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Built to last: Mesolithic and Neolithic settlement at two sites beside the Forth estuary, Scotland

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ABSTRACT

A programme of archaeological investigations undertaken in advance of the Forth Replacement Crossing, at Castlandhill in Rosyth and Echline Fields in South Queensferry, revealed archaeological features dating from the Mesolithic to medieval periods, including Neolithic Grooved Ware and Impressed Ware pottery dating to the 4th to 3rd millennium BC. The principle focus of this paper is the Mesolithic remains, which are of major significance for the study of Mesolithic habitation in Scotland; particularly given the finding of a sunken-floored structure at Echline Fields that has returned a date of approximately 8300 cal BC. It is the second such structure discovered in Scotland and also the earliest yet. The sites add to a growing group of Mesolithic settlements characterised by semi-permanence and value of place in a period that has often been more associated with high mobility and temporary camps. Lithic information from these sites further acknowledges the presence of narrow-blade technology in northern Britain during this pioneering period.

INTRODUCTION

The excavation and post-excavation assessment and analysis of two sites on opposite sides of the Firth of Forth (one at Echline Fields, South Queensferry and the other at Castlandhill, Rosyth) was undertaken by Headland Archaeology in advance of the Forth Replacement Crossing. Excavation followed a programme of geophysical survey and trial trenching (Humble 2011) and was commissioned by Transport Scotland, managed and monitored by Jacobs Arup and overseen by Historic Scotland.

Areas were selected for excavation on the basis of cut features identified during trial trenching at both sites. At Echline Fields, four areas (A–D) (illus 1) were stripped of topsoil by mechanical excavator, resulting in the exposure of significant settlement remains in Area A, and to a lesser extent in Area D. Five areas were excavated at Castlandhill (A–E) with evidence for habitation found in Area B. Subsequently, an expanded area, incorporating and merging areas A and B, was excavated to reveal the extent of the spread of features.

Post-excavation assessment and analysis found the archaeological deposits to date from the Mesolithic to medieval periods. It is the evidence for early prehistoric settlement activity, principally Mesolithic, that is discussed here. The results from each site are compared and set within a wider context; exploring themes of economy, environment, organisation and mobility. The focus on prehistoric activity precludes the presentation of the medieval data, but this can be accessed in the site archive along with the complete set of specialist reports, finds

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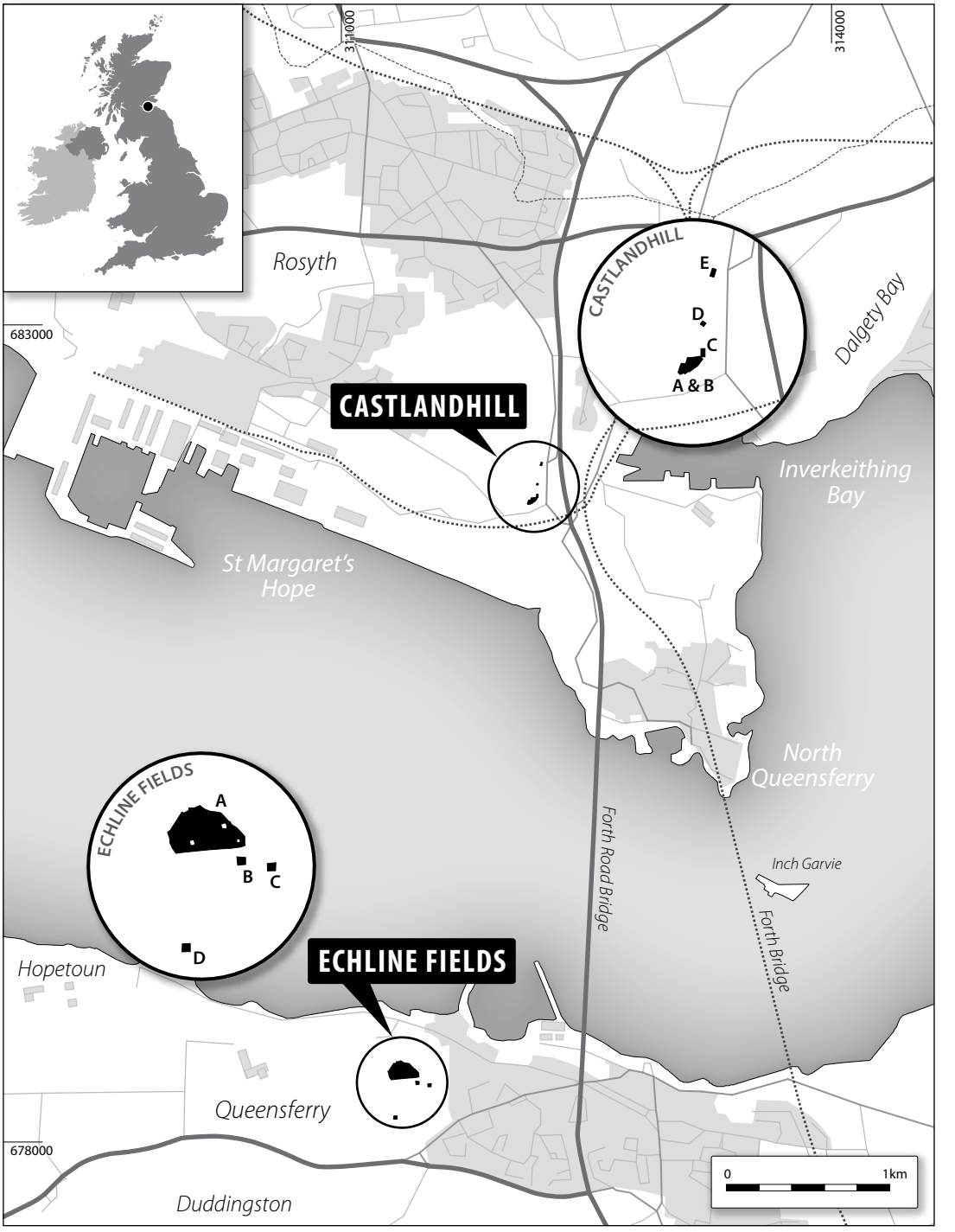


ILLUS 1 Location of sites

and palaeoenvironmental data which will be deposited with the Archaeology Data Service. All radiocarbon dates have been calibrated using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009) and are presented in the text using the 2 σ calibrated age ranges.

LOCATION

The site at Echline Fields lay on the western fringe of South Queensferry (NGR: NT 11370 78443), at a height of 35m OD, on land which slopes gently northward towards the Firth of Forth (illus 1). The south-west of the site had been agricultural land, recently ploughed, with the remainder used as an amenity area typified by rough grassland. Castlandhill was located 3km north, on the opposite shoreline, to the south-east of the town of Rosyth (NGR: NT 1222 8196). The site was situated at 20m OD on a relatively level terrace on the hillside and under arable cultivation. The solid geology of both areas is typified by igneous alkali dolerite (British Geological Survey 2008), which is overlain by glacial till. At Castlandhill, the till was sealed by raised beach deposits that form part of the most extensive late-glacial shoreline in eastern Scotland (the so-called Main Perth shoreline) that dates from *c* 13,000 BP (Smith et al 2010).

RADIOCARBON RESULTS

A total of 21 radiocarbon dates were obtained from the sites of Echline Fields (15 dates) and Castlandhill (six dates) and show that activity at these sites encompassed the Mesolithic, Neolithic, Bronze Age, early medieval and medieval periods. Proxy dating evidence for Neolithic activity at Echline Fields was also provided by pottery and lithics (see below). In order to enable the tightest dating framework to be achieved, when possible, short-lived materials such as charred nutshell and charred cereal grains were chosen for dating as these represent growth in one calendar year. Where short-lived material was not available for dating, material was taken from medium-lived material such as faunal bone and small branch wood, representing a few tens of calendar years. Long-lived materials, such as large trunk wood or aged trees (eg oak) have been used only where no other suitable materials were recovered. The full results for all the radiocarbon dates are provided in Table 1.

EXCAVATION RESULTS

EXCAVATION METHODOLOGY

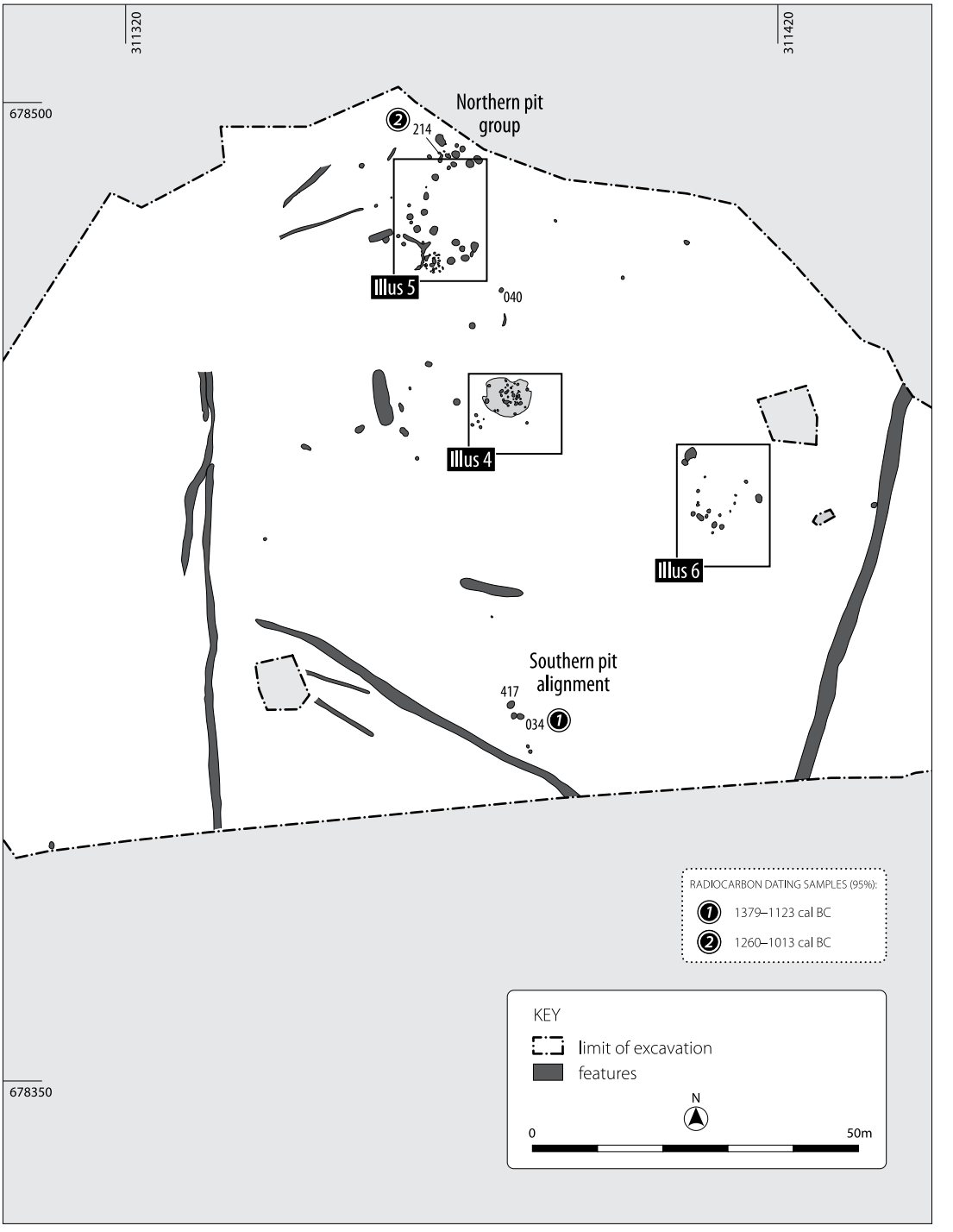
The topsoil from Echline Fields and Castlandhill was not sieved on-site or sampled during removal as previous archaeological work had revealed no potential for, or identified, Mesolithic remains in the vicinity (O'Connell 2005; Jacobs Arup 2009; Humble & Bailey 2010; Jones 2011). The assemblages therefore only derive from the remains of underlying cut features. The sampling strategy incorporated bulk samples of features being taken (a minimum of 30 litres, where possible), which were then transported off-site and wet sieved using a siraf-style flotation tank at Headland Archaeology. The palaeoenvironmental, bone and artefactual assemblages were all recovered in this way, with a negligible number of artefacts collected on-site by hand.

The early identification of the Castlandhill site as Mesolithic led to suitable modification of the mitigation strategy, allowing all features to be 100% sampled. The scattering of pits were almost exclusively single fill and there were no surface scatters to allow detailed on-site plotting of vertical or horizontal distribution. At Echline Fields, the early dates of the remains were not apparent during fieldwork and as a result, not all features were fully sampled. The overall quantities within the assemblages are therefore

TABLE 1
Radiocarbon Dates, calibrated using Oxford Radiocarbon Accelerator Unit calibration programme OxCal v4.1 and the IntCal 09 calibration curve

Site	*Feature group*	*Context*	*Lab code*	*Material*	*Uncalibrated*	*Calibrated 1-sigma*	*Calibrated 2-sigma*	$\delta^{13}C$
Echline Fields	Sunken-floored Structure 273	494	SUERC- 42918	Charred nutshell: *Corylus avellana*	9145 ± 30	8421–8289 BC	8452–8283 BC	–23.0
	Sunken-floored Structure 273	302	SUERC- 42919	Charred nutshell: *Corylus avellana*	9123 ± 28	8325–8283 BC	8432–8276 BC	–24.4
	Sunken-floored Structure 273	440	SUERC-39764	Charred nutshell: *Corylus avellana*	9075 ± 35	8298–8264 BC	8319–8240 BC	–23.7
	Sunken-floored Structure 273	508	SUERC-39769	Charred nutshell: *Corylus avellana*	9060 ± 35	8291–8256 BC	8302–8238 BC	–25.2
	Sunken-floored Structure 273	302	SUERC- 42920	Charred nutshell: *Corylus avellana*	8230 ± 29	7306–7184 BC	7352–7085 BC	–24.9
	Sunken-floored Structure 273	302	SUERC-40216	Burnt bone	8115 ± 30	7137–7058 BC	7176–7050 BC	–27.4
	Sunken-floored Structure 273	302	SUERC- 42917	Charred nutshell: *Corylus avellana*	8107 ± 29	7131–7056 BC	7174–7047 BC	–23.8
	Oval Structure 519	176	SUERC-39760	Charred nutshell: *Corylus avellana*	9095 ± 35	8311–8271 BC	8423–8244 BC	–26.7
	Oval Structure 519	188	SUERC-39761	Charred nutshell: *Corylus avellana*	9080 ± 40	8301–8257 BC	8421–8233 BC	–24.6
	Northern pit group	144	SUERC-39759	Charred nutshell: *Corylus avellana*	9130 ± 35	8419–8282 BC	8454–8276 BC	–25.1

Site	*Feature group*	*Context*	*Lab code*	*Material*	*Uncalibrated*	*Calibrated 1-sigma*	*Calibrated 2-sigma*	$\delta^{13}C$
Echline Fields	Northern pit group	215	SUERC-39762	Charcoal: *Prunus spinosa*	2925 ± 35	1194–1053 BC	1260–1013 BC	–24.6
	Southern pit alignment	035	SUERC-39754	Charred nutshell: *Corylus avellana*	2995 ± 35	1308–1133 BC	1379–1123 BC	–23.7
	Medieval pit	150	SUERC-39763	Charred grain: *Hordeum vulgare*	690 ± 35	cal AD 1275–1300	cal AD 1261–1391	–23.2
Castlandhill	Pit beside Oval Structure	1026	SUERC-39750	Charred nutshell: *Corylus avellana*	7860 ± 35	6750–6643 BC	6825–6603 BC	–27.7
	Central post-setting	1076	SUERC-39751	Charcoal: *Quercus sp*	6200 ± 35	5217–5072 BC	5294–5048 BC	–25.9
	Central post-setting	1079	SUERC-39748	Charcoal: *Quercus sp*	5915 ± 35	4830–4728 BC	4896–4710 BC	–23.9
	Central post-setting	1079	SUERC-39748	Charcoal: *Quercus sp*	5915 ± 35	4830–4728 BC	4896–4710 BC	–23.9
	Western hearth features	1245	SUERC-39753	Charcoal: *Quercus sp*	5660 ± 35	4529–4458 BC	4584–4372 BC	–24.7
	Western hearth features	1263	SUERC-39752	Charcoal: *Pinus sylvestris*	5690 ± 35	4549–4463 BC	4652–4452 BC	–26.6
	Medieval pit	1108	SUERC-39749	Charred grain: *Hordeum Vulgare*	1525 ± 35	cal AD 442–455	cal AD 431–606	–23.1



Illus 2 Echline Fields: site plan

inevitably low in comparison to similar sites where 100% sieving of the deposits has been undertaken.

