Archaeology. Cambridge University Press.

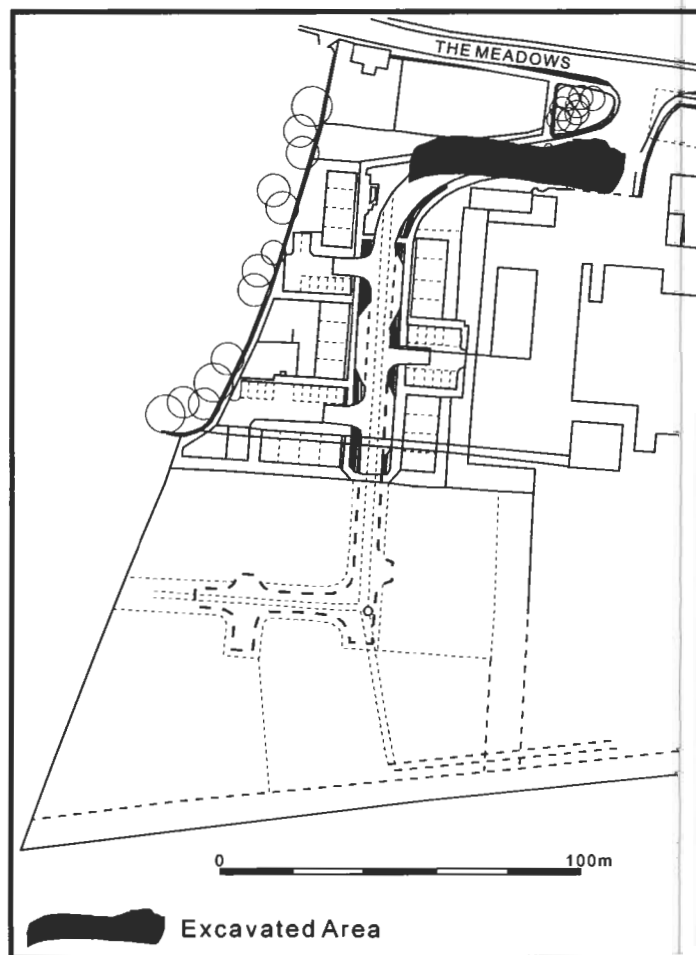
Wheeler, A 1978 *Key to the Fishes of Northern Europe*. London.