ECHLINE FIELDS: MESOLITHIC PERIOD

Sunken-floored Structure 273

An oval, sunken-floored structure with an outer ring of post-holes was identified, set into the edge of a terraced area at the centre of the site (illus 2, 3 and 4). The extent of the sunken floor was 6.96m by 5.92m and up to 0.55m deep. The outer post ring contained nine post-holes measuring between 0.30m and 0.70m in diameter and up to 0.30m deep. The post-holes were angled slightly inwards with four on each side of the structure, each post-hole roughly corresponding to one on the opposing side.

A west-facing entrance may have been formed by two post-holes (472) and (255), as they were larger and deeper than the rest of the outer post ring. This was further supported by the floor of the structure being shallowest on the western side. The area within the outer post ring, which is likely to have formed the internal living space, was 20.91m^2. An episode of post replacement was also apparent as indicated by the close proximity of post-holes (433) and (435).

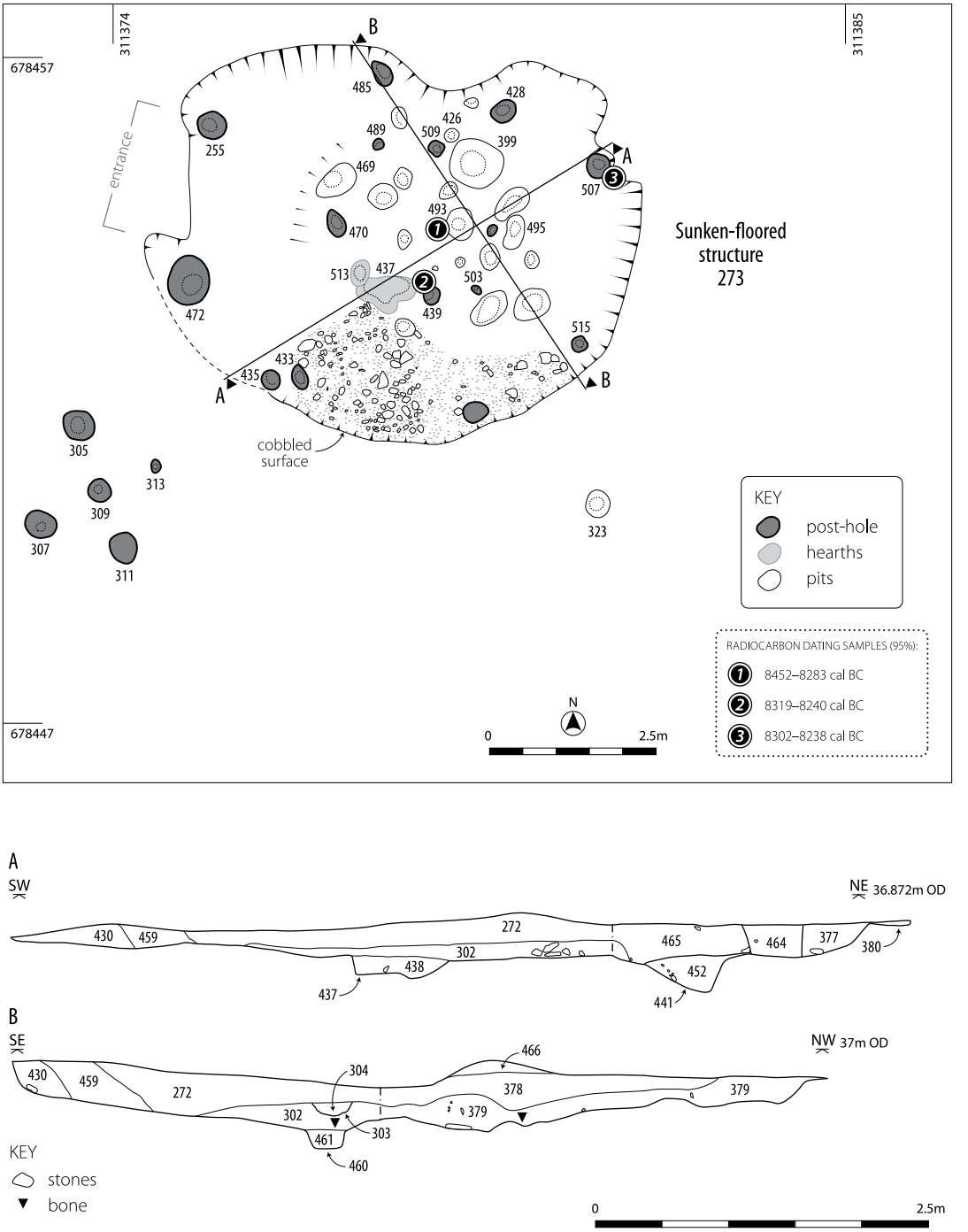
A second, smaller ring of post-holes was identified in the interior of the structure, along with a series of hearths. The inner ring comprised six post-holes, forming an oval arrangement measuring approximately 2.90m by 2.15m. The post-holes measured from 0.13m to 0.32m in diameter and up to 0.14m deep.

The size of the external post-holes and the inner ring of post-holes indicate that the structure is unlikely to have been temporary. Based on this, it is interpreted that the structure was built with some robustness, for semi-permanent settlement.

Charred hazelnut shell recovered from the fills of two post-holes provided material for radiocarbon dating. Nutshell from the fill of post-hole (439) returned a radiocarbon date of 8319–8240 cal BC (SUERC-39764) while nutshell from fill of post-hole (507) returned a date of 8302–8238 cal BC (SUERC-39769).

Twenty-one cut features were found close to the centre of the structure; the majority of which were small and shallow. They contained brown/

ILLUS 3 Echline Fields: North-east facing shot of site with Sunken-floored Structure 273 in foreground



ILLUS 4 Echline Fields: plan and section of Sunken-floored Structure 273

grey sand and gravel with inclusions of charred hazelnut, burnt bone and lithics. Function could not be clearly assigned but the burnt material present suggested numerous hearths. Pit (493) contained a particularly high concentration of burnt lithics; charred hazelnut from the deposit was radiocarbon dated to 8452–8283 cal BC (SUERC-42918). Burnt clay retrieved from the pit may be the remnant of daub from a superstructure. The larger dimensions of two pits (399) and (469) suggest they were for refuse and deposition of hearth sweepings rather than hearths themselves. At the southern side of the structure, a roughly cobbled surface composed of water-rounded stones was set into the natural sands and gravels. The cobbling covered an area of 8.2m^2 and indicated an area of differentiated activity; but what this activity was could not be identified.

The features were all sealed by a layer of charcoal-rich silty sand and gravel (302/379; illus 4) that was subsequently confirmed as a likely in-situ occupation deposit by thin-section micromorphology (see Palaeoenvironmental Synthesis below). Samples of charred hazelnut shell from this deposit were radiocarbon dated and, when compared to the dates from the underlying pits and post-holes, infer two broad periods of activity for the structure (Table 1 and illus 11). The earliest range of dates indicates an initial phase of occupation between 8450 and 8240 cal BC. The latter group of dates suggests the site of the structure was reused approximately 1,000 years later; between 7350 and 7050 cal BC. The occupation deposits from both phases contained large amounts of fragmentary and often burnt lithics, along with fragments of burnt bone. For purposes of comparison, it is estimated that approximately 5% of the total volume of occupation deposits was sampled.

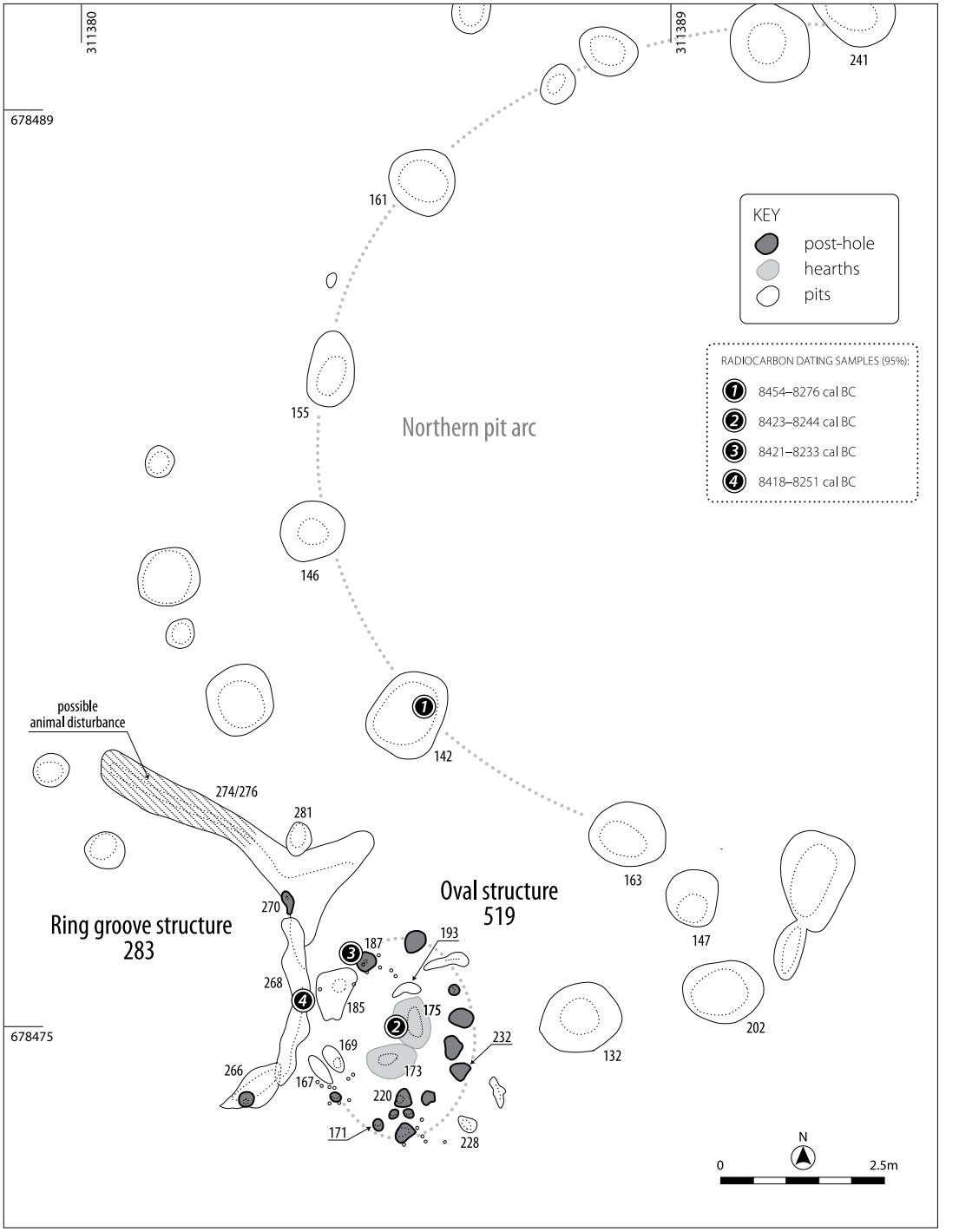
The structure had filled with successive layers of loam and debris after its final abandonment. Around the northern and southern edges of the structure an organic-rich deposit of silty sand (377) and (430) had formed that may be the remains of decayed organic walling. Overlying this were redeposited natural sands and gravels (459) and (464), interpreted as the remains of an outer bank that may have stabilised a wall or acted as a windbreak, slumped back into the structure after it was abandoned. Immediately to the south-west of Structure 273, a group of five post-holes formed a small, undated, square structure, 2m long with unknown function.

Oval Structure 519

Structure 519 (illus 5) comprised an oval ring of 11 post-holes and measured 2.95m by 2.10m. It was identified 18m north-west of Sunken-floored Structure 273. The post-holes ranged in diameter from 0.18m to 0.41m, with the fills of several containing lithics of Mesolithic date. Hazelnut shell retrieved from the fill (188) of post-hole (187) was radiocarbon dated to 8421–8233 cal BC (SUERC-39761). The structure contained two wide, deep central hearths, one of which (175) provided a radiocarbon date of 8423–8244 cal BC (SUERC-39760) which was contemporary with the date retrieved from post-hole (187). A series of stake-holes and pits were also located around the hearths and post-holes. To the western side there were no post-holes but instead three shallow pits. The northern shallow pit (185) had an irregular shape that appeared to roughly mimic the two oval-shaped southern pits (167) and (169). These features had arcs of stake-holes positioned nearby; north-east of (185), south/south-west of (167) and (169) and with a further pair of stake-holes positioned on the eastern and western edges of (185).

Ring groove Structure 283

A group of features, directly west of Oval Structure 519, formed a C-shape open to the west, with a short spur running north-east (illus 5). This 'ring groove' structure comprised a group of inter-cutting curvilinear ditches, between 0.51m and 0.90m wide and between 0.27m and 0.08m deep, two post-holes and a small pit. Two of the segmented ditches (266) and (268) and small post-hole (270) contained



ILLUS 5 Echline Fields: plan of Oval Structure 519, Ring groove Structure 283 and Northern pit arc

a dark silty fill, which included quantities of Mesolithic chipped stone, numbering 62 pieces. Ditches (266) and (268) had similar undulating, steeply inclined sides with similar maximum dimension of between 0.50m and 0.51m wide and 0.25m and 0.27m deep. Within the south-west of ditch (266) was a post-hole, and possible small stake-holes were noted along the base of (268), indicating that the ditches were probably foundation slots for an upright wooden structure. The third ditch segment (274/276) to the north appeared to have been disturbed, possibly by animal burrowing. In comparison to the other ditches, its fill had gently sloping sides and a wide round base, measuring between 0.56m and 0.35m wide and 0.18m and 0.08m deep, becoming wider and shallower at its western end. Its fill was lighter in colour, mottled, ill-defined and contained only a single chert blade. The relationship of pit (281) to the structure is difficult to discern, it either abuts or was cut by ditch (274/276). Its sand and gravel fill differed from ditch fills from (266) and (268) in the same area but it did contain five examples of Mesolithic chert and quartz chipped stone.

Charred hazelnut shell from the fill of ditch (268) provided a radiocarbon date of 8418–8251 cal BC (SUERC-40088). The ring groove is most probably the remains of a curvilinear screen or windbreak and very possibly related to the processes carried out at the broadly contemporary Oval Structure 519.

Northern pit arc

A number of additional isolated pits were identified across the site; however, there was a distinct concentration to the north, adjacent to Oval Structure 519 and Ring groove Structure 283. This concentration of pits formed an arc open to the east (illus 5). The pits ranged in size from 0.27m to 1.86m in length and 0.04m to 0.71m in depth.

Frequent amounts of charred hazelnut fragments were recovered from several of the pit fills, with one sample (from pit 142) providing a radiocarbon date of 8454–8276 cal BC (SUERC-39759). The pit samples were also found to contain varying amounts of lithics, burnt mammal bone and rare amounts of small charcoal fragments. The assemblages imply the features were for disposal of food refuse, rather than in-situ preparation, and may have partially surrounded a structure/processing area for which any evidence has been lost.

MIDDLE TO LATE NEOLITHIC PERIOD

Isolated pits

Three isolated pits (002), (040, illus 2) and (323, illus 4) identified across the site provided evidence of Middle to Late Neolithic activity. Impressed Ware was retrieved from pit (040) which was radiocarbon dated from associated hazel nutshell to 3337–2936 BC (SUERC-39758). Pit (002), Area D (illus 1), and pit (323), Area A, both contained Grooved Ware but were located 304m apart.

BRONZE AGE

Northern pit group and Southern pit alignment

At the northern extent of the site, a group of pits was identified that varied from sub-round to sub-oval in plan (illus 2). They ranged from 0.50m to 1.20m in length and were between 0.03m and 0.27m deep. Function could not be ascertained due to their generally sterile fills, however, charcoal retrieved from one pit (214) was radiocarbon dated to 1260–1013 cal BC (SUERC-39762; Humble 2011).

At the southern extent of the site, five sub-circular pits formed an alignment and ranged in size from 0.5m to 1.3m in length and up to 0.4m in depth. Charcoal was identified in several fills and one sample, from pit (034), was radiocarbon dated to 1379–1123 cal BC (SUERC-39754). Two of the pits, (034) and (417), contained undiagnostic pottery, which may date to the middle Bronze Age, based on the C14 date retrieved.

ILLUS 6 Echline Fields: plan of undated Circular Structure 410

UNDATED

Circular Structure 410

Structure 410 was located in the eastern part of the site (illus 2 and 6). It comprised a C-shaped alignment of post-holes with a cluster of features at the south-west. The features were better preserved to the south, with those to the north becoming progressively shallower. It is suggested that the structure was originally circular in plan, with the post-holes on the northern side lost through truncation.

Eight post-holes formed the structure, which measured approximately 6.40m by 5.90m. The post-holes were sub-circular to oval in plan, measuring between 0.61m by 0.50m and 0.30m by 0.22m. They were between 0.03m and 0.18m deep.

The cluster of six features at the south-west of the structure may have formed a south-west facing porch approximately 4.10m by 2.30m. These were circular to oval in plan and measured between 1.36m by 0.75m and 0.60m by 0.55m. They were between 0.35m and 0.15m deep. The cut features all contained homogenous fills of silty sand with no ecofactual or artefactual material to assist with their dating or characterisation.

CASTLANDHILL: MESOLITHIC PERIOD

Oval Structure 1280 and surrounding pits

At Castlandhill on the northern side of the Firth of Forth, Oval Structure 1280, defined by six post-holes and orientated approximately north-east/south-west, was found in the centre of the excavation area (illus 7 and 8). The post-holes were arranged in three pairs; forming a structure 4.7m in length by 3m at its widest point. They were on average 0.45m diameter and 0.2m deep, however, the central post-holes were cut deeper at 0.26m and 0.32m depth. It was also noted that the post-holes at the south-western end of the structure sloped towards the north-east; suggesting that the posts were angled inwards. No material suitable for radiocarbon dating was recovered from any of the post-hole fills. A total of 15 lithics, characteristic of later Mesolithic date were recovered from five of the post-hole fills: (1044) from cut (1043); (1053) from cut (1052); (1055) and (1056) from cut (1054); and (1065) from cut (1064).

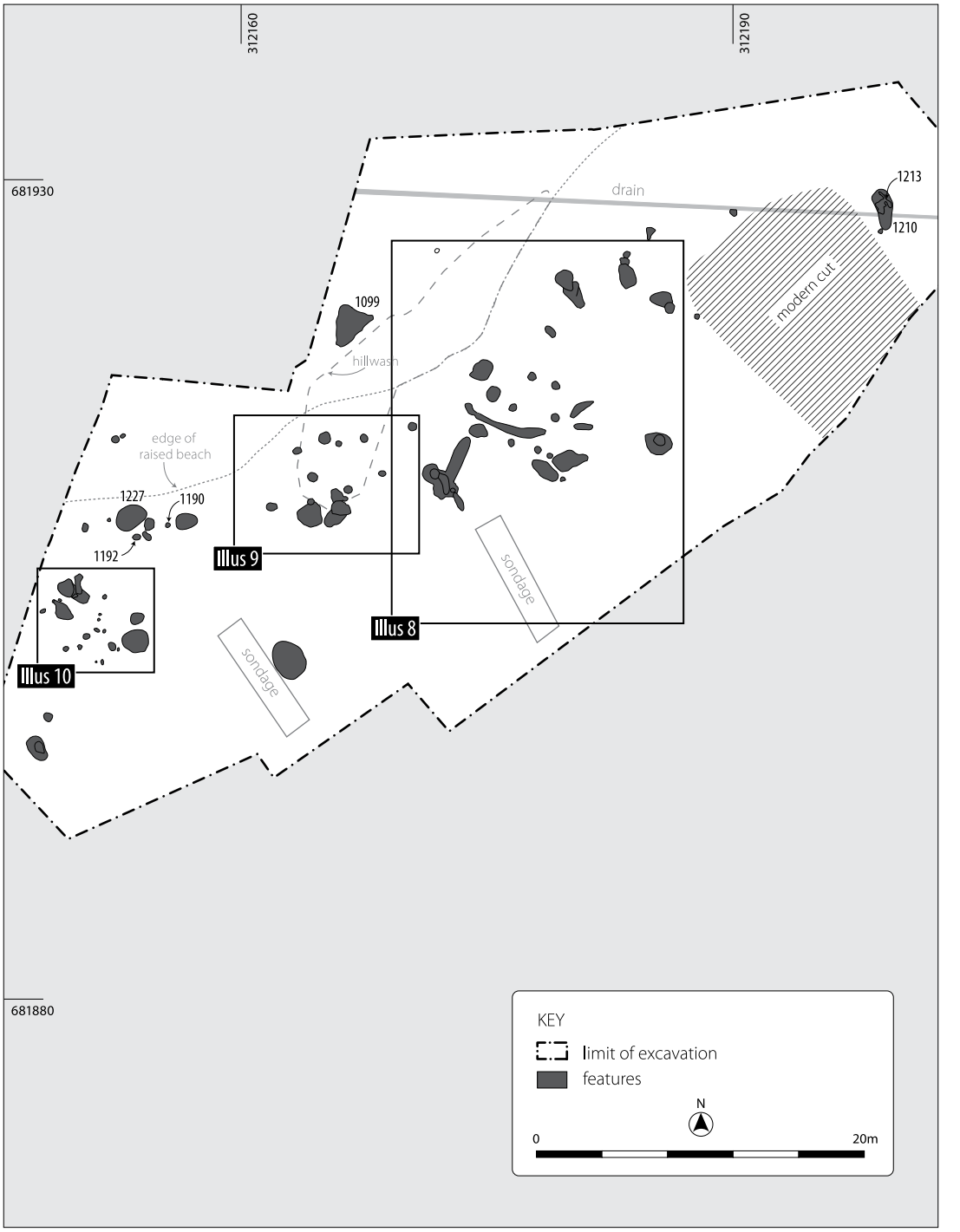
A curvilinear gully (1058) crossed the southern part of the structure from east to west (illus 8). The cut was 5m in length, 0.39m at its widest point and up to 0.19m deep. A possible small post-setting was found midway along the feature. A possible extension (1059) to gully (1058) was identified to the north-east and measured 1.60m in length, 0.65m wide and 0.18m deep. No relationship could be discerned between the gully and post structure.

A grouping of pits and two small post-holes lay to the south-east of the oval structure. The pits were sub-oval in plan and several contained lithic fragments in their fills. The upper fill (1026) of pit (1048) – a possible re-cut – was radiocarbon dated to 6825–6603 cal BC (SUERC-39750). A further three pits were also found to the north-west.

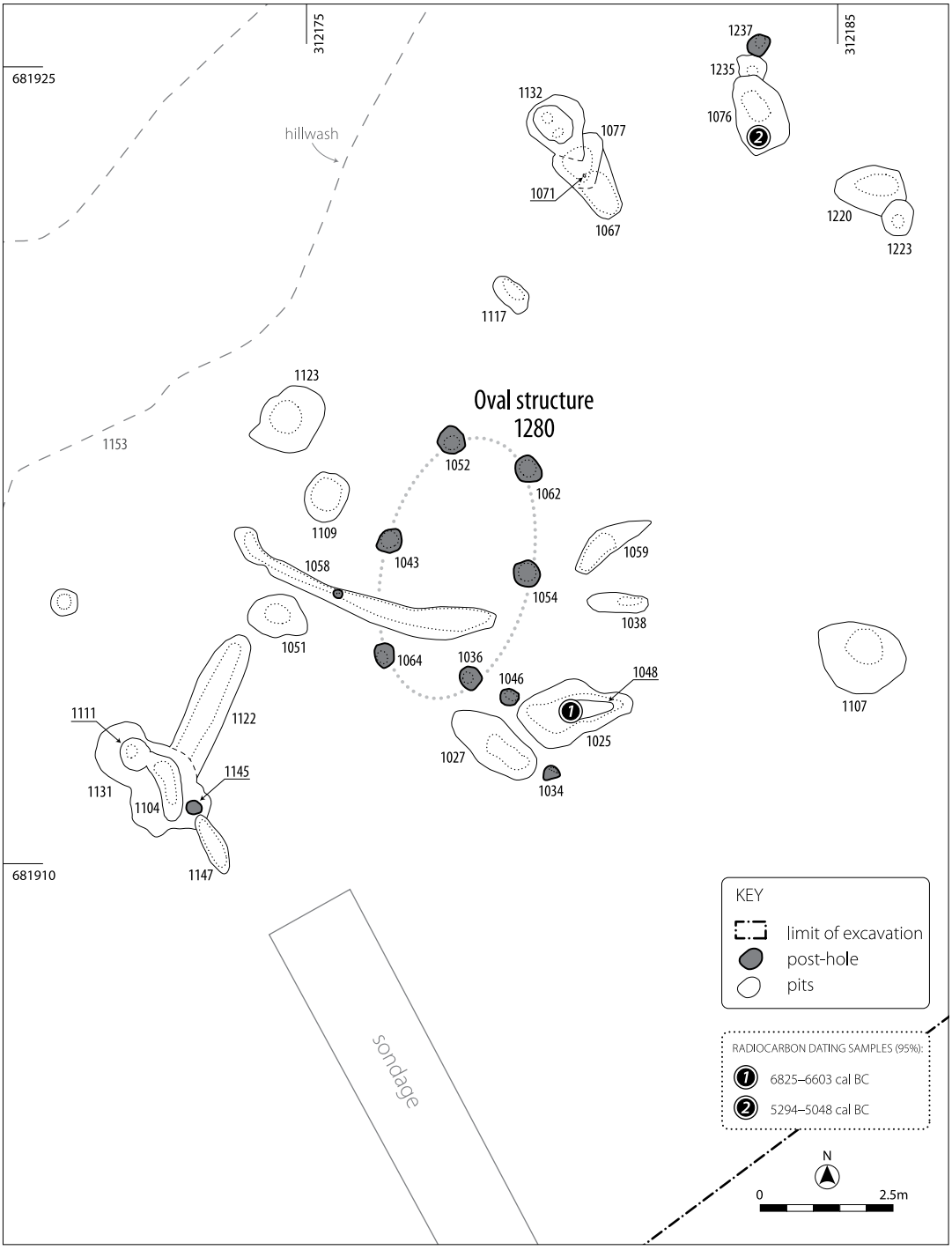
A series of pits, along with a gully, were identified to the south-west of the oval structure. A short gully (1122) orientated north-east to south-west had been cut by a large oval pit (1131). The pit measured 2.50m by 1.40m and was 0.40m deep. Four features were cut into the top of the large pit, comprising two inter-cutting pits (1104) and (1111), a post-hole (1145) and further pit (1147). A significant amount of lithics were recovered from the inter-cutting pits (1104) and (1111) which included the highest number of tools and cores on the site.

North-eastern pit group

A further group of inter-cutting pits was concentrated along the upper edge of the Main Perth Shoreline raised beach, found on the north-eastern side of the excavation area (illus 7 and 8). One pit (1076), with an associated post-hole (1237), measured 1.50m by 1m and was 0.55m deep. It contained patches and linear bands of charcoal that appeared to be



ILLUS 7 Castlandhill: site plan



ILLUS 8 Castlandhill: plan of Oval Structure 1280 and surrounding pits

burnt branches. The charcoal was identified as oak and provided a radiocarbon date of 5294–5048 cal BC (SUERC-39751). A similar-sized pit (1220) had been cut to the south-east. The lithics from this area were suggestive of small scale manufacture and a higher instance of tools suggested accidental loss or deliberate discard (illus 8).