Dornoch Regional Setting

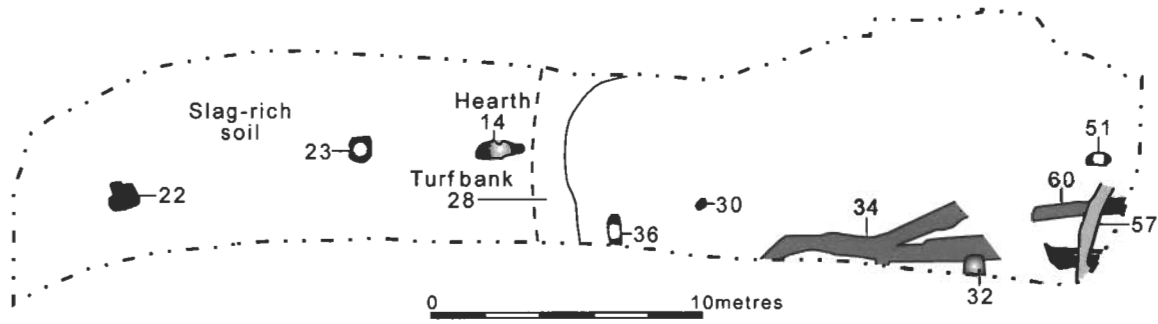




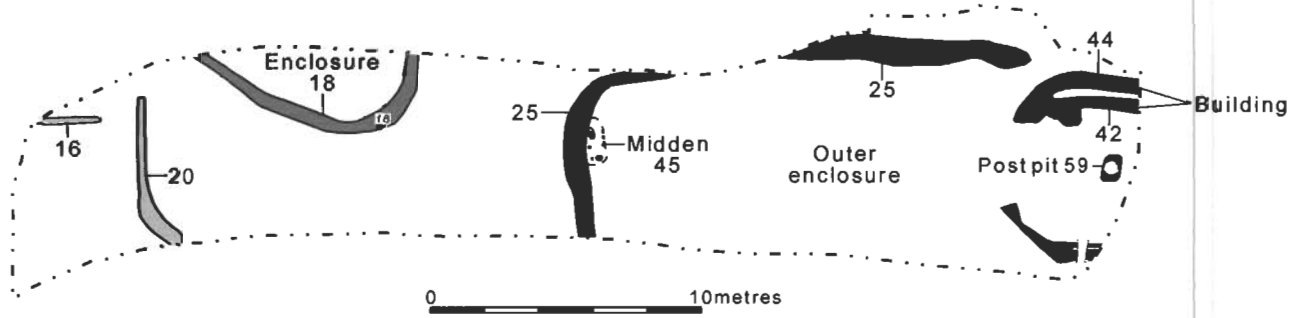
Site Location



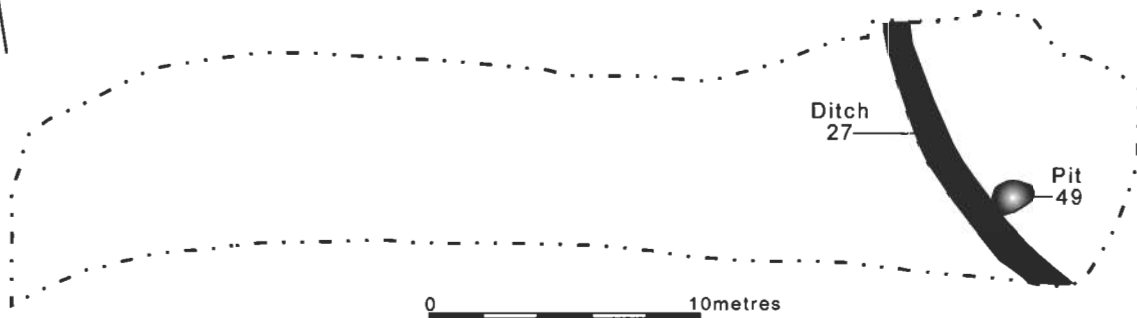
PHASE 1 ~ 8th - 9th century



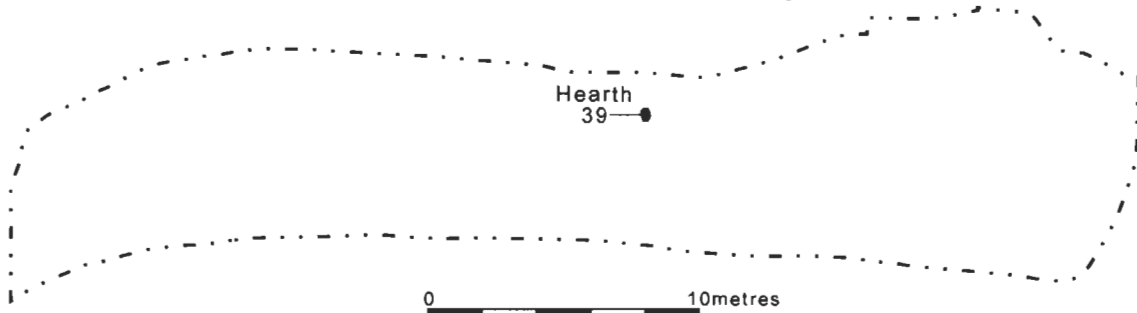
PHASE 2 ~ Late 9th - 10th century



PHASE 3 ~ 10th - 11th century



PHASE 4 ~ 15th century



Illus 4



A large assemblage of finds from the Early medieval to the Victorian period was recovered from the deep cultivation soil in the foreground by a local Metal detectorist, the new Visitor Centre is in the background.