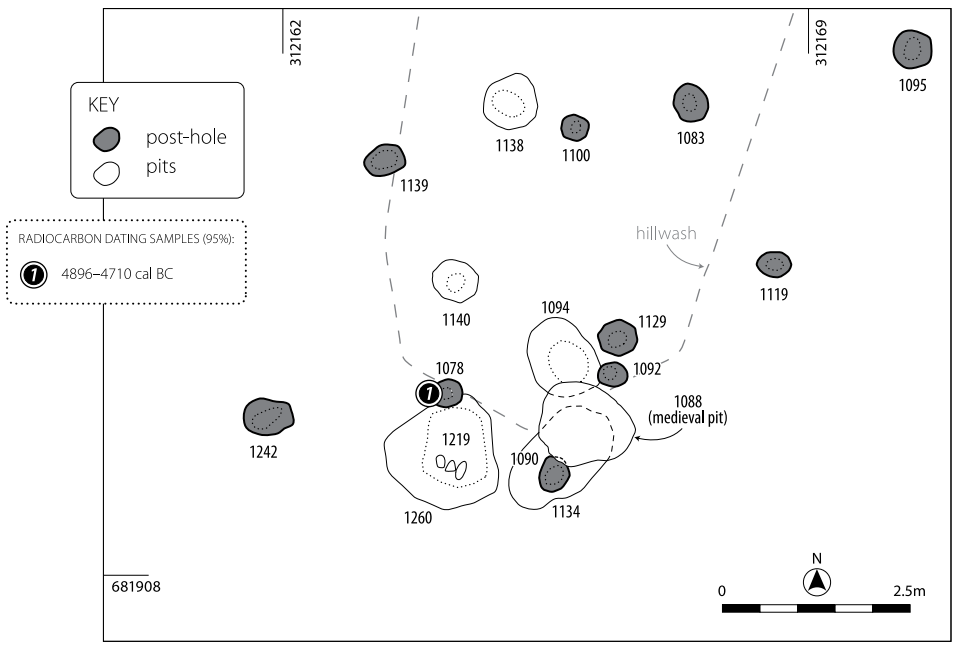
Central pits and post-setting

Three large pits (1094), (1134) and (1260) were identified in the centre of the excavation area, located to the south of a hillwash deposit (illus 7 and 9). One pit (1260) contained a thin band of orange clay at the base, which was overlain by a group of large sub-rounded stones, however, it could not be established if the clay represented the remains of a deliberate lining. It seems more likely this was a naturally formed deposit caused by water pooling at the base. The pit was cut on its northern edge by a post-hole (1078). Subsequent radiocarbon dating of charcoal from the fill provided a date of 4896–4710 cal BC (SUERC-39748).

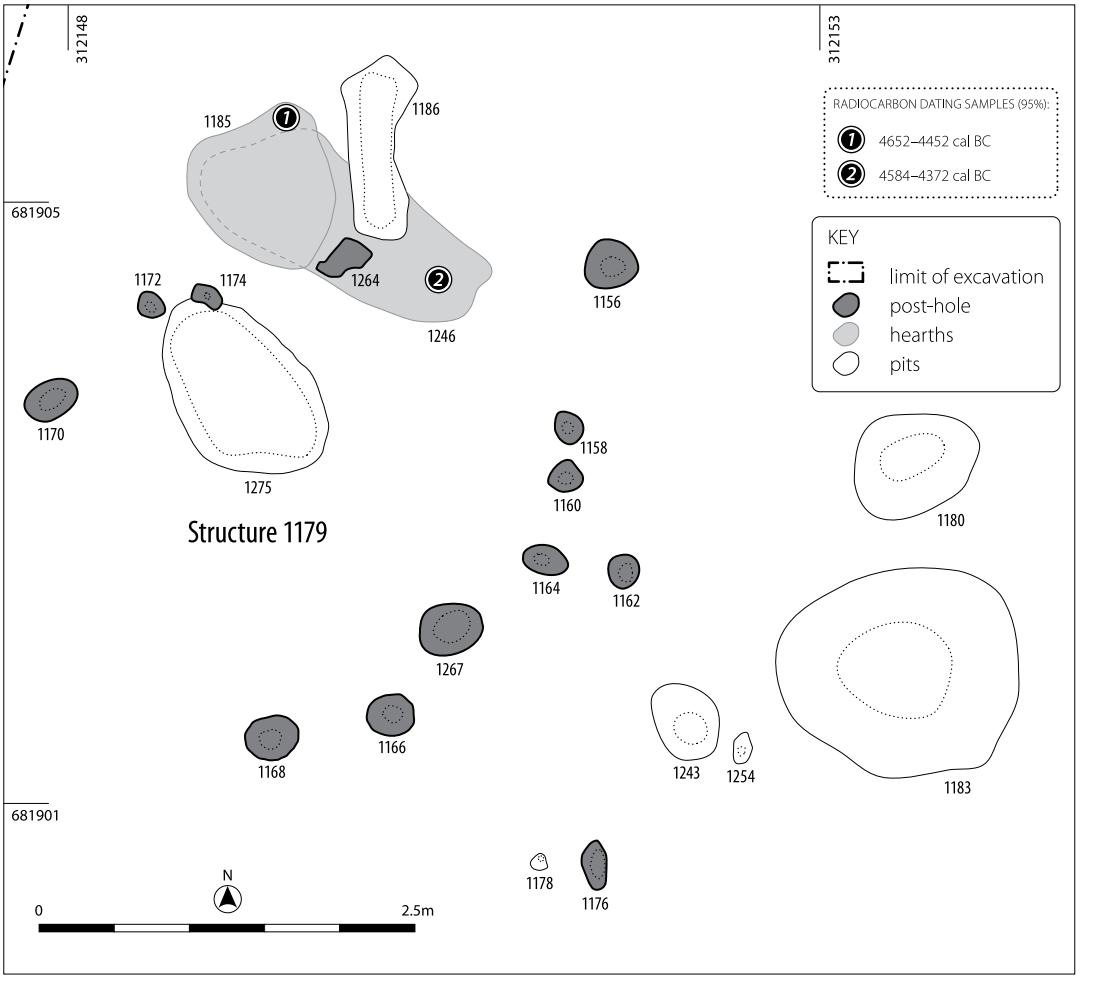
Post-hole (1078) formed part of a larger feature that consisted of two roughly parallel rows of four post-holes. They were aligned parallel to the edge of the raised beach and cut into the hillwash. The post-holes were around 0.5m in diameter and 0.15m deep, with stone packing identified in several. A large, irregular-shaped feature (1099) was found to the north of the post-setting (illus 7); interpreted as a natural hollow. A layer of charcoal was identified in the feature and fragments of fuel ash slag were recovered from the samples, indicating that the soil had been subjected to high temperatures. The burnt material may derive from a natural event, such as the burning of vegetation, or the feature may have been used as a hearth.

Western hearth features and Structure 1179

At the western edge of the excavation area was a series of hearth features and a post-built



Illus 9 Castlandhill: plan of central pits and post setting



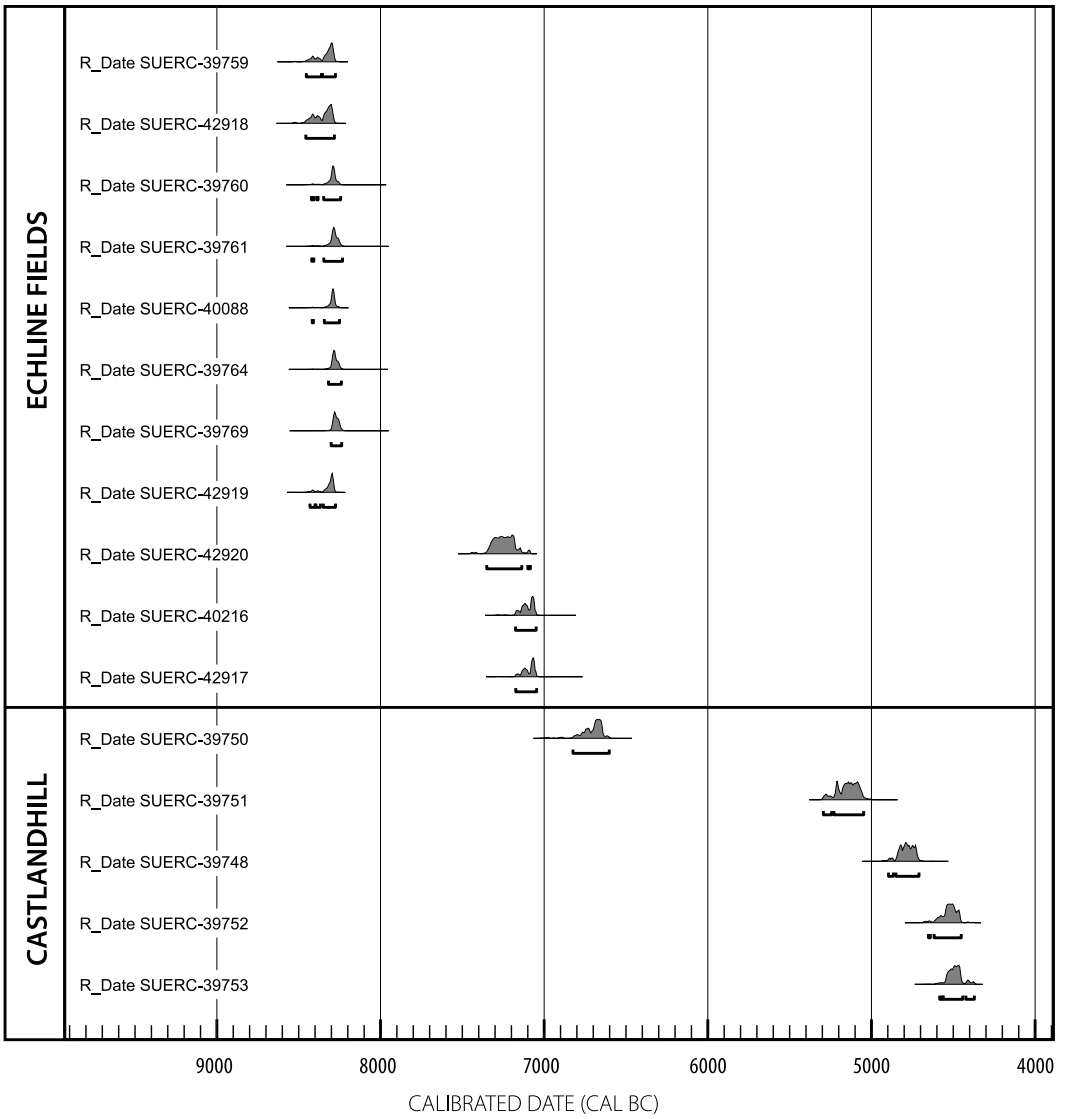
ILLUS 10 Castlandhill: plan of western hearth features and Structure 1179

structure (illus 10). The earliest hearth (1246) comprised a large pit measuring 2m by 0.80m and 0.40m in depth. The primary fill (1263) contained charcoal deposits radiocarbon dated to 4584–4372 cal BC (SUERC-39753). This fill was overlain by sandy loam, with occasional charcoal and burnt clay fragments; interpreted as the remains of a fire.

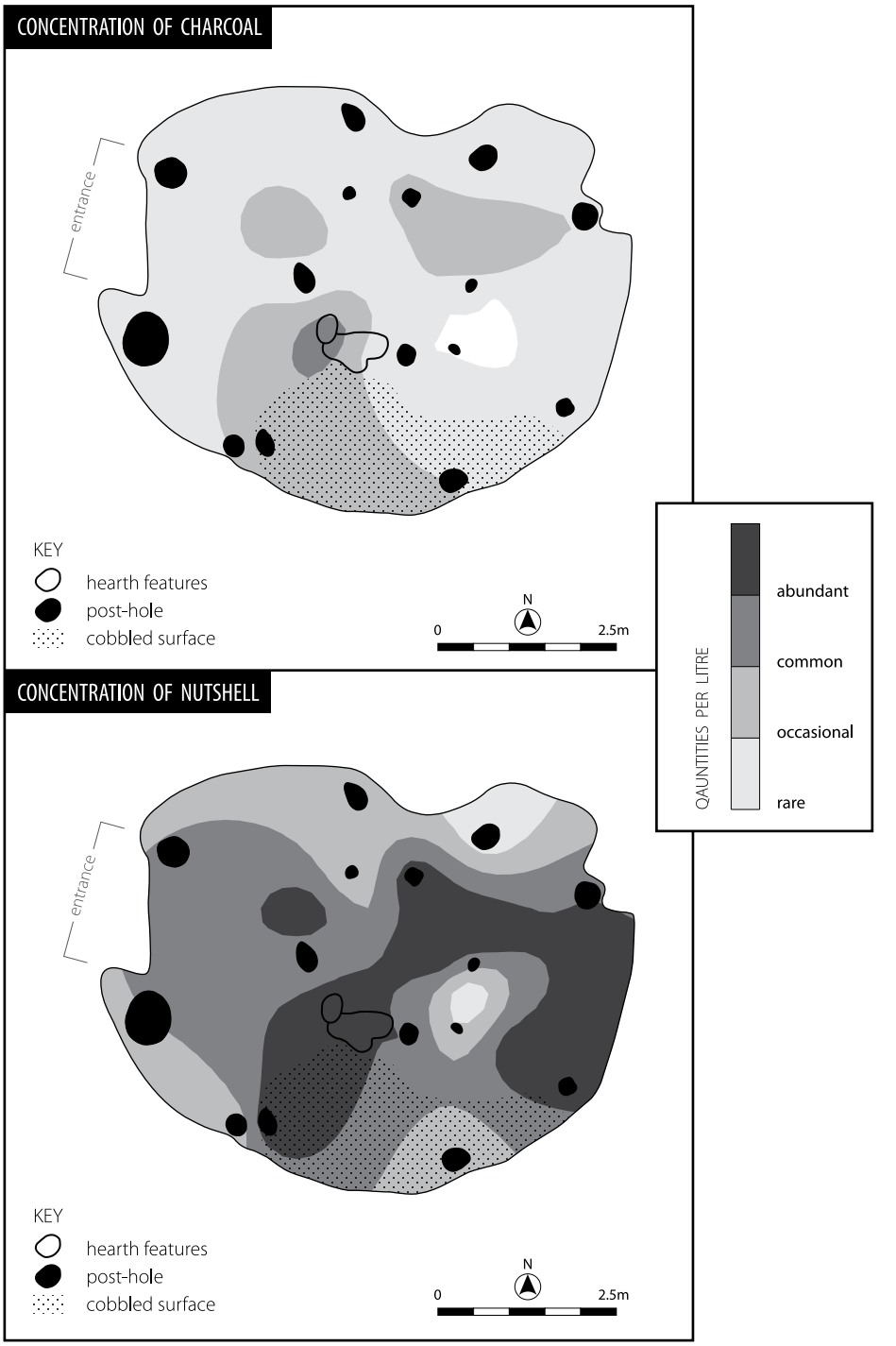
A second hearth (1185), a pit (1186) and a truncated hearth (1246) were identified. The hearth (1185) measured 1m in diameter and 0.15m deep and had a charcoal-rich deposit (1245) at its base. This charcoal-rich deposit was radiocarbon dated to 4652–4452 cal BC (SUERC-39752) which is broadly contemporary with underlying hearth (1246). Pit (1186) was rectilinear in plan, measuring 1.10m by 0.40m and 0.07m in depth, and located immediately east of (1185). It was filled with reddish brown sandy loam (1187) with charcoal, and may represent rake-out from hearth (1185).

A sub-circular structure (1179) made up of 12 post-holes was also identified on the western edge of the excavation area (illus 10). The structure measured 4.20m by 3.30m and was orientated roughly north-east to south-

west, similar to the oval structure found in the centre of the area. The post-holes were relatively small and ranged in diameter from 0.15m–0.30m and were generally 0.10m–0.20m in depth. It was noted post-holes (1166), (1168) and (1264) sloped inwards towards the centre of the structure. One of the post-holes (1264) on the northern side of the structure truncated the southern edge of hearth (1246), indicating the structure post-dated the hearth features. On the western side within the structure was a large irregular-shaped pit (1275), measuring 1.60m by 0.95m and 0.35m in depth. No material suitable for radiocarbon dating was recovered from the structure. A total of eight lithics typical of later Mesolithic narrow blade industry were recovered from post-hole (1170) and pit (1275) and provide a probable date for the structure. Its



Illus 11 Graph of all Mesolithic radiocarbon dates



Illus 12 Echline Fields: Sunken-floored Structure 273, Primary Occupation Phase, charcoal and nutshell distribution

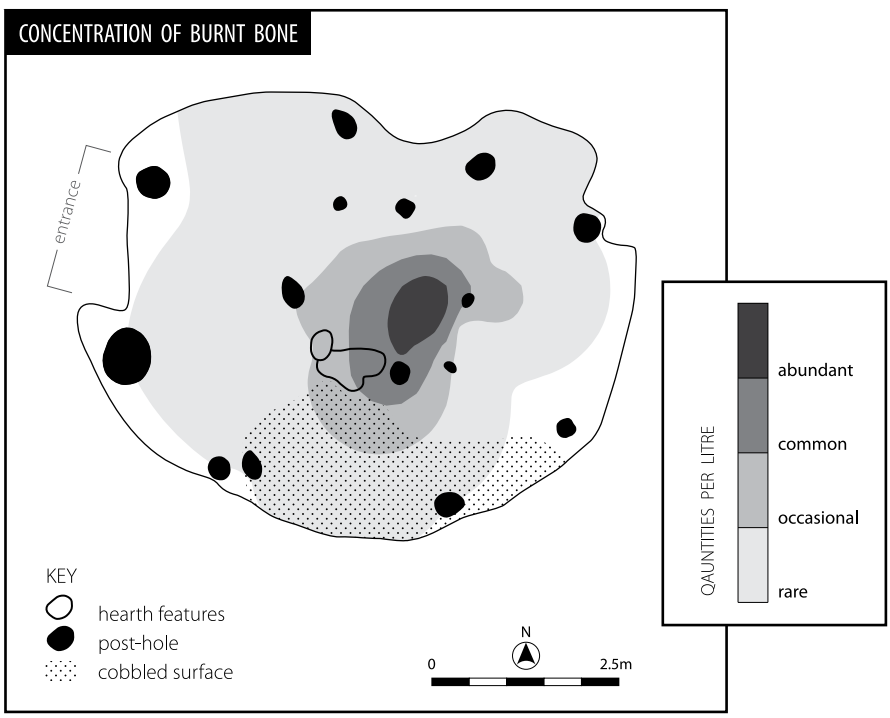
function remains unclear but the structure may represent an open-sided dwelling.

A number of other pits and small post-holes were found in the area surrounding the structure. In the direct vicinity were small stake- and post-holes on the southern edge of the structure and two large pits to the south-east (1180) and (1183). The proximity of these features to the hearths suggests a Mesolithic date, confirmed from Mesolithic chipped stone recovered in two of the features (1170) and (1183). Further to the north of Structure 1179 was a group of six small post-holes and two small pits (illus 7). A small quantity of Mesolithic chipped stone was discovered within three of these features (1190), (1192) and (1227). The small quantities found in this area reflect the similarly low levels found amongst Structure 1179 and other features to the south and may suggest similar activity types of potentially contemporary date.

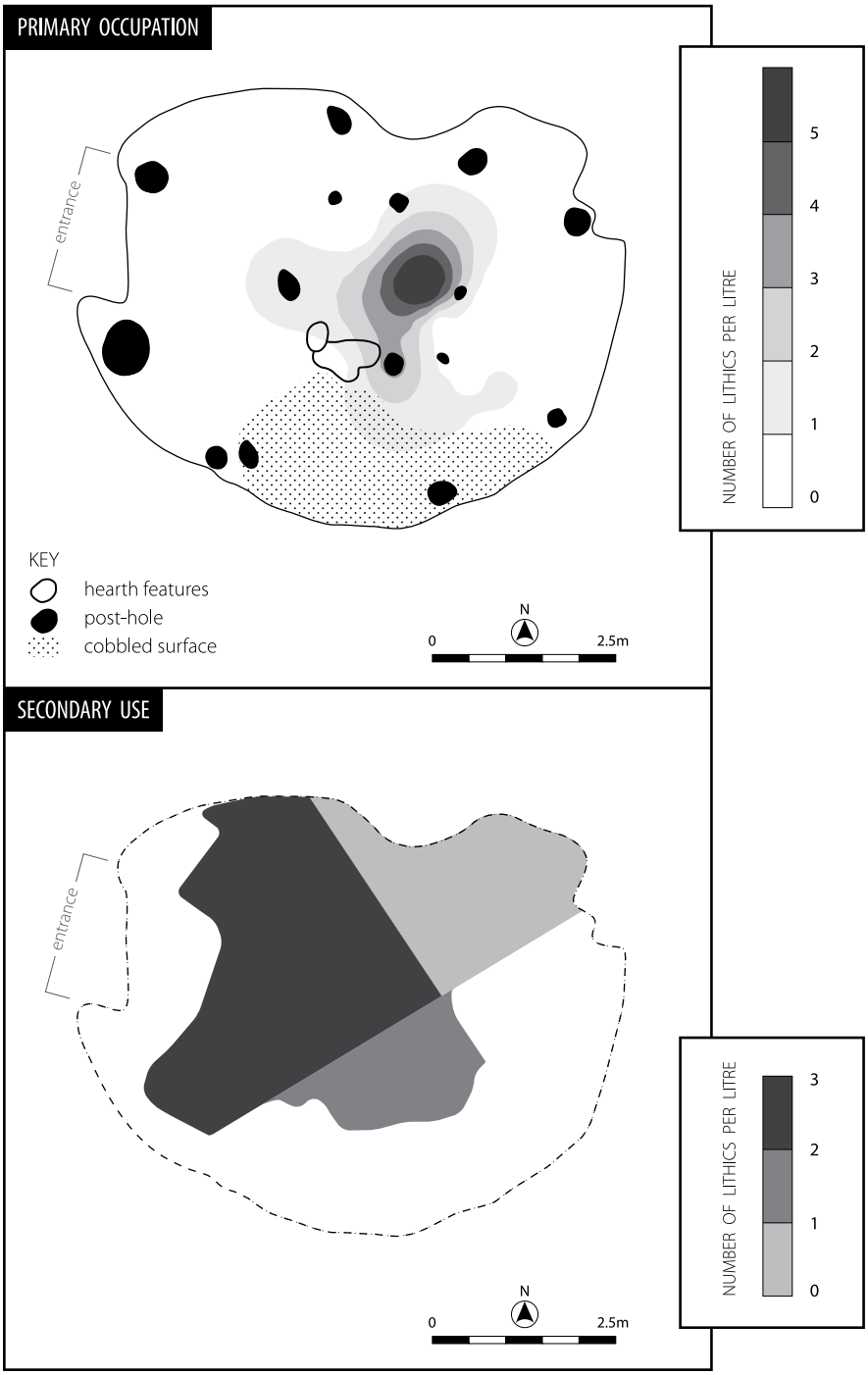
PALAEOENVIRONMENTAL SYNTHESIS

INTRODUCTION

This section provides a chronological synthetic overview of the palaeoenvironmental work undertaken at the Mesolithic sites of Echline Fields and Castlandhill. During the course of the excavations on these sites bulk sampling was undertaken from which charred plant remains (CPR), burnt faunal bone fragments and charcoal fragments were recovered and analysed. Thin-section, kubiena tin samples were also taken from deposits within Sunken-floored Structure 273 at Echline Fields, for soil



Illus 13 Echline Fields: Sunken-floored Structure 273, Primary Occupation Phase, burnt bone distribution



Illus 14 Echline Fields: Sunken-floored Structure 273, Primary Occupation Phase and Secondary Use, lithic distribution

micromorphological analysis of the composition and depositional formation of these layers.

METHODOLOGY AND DISTRIBUTION MAP CONSTRUCTION

Palaeoenvironmental assessment of the bulk samples taken from Mesolithic features at both Echline Fields and Castlandhill for CPR revealed that there was limited material available for further analysis. Charcoal fragments and charred hazelnut shell were the main CPR recovered that could be used to provide information on the landscape, diet and economy for the periods of activity at both sites. Further such information was provided from burnt and unburnt bone fragments recovered from these samples.

Charcoal fragments were analysed from nine samples from Mesolithic dated contexts (five from Echline Fields and four from Castlandhill). A maximum of 20 fragments were randomly selected and analysed from each sample, based on their size (>0.5 cm^3) and therefore suitability for identification. A total of 135 fragments were analysed; 87 from Echline Fields and 48 from Castlandhill. The charcoal was broken or fractured to view three sectional surfaces (transverse, tangential and radial) necessary for microscopic wood identification. The charcoal fragments were then mounted onto a slide and examined using an incident light microscope at magnifications of 100×, 200× and 400×, where applicable. Identifications were made using wood keys by Schweingruber (1990) and modern reference materials. Ring curvature was measured using the key by Marguerie & Hunout (2007), where weak curvature is thought to denote large-sized timbers, medium curvature, medium-sized timbers and strong curvature represent small-sized timbers. Where curvature could not be viewed it was recorded as indeterminate.

Hazelnut shell fragments were also analysed from contexts dating to the Mesolithic period. Analysis of the nutshell fragments consisted of quantifying the total number of fragments present in five different class sizes (whole, ½, ¼, ⅛ and <⅛) and the weight of each size class in order to investigate the degree of fragmentation (cf Holst 2010; Bunce 2011). The degree of fragmentation can be used in order to gauge how the shell was opened in order to extract the nut inside. A total of 12,209 fragments were counted with a total weight of 293.2g. Almost the entire nutshell fragment assemblage was recovered from Echline Fields (12,188 fragments, 292.8g), with only 21 fragments (0.4g) recovered from Castlandhill.

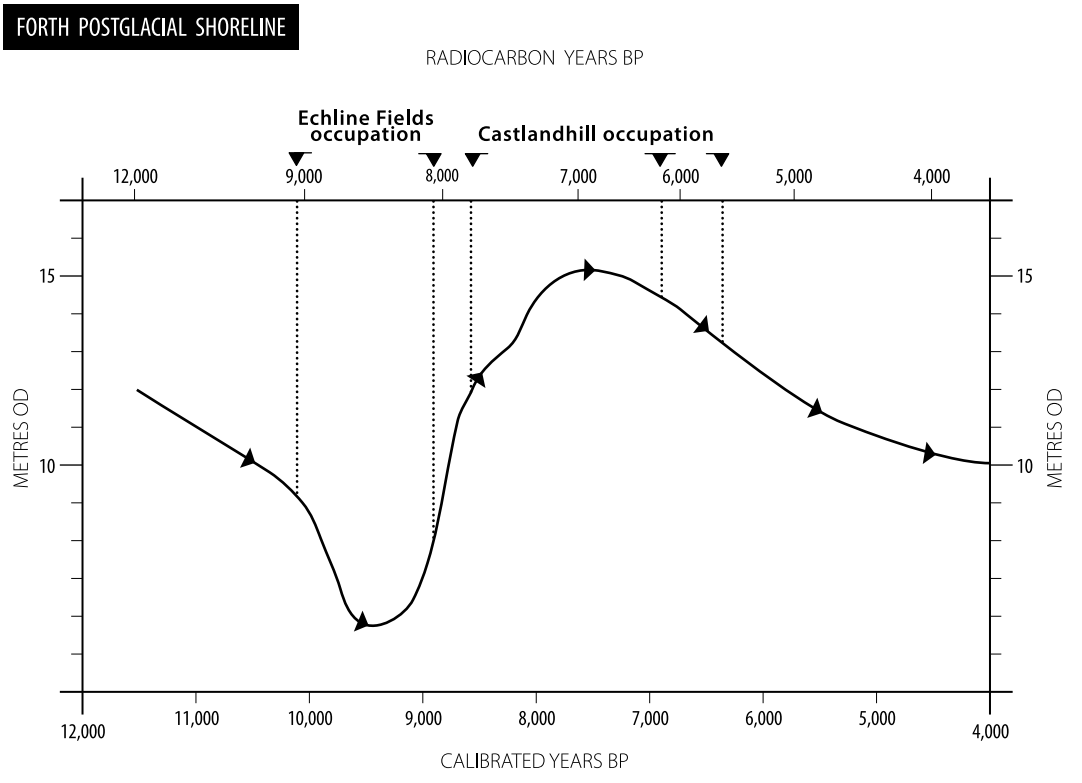
In order to look at the distribution of materials within the interior of Sunken-floored Structure 273, a series of distribution maps were created (illus 12–14). The 2-D contour maps were produced using a digital surface mapping and contouring program (SURFER10) to plot location of internal features (eg pits and post-holes) and samples from the on-site survey data. Contour maps were then created using the abundance counts for charcoal, charred hazelnut shell, burnt bone and lithic data gained from the bulk sample assessment data from samples located within this structure; where rare = 1–5; occasional = 6–15; frequent = 16–50; abundant = >50. The computer model interpolated the shape of the contours based on the distribution of the abundance data. For the lithic data, two contour maps were constructed showing sample data from the primary and secondary uses of the structure. The sharp contrast of the contours for the secondary phase of use is a result of the smaller data set combined with distribution defined only by quadranted area of the structure.