Illus 5



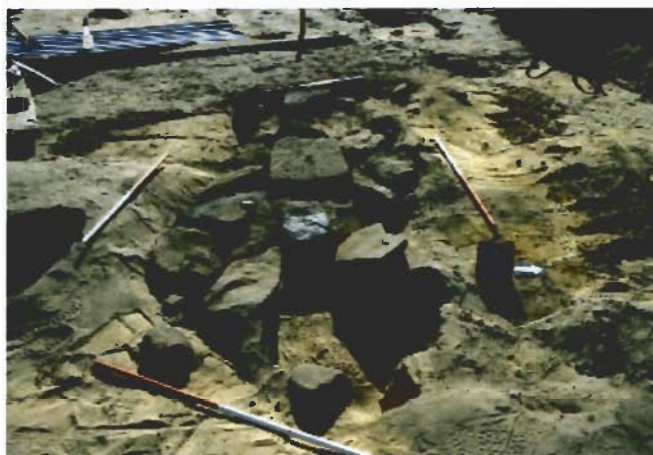
Enclosure and ditches at the west end of the site. The discoloured sandy soil was rich with slag and fragments of clay furnace lining.

Illus 6



The East end of the site looking West. The possible double walled building is in the foreground. A later ditch runs diagonally across the site.

Illus 7



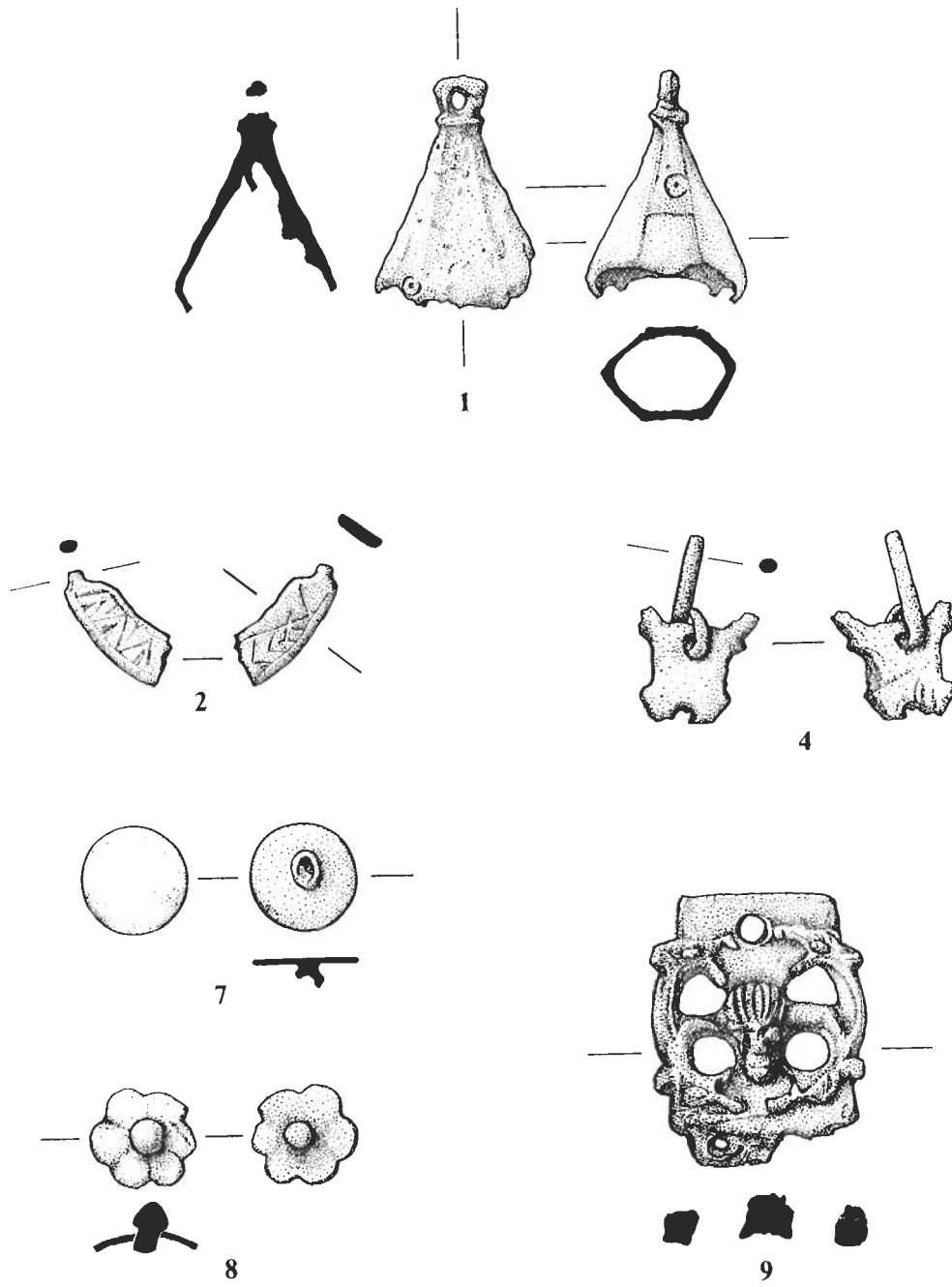
The stone threshold of the building.