ECHLINE FIELDS

The radiocarbon dating results show that the earliest phase of activity at Echline Fields occurred between 8454–8276 cal BC (SUERC-39759) and 8302–8238 cal BC (SUERC-39769) when Oval Structure 519 and the associated Ring groove Structure 283, together with Sunken-floored Structure 273 and

the Northern pit group were in use. This period of activity would have taken place against a background of dynamic landscape change. Relative sea-level (RSL) studies from the Forth Valley show that the construction of these structures took place during a period of falling RSL named 'The Early Holocene Regression' which took place between 9800 to 8200 BP (Robinson 1993; Ellis 2000; Smith et al 2010) (illus 15). At this point, RSL would have been at approximately 8m above current OD in the Forth Valley and falling (Smith et al 2010). The placement of the settlement, high up the shore at 35m OD, would have given the occupants a good view over the Forth Valley, while on the lower slopes there would have been ready access to marine resources (eg fish, waterfowl) and potential transport routes. The continuing fall in RSL in this area may explain the abandonment of the site with marine resources declining and migratory birds abandoning the area, causing the inhabitants to seek richer resources elsewhere.

Pollen diagrams dating to this period are fairly limited, but those available from sites in Pickletillem, Fife (Whittington et al 1991a) and Black Loch, Fife (Whittington et al 1991b) show that the landscape in *c* 9100 BP had a dominant woodland cover of hazel (*Corylus avellana*). A rise in hazel is seen in pollen diagrams across Scotland occurring between 9500 to 9000 BP (Birks 1989). Other tree types such as birch (*Betula* sp), elm (*Ulmus* sp), pine (*Pinus* sp) and willow (*Salix* sp) were also present (Whittington et al 1991a; 1991b). However, it is more likely that the landscape would have been a mosaic of stands of hazel scrub woodland, mixed woodland and open ground; with herbaceous pollen values showing the presence of sedges



ILLUS 15 Relative sea level change in the Forth Lowland

TABLE 2
Echline Fields: summary of identifiable bone

Feature group	*Context*	*Sample*	*Taxonomic grouping*	*Bone*	*Details*
Oval Structure 519	168	68	Small mammal	Astragalus	One entire
Oval Structure 519	168	68	Small mammal	1st phalanx	Three entire
Oval Structure 519	168	68	Small mammal	Caudal vertebra	Two entire
Oval Structure 519	168	68	Small mammal	Metapodial	Proximal fragment
Oval Structure 519	168	68	Small mammal	Metapodial	Distal fragment
Oval Structure 519	168	68	Small mammal	Shaft	Five possible long bone fragments
Oval Structure 519	168	68	Bird indeterminate small species	Phalanges	Three examples
Oval Structure 519	168	68	Bird indeterminate medium species	Tarso-metatarsus	Proximal fragment
Oval Structure 519	168	68	Fish		Three small fragments
Sunken-floored Structure 273	302	130	Sheep/goat/roe-deer	Maxilla	Fragment with remnants of alveoli for molars/premolars
Sunken-floored Structure 273	302	130	Large mammal	Femur	Proximal fragment
Sunken-floored Structure 273	302	130	Medium mammal		Epiphysial fragment
Sunken-floored Structure 273	302	230	Large mammal	probable vertebra	Epiphysis (from centrum)
Sunken-floored Structure 273	302	230	Sheep/goat/roe-deer	?ulna	?part of olecranon

Feature group	*Context*	*Sample*	*Taxonomic grouping*	*Bone*	*Details*
Sunken-floored Structure 273	302	231	Wild boar	2nd phalanx, digit II/V	Proximal only; epiphysis fused (ie immature/adult)
Sunken-floored Structure 273	302	232	Cattle/red-deer	1st phalanx	Proximal only; epiphysis fused (ie immature/adult)
Sunken-floored Structure 273	302	234	Cattle/red-deer	2nd phalanx	Proximal fragment only; epiphysis fused (ie immature/adult)
Sunken-floored Structure 273	379	129	Bird small species	1st phalanx	Entire
Sunken-floored Structure 273	379	129	Bird indeterminate species	3rd phalanx	Entire
Sunken-floored Structure 273	379	129	Medium mammal	Innominate	Acetabular rim fragment one other pelvic fragment
Sunken-floored Structure 273	379	129	Medium mammal	Rib	Shaft
Sunken-floored Structure 273	379	129	Canid, cf wolf	2nd phalanx	Entire; proximal fused (ie adult/ immature)
Sunken-floored Structure 273	379	222	Canid, cf wolf	1st phalanx	Entire; proximal fused (ie adult/ immature)
Sunken-floored Structure 273	379	222	Canid, cf wolf	3rd phalanx	Articular fragment only
Sunken-floored Structure 273	379	222	Medium mammal	?vertebra	Epiphysial plate only (?caudal)

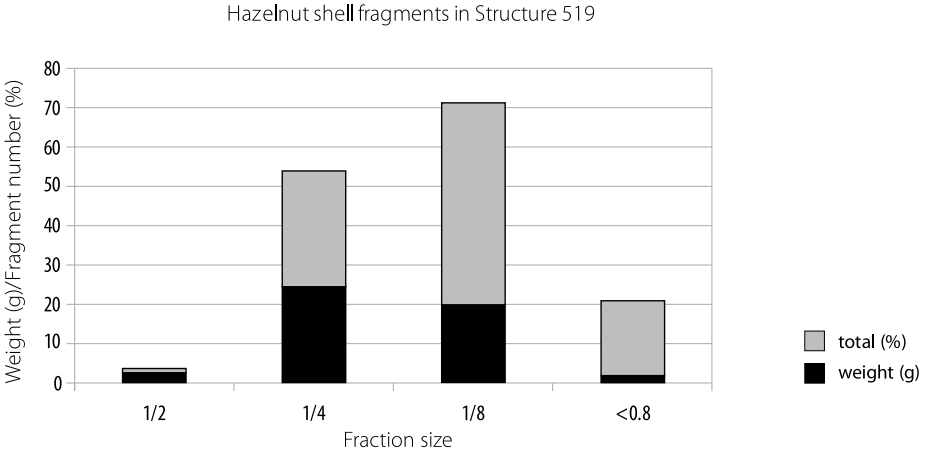
(Cyperaceae) and grasses (Poaceae) rather than a cover of dense woodland (Whittington et al 1991a; 1991b).

Analysis of burnt faunal bone from the interior of Oval Structure 519, which was in use between 8423–8244 cal BC (SUERC-39760) and 8421–8233 cal BC (SUERC-39761) provides some evidence of how these Early Mesolithic peoples interacted with their environment; although the faunal evidence from the structure is scant and must be treated with caution. The presence of bird bones, together with three small fish bones and 13 fragments of unidentified small mammal bones (Table 2), suggests the inhabitants were exploiting maritime resources of fish and, most likely, waterfowl together with small animals.

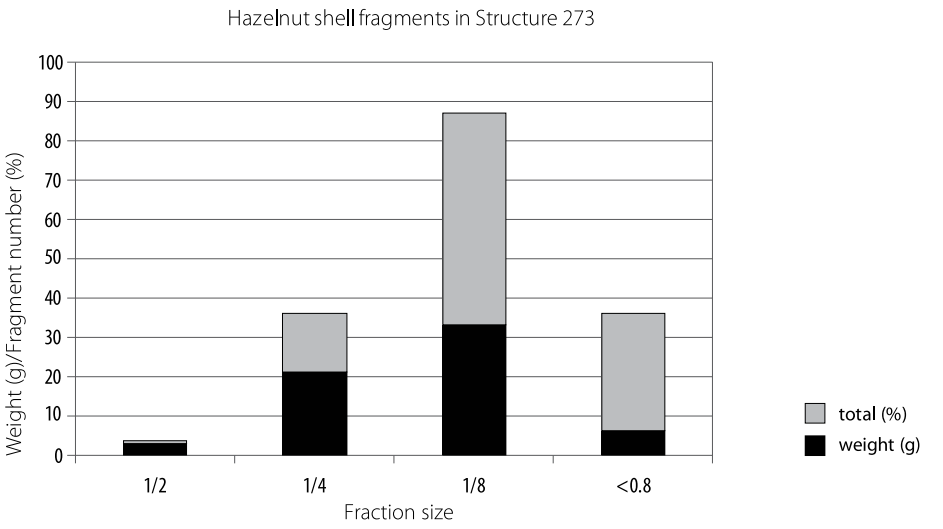
In addition to the faunal bone recovered from Oval Structure 519, further evidence of food consumption was recovered with the presence of 1,431 fragments of charred hazelnut shell (illus 16). The exploitation of hazelnuts during the Mesolithic is well-known from sites across the UK (eg Mithen et al 2001) and the abundance of hazel trees within the landscape, as seen from pollen evidence, would have made it a plentiful resource. Hazelnuts would have provided a good source of fats, protein, carbohydrates and vitamins, particularly vitamin E (McComb & Simpson 1999; Monk 2000; Holst 2010). The charring of the hazelnut shells is most likely to have occurred as a result of the nuts being roasted, probably in shallow pits (Holst 2010), in order to enhance the flavour, destroy impurities and make them easier to store without spoilage (Saklar et al 2003).

The exploitation of hazelnuts is also seen in the palaeoenvironmental evidence from Sunken-floored Structure 273, which was in use between 8452–8283 cal BC (SUERC-42918) and 8302–8238 cal BC (SUERC-39769). Within this structure a total of 3,202 hazelnut shell fragments were recovered (illus 17). Interestingly, the percentages of the nutshell fragments recovered present broad similarities with those from Oval Structure 519 (illus 16). In both structures, the bulk of the nutshell fragments are within the ⅛ size category, suggesting that once roasted, nutshells were smashed open using stones in order to get at the nut inside (Holst 2010; Bunce 2011).

Tentative evidence for the consumption of other wild plants was recovered in the form of several charred fruit stones. It was not possible



ILLUS 16 Echline Fields: Oval Structure 519, charred hazel nutshell fragments



ILLUS 17 Echline Fields: Sunken-floored Structure 273, charred hazelnut shell fragments

to identify these to species level, although it is likely these may relate to the exploitation of wild fruit resources.

Analysis of charcoal fragments from pit (469) within Sunken-floored Structure 273 indicates that hazel was the principle fuel-wood used in the structure. All the fragments had strongly curved annual rings indicating that they are representative of the burning of small branch wood (Marguerie & Hunot 2007). Evidence that some of the hazel wood had begun to rot and was damp prior to burning was shown by the presence of fungal hyphae and radial cracks on several of the charcoal fragments analysed (Schweingruber 1990; Marguerie & Hunot 2007). This suggests that fuel-wood may have been either collected off the ground (eg deadwood) or that it was exposed to the elements and had started to degrade prior to burning; possibly from being stored outside.

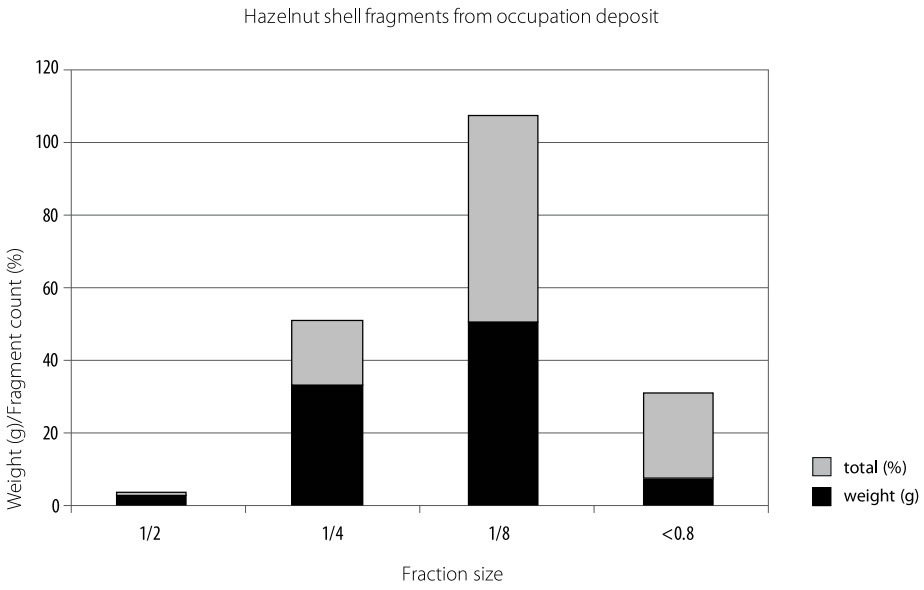
The contour maps showing the distribution of materials recovered from within Sunken-floored Structure 273 provided an idea of the use of different areas of the structure (illus 12–14). The maps show that the main concentration of burnt faunal bone (illus 13) was in the central area of the structure; the majority of which was too fragmented to identify. The concentration of burnt bone (illus 13) within the centre of the structure appears to be matched by the concentration of lithics (illus 14), suggesting this was the main activity area for eating and working lithics. Charcoal fragments (illus 12) were also present in higher numbers in the centre of the structure but outside the area of burnt bone and lithic concentrations, suggesting that these may have been areas where hearths were in use. Interestingly, these areas of charcoal concentrations are within large pits within the structure and may reflect different pits being used as hearths – or for deposition of hearth sweepings during the life of the building.

The highest concentration of charcoal was found within hearth (513) (illus 4) in the central area of the structure and may represent the final area of burning prior to the first abandonment phase of the structure. The distribution map indicates charcoal may have been swept from this location toward the edge of the structure (illus 12). Interestingly, the charcoal, burnt bone and lithics appear to respect an area in the south-eastern central part of the structure where

charcoal abundance values fall to zero and burnt bone abundance and lithic concentrations also decline. Significant quantities of hazelnut shell fragments are also absent from the area, suggesting that food waste was prevented from building up here. This may indicate the area was used for a specific, undetermined purpose. The wide distribution of nutshell across the structure may reflect the smashing of the shells in order to eat the nuts, allowing small nutshell fragments (illus 12) to lodge in negative features, such as pits and post-holes, while abundant quantities of nutshell around central hearth (513) may represent the discard of nutshell waste into the hearth to supplement the wood fuel. Following the period of occupation linked to Oval Structure 519 and the associated Ring groove Structure 283, and Sunken-floored Structure 273, there is a *c* 1,000 year period of abandonment before the formation of a further occupation deposit (302/379) overlying Sunken-floored Structure 273 (illus 4). This hiatus in activity may be explained by the changes taking place in RSL within the Forth Valley at this time (illus 15). Radiocarbon dates from this deposit from hazelnut shell and faunal bone (probable red deer) indicate activity from 7352–7085 cal BC (SUERC-42920) to 7174–7047 cal BC (SUERC-42917). An errant date was also returned from hazelnut shell within this deposit of 8432–8276 cal BC (SUERC-42919), this is likely to originate from the base of the deposit and material from the primary occupation phase of the structure (Shillito 2012); the date falling within those returned from the structure's cut features.

Deposit (302/379) appears to represent a general spread of material across this area, suggesting people were using this location for eating and tool working. The spread may have extended beyond the confines of the structure and been subsequently truncated, and thus we may only be looking at a partial picture of the complete spread here. The dates indicate this secondary use of the site took place during the early stages of a period of RSL rise, termed 'The Main Postglacial Transgression', which occurred between *c* 8200 to 6900 BP, when RSL height would have re-attained a similar level to that when the site was first occupied (Robinson 1993; Smith et al 2010; illus 15). The rate of RSL rise during this period has been estimated by Smith et al (2002) to have been rapid and may have been rising by as much as *c* 3.94mm per calendar year in the Forth Valley. This rising sea level would have been noticeable by the communities living in this area and may explain the lack of any permanent structure, with people instead choosing to occupy temporary camps. This is by no means certain and the use of temporary camps may more reflect a mobile hunter-gatherer society. The presence of later occupation material within the hollow formed by the abandoned sunken-floored structure suggests it may have been visible to some extent and have encouraged people to reuse this location. In the *c* 1,000 year hiatus in occupation, the vegetational environment would have changed little, which is illustrated in pollen diagrams from Fife (Whittington et al 1991a; 1991b).

The continued exploitation of hazel trees as a food source, during this second period of occupation, is indicated by the recovery of 4,088 charred hazelnut shell fragments from deposit (302/379) (see illus 18). The weights and fragments sizes recovered show a similar pattern to those from the previous phase of activity, dominated by small fragments, which again suggests people were smashing open the shells to get to the nuts inside (Holst 2010; Bunce 2011). The charcoal recovered from the occupation layer was extremely fragmented, leading to the majority of fragments being of a size too small for analysis (<0.5cm). A small quantity of charcoal fragments (19) that were analysed from the deposit were all identified as hazel. Most fragments showed strong ring curvatures, indicating they represent small branch wood and that hazel was also being exploited as a fuel source. A single fragment showing moderate ring curvature indicated



ILLUS 18 Echline Fields: occupation deposit (302/379), charred hazelnut shell fragments

it represented medium-sized wood, such as larger branch wood (Marguerie & Hunot 2007). Fungal hyphae were again recorded on a few of the charcoal fragments from this deposit.

Thin-section samples taken through the secondary occupation deposit (302) and overlying deposit (272) (illus 4) show the presence of cracked and degraded charcoal, together with highly weathered bone. The orientation and distribution of the charcoal and bone fragments within deposit (302) suggests the material was largely in situ. The degraded nature of these materials, particularly the bone fragments, suggests they lay exposed on the surface for an extended period prior to burial. The thin-section analysis indicates accumulation of material took place during periods of both rapid and slow build-up, where single confined episodes of activity have become blurred and mixed by post-depositional processes to give the impression of a single build-up of material. There does appear to be multiple episodes of deposition, evidenced through the clustering and a degree of orientation of some charcoal components. The embedded nature of the base of deposit (302) makes it more typical of an activity surface and suggests this was essentially the 'floor' for this phase of occupation. In the overlying unit (272), sparse fragments of burnt shell and bone were also identified, giving the only putative evidence for the exploitation of marine shell resources from the entire site. No dates are available for this layer so it is unknown where it ties into the chronology of the site; however, the thin-section samples found the deposit to be highly disturbed therefore dating this may have proved unreliable.

Burnt faunal bone was recovered from the occupation deposits and provided a degree of identification of the species that were observed in the thin-section samples, where both burnt and unburnt bone was recorded. The assemblage recovered from occupation deposit (302/379) comprised a range of taxa, with fragments from wild boar, possible roe and red deer, as well as fragments recorded as large and medium mammals. The bones identified from larger mammals appeared to be of too small a

size (taking into consideration shrinkage caused by the burning process) to be auroch. However, bones identified with more certainty as bovid, and recovered from the An Corran site on Skye, were also of small size and, in the absence of comparative data on aurochsen from coastal Scotland, the possibility that both the An Corran and Echline bones had derived from small wild cattle is not unreasonable (Bartosiewicz 2012: 59).

Canid bones were also identified from the occupation deposit and included three small toe bones and phalanx. Although early domestic dog cannot be entirely ruled out, there remains a strong possibility that these bones came from a wolf or indeed, wolves. However, since only the toe bones of a canid were recovered, it may be speculated that they were associated with a pelt, to which the feet and associated bones are often left attached in order to facilitate handling. An alternative explanation may be that the canid remains came from a companion animal, presumably a dog, which died at the site. Thus there is no way of knowing whether the canid bones were isolated finds associated with a pelt, or whether the entire animal had also been brought to the site – presumably as a carcass. In addition, it is clear that long bones and foot bones of other species, such as wild boar and possibly red and roe deer (*Cervus elaphus* and *Capreolus capreolus*), were present.

CASTLANDHILL

Located on the opposite side of the Forth Valley to Echline Fields, at the site of Castlandhill further Mesolithic activity was also recorded. Radiocarbon dates indicate that at least four phases of activity took place at Castlandhill. The earliest activity is associated with Oval Structure 1280 (illus 7 and 8), where material (nutshell and charcoal) from external pits (1048) and (1076) show activity in the Later Mesolithic period between 6825–6603 cal BC (SUERC-39750) and 5294–5084 cal BC (SUERC-39751) respectively.

The peak of the Main Postglacial Transgression was reached in the Forth Valley around 6900 BP, reaching a maximum height of between 8–10m OD (Smith et al 2006: 954, Smith et al 2010: 2399). Thus, when the first occupation at Castlandhill took place, RSL was still rising, with graphs for the Forth Valley indicating that at this stage RSL rise occurred quite rapidly (illus 15). The site is situated at 20m OD on the terrace of a steep slope and would have been approximately 8m above the shoreline at *c* 7800 BP, when Oval Structure 1280 may have been constructed. Interestingly, the gap in the radiocarbon dates between *c* 7800 to 6200 BP is when RSL would have reached its maximum height in the Forth Valley. Together with the rapidity of the rise in RSL, this might have been a reason why people chose to leave the area and then return again when RSL began to fall, after *c* 6900 BP. Furthermore, it is during this period of abandonment that the Storegga tsunami impacted upon this part of Scotland, immediately prior to the end of the Main Postglacial Transgression at around 7100 BP (Dawson et al 1988; Robinson 1993; Smith et al 2010).

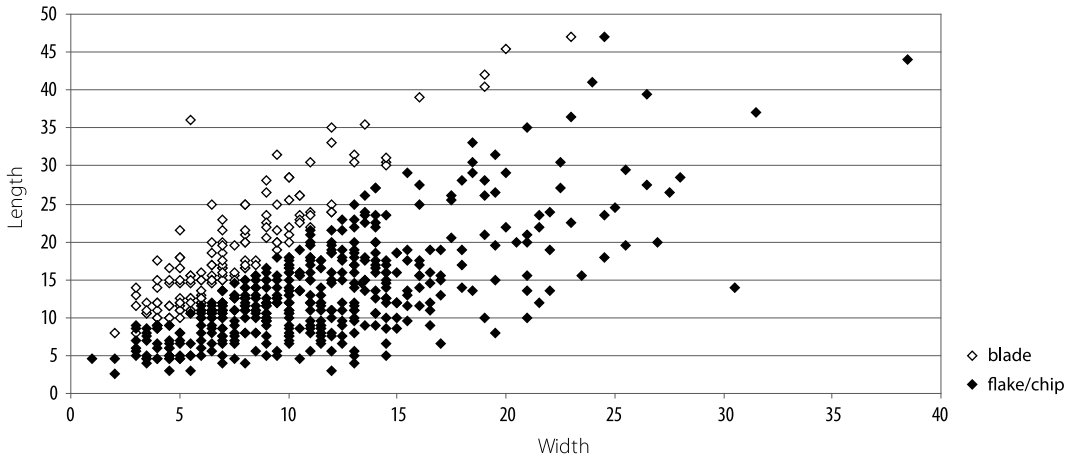
Pollen diagrams from the Lower Forth Valley (Smith et al 2010) and Fife (Whittington et al 1991a; 1991b) show that during these periods of the Later Mesolithic, the vegetational environment was altering. The hazel scrub woodlands of the earlier Mesolithic would have been changing into mixed deciduous woodland with the arrival and expansion of oak (*Quercus* sp) trees from around 7800–7600 BP (Birks 1989; Whittington et al 1991a; 1991b) and other tree types including elm and alder (*Alnus glutinosa*), which arrived in this area of Scotland sometime between 7500 BP (Smith et al 2010) and 6500 BP (Whittington et al 1991b). Other tree types noted in the pollen records but at lesser values include pine, ash (*Fraxinus excelsior*), birch and willow. However, despite the arrival of new tree species and the expansion of others, pollen data shows that hazel was still prominent in the landscape

(Whittington et al 1991a; 1991b; Smith et al 2010).

The continued prominence of hazel is shown in the macrofossil remains from Oval Structure 1280 and associated pit features, where 21 fragments of charred hazelnut shell were recovered and represent the only non-charcoal charred plant remains recovered from this period. The greatest number of nutshell fragments is in the smaller size category (⅛ of a nutshell), which suggests similar methods of breaking the shells (eg using stones) continued into this period (Holst 2010; Bunce 2011). Although only nutshell fragments were recovered from the site, it is likely other wild foodstuffs were collected that have not preserved in the fossil record (not being charred), such as acorns, fruits (eg bramble and apple), together with tubers (eg pignuts) (Mason et al 1994; Zvelebil 1994; Simmons 1996; Mason 2000).

Charcoal fragments analysed from pit (1076) dated to 5294–5048 cal BC (SUERC-39751) and show the increasing diversity of arboreal taxa during this period, with the appearance and dominance of oak within the assemblage, together with the presence of apple-type (*Maloideae* sp); the latter includes crab apple (*Malus sylvestris*), pear (*Pyrus communis*) and hawthorn (*Crataegus* sp), which cannot be distinguished based on their wood anatomy (Schweingruber 1990). Ring curvature indicated that oak was mainly from medium-sized wood while apple-type and a small number of oak were from small-sized wood, suggesting the fuel-wood being used consisted mainly of small to medium branch wood. Three fragments had evidence of radial cracks indicating some wood was damp when burnt (Marguerie & Hunot 2007).

Following the use of Oval Structure 1280 and the surrounding pits, the next phase of activity took place around the central pits and post-setting features at 4896–4710 cal BC (SUERC-39748) and around the western hearth features and Structure 1179 between 4652–4452 cal BC (SUERC-39752) and 4584–4372 cal BC (SUERC-39753) respectively. During this phase of site use, RSL would have still been falling after the culmination of the Main Postglacial Transgression, with RSL graphs indicating it would have fallen by a couple of metres since the previous phase of activity (illus 15) (Smith et al 2010: 2399). Pollen diagrams for this period from Fife and the Lower Forth Valley indicate a landscape similar to the previous period (Whittington et al 1991a; 1991b; Smith et al 2010).



ILLUS 19 Echline Fields: dimension of unbroken blades, flakes and chips

TABLE 3
Echline Fields: lithic assemblage summary

Group	*Sunken-floored Structure 273: Upper Deposit*	*Sunken-floored Structure 273: Lower Deposit*	*Sunken-floored Structure 273: Cut features*	*Oval Structure 519 and Ring Groove 283*	*Northern pit group*	*Isolated pits*	*Ditches*	*Five-post structure*	*Structure 410*	*Area D*	*Total*
Type:	–	–	–	–	–	–	–	–	–	–	–
Debitage total	(172)	(513)	(289)	(133)	(78)	(12)	(11)	(2)	(2)	(3)	(1215)
Blades	24	54	28	22	17	1	–	–	1	–	147
Flakes	66	181	94	60	43	6	9	1	1	2	463
Chip	80	272	164	49	17	4	–	–	–	1	587
Indeterminate/chunk	2	6	3	2	1	1	2	–	–	–	17
Cores total	(9)	(9)	(2)	(2)	(1)	–	–	(1)	–	–	(24)
Split pebble	1	–	–	–	–	–	–	–	–	–	1
Bipolar	1	1	–	–	–	–	–	1	–	–	3
Single platform	1	3	–	–	1	–	–	–	–	–	5
Dual platform		1	–	1	–	–	–	–	–	–	2
Multi-platform	6	4	2	–	–	–	–	–	–	–	12
Fragment	–	–	–	1	–	–	–	–	–	–	1
Microburins	–	2	–	–	–	–	–	–	–	–	2
Retouched pieces total	(15)	(47)	(22)	(16)	(7)	(1)	(1)	–	–	(1)	(110)

Group	*Sunken-floored Structure 273: Upper Deposit*	*Sunken-floored Structure 273: Lower Deposit*	*Sunken-floored Structure 273: Cut features*	*Oval Structure 519 and Ring Groove 283*	*Northern pit group*	*Isolated pits*	*Ditches*	*Five-post structure*	*Structure 410*	*Area D*	*Total*
Microliths	–	–	–	–	–	–	–	–	–	–	–
Crescent	–	6	–	2	–	–	–	–	–	–	7
Scalene triangle	–	1	1	–	–	–	–	–	–	–	2
Atypical		1	–	1	–	–	–	–	–	–	2
Fragmentary	6	25	7	2	2	–	–	–	–	–	42
Edge blunted flakes and fragments	1	1	4	4	–	–	–	–	–	–	10
Obliquely truncated flakes	1	1	1		1	–	–	–	–	–	4
Notched	–	1	–		1	–	1	–	–	–	3
Piercer	–	–	1			–	–	–	–	–	1
Scrapers	2	10	3	6	1	–	–	–	–	–	22
Oblique arrowhead	–	–	–	–	–	–	–	——	–	1	1
Semi-invasive retouch	–	–	1	–	–	–	–	–	–	–	1
Miscellaneous edge retouch	5	2	4	1	2	1	–	–	–	–	15
Total	196	572	133	156	87	13	11	2	2	4	1350

Charcoal analysis of fragments from features associated with the western hearth features and Structure 1179 show the use of Scots pine (*Pinus sylvestris*), hazel, oak and birch for fuel wood. Ring curvature indicated that the majority of wood fuel was from medium-sized wood, while small-sized wood was also present; suggesting the main fuel resource used was small to medium branch wood (Marguerie & Hunot 2007). Radial cracks and fungal hyphae were observed in a small number of charcoal fragments. The dominance of pine charcoal in the assemblage from these features may suggest selection bias or that it was probably more prominent in the landscape than indicated by pollen diagrams for this area, where it has only a limited representation (Whittington et al 1991a; 1991b; Smith et al 2010). The ability of pine to burn easily and attain high temperatures quickly is also observed in the charcoal record with some fragments being partially vitrified; a characteristic associated with exposure to extremely high temperature (Prior & Alvin 1983). There is some indication of the mosaic nature of woodland during this period, with narrow-rings recorded in some hazel fragments suggesting they were growing under a closed canopy (possibly within an oak-hazel woodland), while some birch fragments had wide rings recorded showing they were growing in more open conditions.