Illus 8



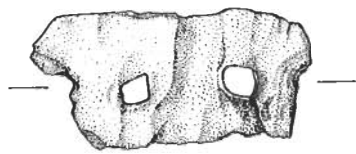
One of several isolated pits.

Illus 9

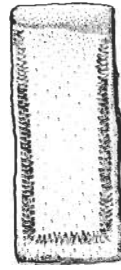


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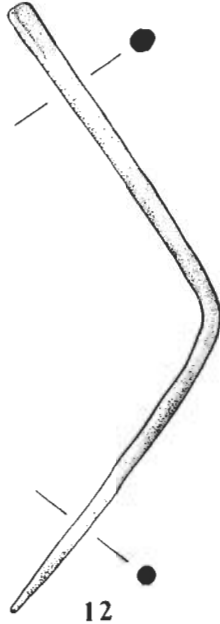
Illus 10



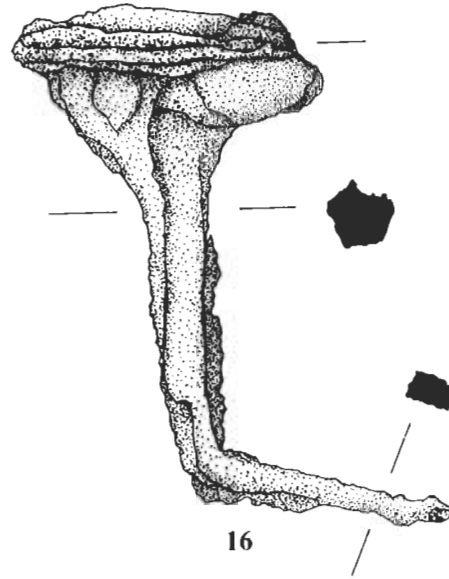
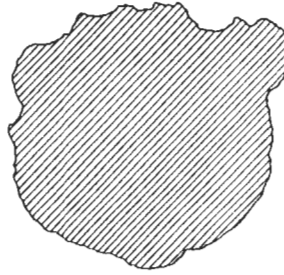
11



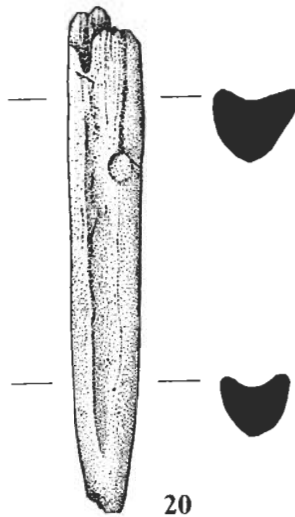
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12



16



20



19

Scale ~ 1:1