LITHICS

ASSEMBLAGE SUMMARY

The Echline Fields assemblage numbers 1,349 pieces and the Castlandhill assemblage numbers 1,663 pieces. A summary is provided (Table 3 and Table 4) and a full catalogue of all pieces is available in the archive.

Both assemblages can be characterised as narrow blade industries typically of later Mesolithic date. Echline Fields is the earlier of the two sites, dating to around 8400/8300 BC, and is a rare example of a Mesolithic 'house' site. The Castlandhill assemblage is later, spanning a period from 6800 BC to around 4400 BC. The only lithics which can be dated to other periods were four later Neolithic pieces from Area D of Echline Fields.

METHODOLOGY

The assemblage was retrieved mainly by sample processing. During excavation no systematic retrieval of chipped stone by grid or survey was implemented as the evaluation had not identified any Mesolithic presence. Structure 273 was separated into quadrants and some pieces can be associated with certain areas within the dwelling. The sampling strategy was by 50%–100% bulk samples of pit, post-hole and hearth fills and a minimum of 30 litres from spreads and deposits. All samples collected were processed by flotation tank and it was during this process that 90% of the assemblage was retrieved. No in-situ surface scatters were discovered and it is likely that Neolithic and Bronze Age activity, combined with modern ploughing, had disturbed any such remains.

All pieces were catalogued using visual and metric recording. Numbers have been allocated to every piece; those beginning with 4 and 5 are from Echline Fields whilst those beginning with 1 or 2 are from Castlandhill. All pieces exceeding 10mm were measured whilst pieces below 10mm were measured only when of particular interest (eg broken tools or small tool types such as microliths). Classification terminology is as follows; Debitage: pieces which have not undergone any secondary modification (retouch); Flakes: detached piece with one identifiable ventral surface; Blades: a flake with 2:1 height to width ratio; Chunk: a large indeterminate piece with no clear ventral surface; Chip: any flake or indeterminate piece < 10mm unless retouched; Core: artefact with

only dorsal surfaces, less than three removals is a split pebble; Tools: any piece with secondary modification (retouch).

RAW MATERIAL

Chert was the dominant raw material but smaller quantities of flint, quartz, chalcedony, agate and mudstone were also present. This was more pronounced at Castlandhill where approximately 37% of the assemblage was neither flint nor chert; in comparison, only 6% from Echline Fields was not flint or chert.

It was common for Mesolithic people to exploit the readily available, easily collected, local resources and the mixture of material types is not unusual (Saville 1994: 59). In some instances, identification of material as a microcrystalline silicate with conchoidal fracture was all that could be confirmed.

The chert was of southern uplands type and typically has a semi-matt, lacklustre surface with occasional banding, occurring in colour variations of black, grey, grey-green and grey-brown. Fissures running through the chert were common and these occasionally caused irregular flaking, but did not prevent reduction of well made and regular pieces. Chert is readily available nearby, not only from radiolarial or other primary deposits but from secondary, river and coastal deposits (Wickham-Jones & Collins 1977–8). The pieces of chert used at both Echline Fields and Castlandhill were fairly small and it was common for an entire face of a core to remain cortical. The levels of cortex present indicate that the chert was not decorticated elsewhere before being brought to site. As so many pieces were heavily modified, it is impossible to make any accurate estimate of original size, but no pieces measured over 50mm.

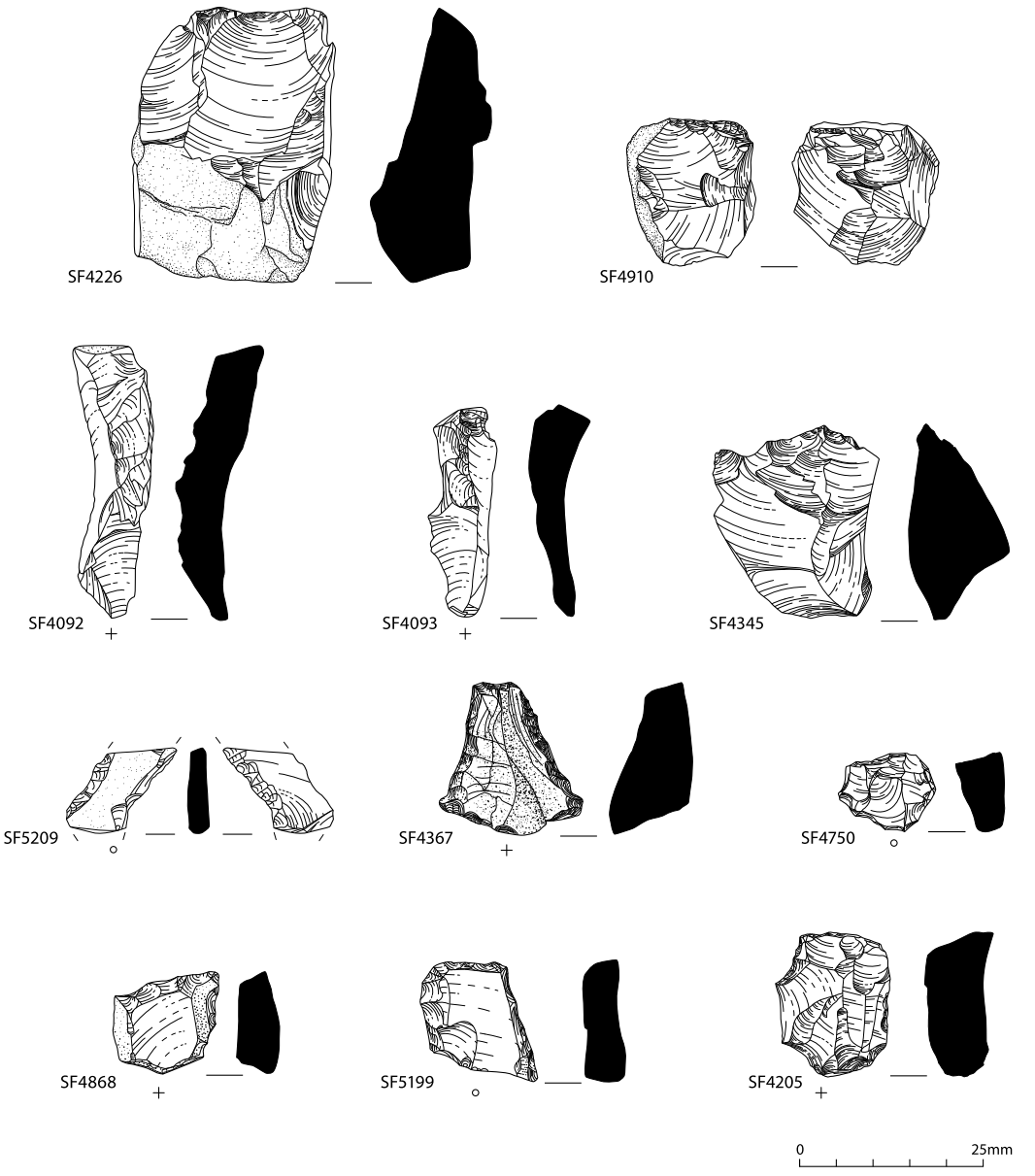
No detailed analysis was made on the patination and abrasion of the assemblage as it became clear during cataloguing that different material types had weathered differently. Much of the flint was patinated to some degree, whilst chert from the same contexts appeared completely fresh in colour. In addition to this, the flint and quartz were almost never abraded, but abrasion was a frequent feature of the chert and even more so to the mudstone. This phenomenon was also observed at Meldon Bridge, Peeblesshire and Glentaggart, Lanarkshire (Ballin 1999: 82; Ballin & Johnson 2005: 62) and seems to be an inherent characteristic of the materials rather than related to site formation processes. Broken and burnt pieces have been analysed by location, however caution should be applied over these figures; experimental work has shown that chert can behave unpredictably when heated and often no colour changes or surface condition are evident (Ballin & Johnson 2005: 63). In view of this and the high proportion of chert in the assemblage, burnt pieces may be more frequent than is apparent. Within the assemblage, broken pieces from Echline Fields account for 50% while broken pieces from Castlandhill account for 40%.

Flint, chalcedony, quartz and mudstone are also available for local collection (Saville 1994: 59; Wickham-Jones 1986) but have not been exploited as intensively as the chert. The flint, almost exclusively, took the form of small brown, abraded pebble flint, most likely collected from the coast of the Firth of Forth. The one exception to this is the dark, translucent brown flint of the Neolithic oblique arrowhead, this flint is certainly an import into the area.

ECHLINE FIELDS

Primary technology

The reduction techniques at Echline Fields are what would be expected for a narrow blade industry. Reduction was almost exclusively by platform, mostly hard hammer percussion, occasionally by soft hammer. Blades were being produced, but almost all the cores show evidence of blade and flake reduction on the same core.



Illus 20 Echline Fields: cores, scrapers and edge retouch. SF4226 (147) SF4910 (399) and SF4345 (252): cores; SF4092 (175) and SF4093 (175): core trimming flakes; SF5209 (489) edge retouch; SF4367 (255): semi-invasive retouch; SF4750 (302), SF4868 (399), SF5199 (470) and SF4205 (132): scrapers. SF4345: flint, all others chert

There were only three examples of bipolar (hammer on anvil) cores (SF4855, SF4345 and SF4283), two flint and one chert. Whilst there are three examples of bipolar cores, there are very few clear examples of bipolar flakes.

All other cores were chert and multiple platforms were the most common form (see illus 20). Of the 14 multiple platform cores, two were opposing dual platform cores, while the others had three or more platforms. In most cases, the multiple platform cores were sub-circular in shape and had been turned 90° or 180° along different planes before a new platform was used. In most instances, one platform had been more extensively reduced than the others, which is partially due to new removals obliterating the old. This indicates that the platform was thoroughly exploited before attempting to re-orientate the piece.

Two of the single platform cores (SF4226, illus 20, SF4344) consisted of fairly tabular pieces of chert with one cortical face upon which no attempt at reduction had been made (illus 20). This was also the case with two of the multiple platform cores (SF4993, SF5136). The other single platforms cores (SF4375, SF4525, and SF4910, illus 20) had typically been worked around most (60%–75%) of a sub-circular or oval platform and formed sub-spherical or conical cores.

Preparation flakes were certainly present and core curation appeared to be a regular activity. Two core-trimming blades (SF4092 and SF4093, illus 20) were identified in addition to three platform-trimming flakes. This, when combined with a high level of secondary pieces, supports the assumption that the material was collected locally and taken back to the site for reduction. Few primary pieces were identified, but in many cases it would seem that cores were left partly cortical.

Blades only formed 12% of the Echline Fields assemblage, with most blades below 10mm in width, and it is probable they were more susceptible to breakage due to the length and small width. In total, 50% of the assemblage was broken with many of the small pieces identified as blade fragments. This makes calculation of average dimensions more difficult and for this reason, most of the broken pieces have been removed from the tables below (microliths with a tiny break to the lateral or very tip have been included). Comparing the dimensions of flakes and blades, it is clear that both have very similar lengths. Both groups rarely extended beyond 30mm and were all less than 50mm. This may be partly due to the fairly standard sizes of raw material. Width of both flakes and blades also similarly clustered around 5–15mm. Few flakes could be described as short and squat and in many cases flakes were only marginally too short to be classified as blades.

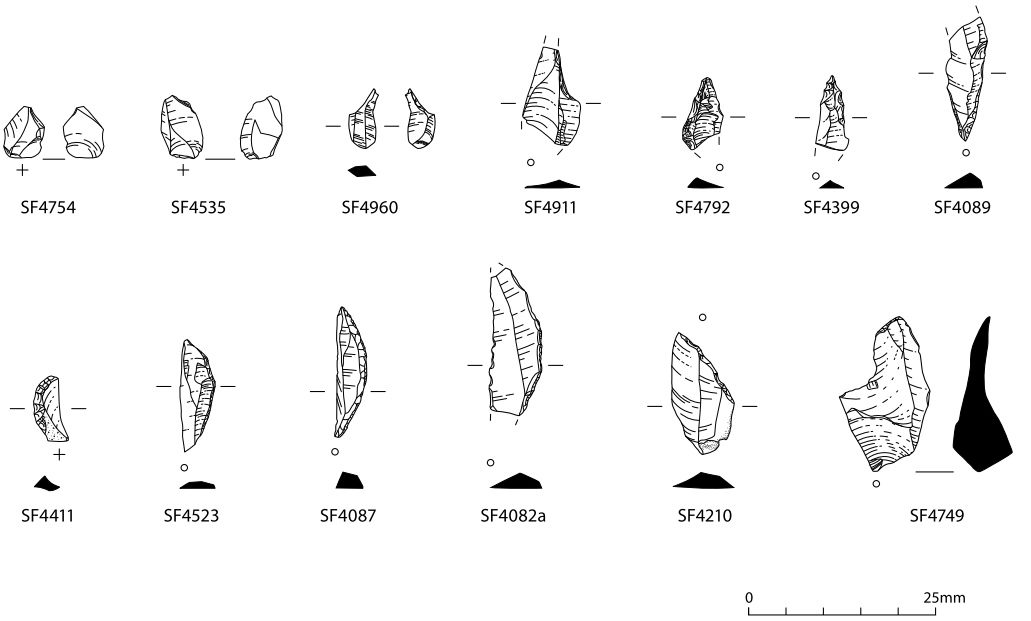
Secondary technology

Chert was the predominant material type, forming 109 of 111 tools. Other materials included a mudstone crescent (SF4082a, illus 21) and a mudstone edge-blunted flake (SF4082b). Microliths (illus 21) were the dominant tool type, numbering 52, and scrapers the second most common, numbering 22 (Table 3).

Due to the very high instances of fragmentary microliths, classification was not possible for most. Average size of microliths was 12mm long by 4.5mm wide. Crescents were the most common form and were only recovered from Oval Structure 519 and the lower occupation deposit of Sunken-floored Structure 273. Only two microburins (a by-product from microlith production) were identified (SF4754, SF4535, illus 21).

Scrapers were the second most common form of retouched piece, many of which were very similar small scrapers of sub-oval shape. These were thicker than the other artefact types, with average dimensions of 15mm × 13mm × 6mm and therefore rarely broken (SF4205, SF4750, SF4868, SF5199, illus 20).

There were six edge-blunted flakes and four edge-blunted fragments, measuring between L8mm–19mm; W10mm–12.5mm and Th2mm–4mm, with four edge-blunted fragments. In all



ILLUS 21 Echline Fields: Microliths and related artefacts. SF4754 (302) and SF4535 (302): microburins; SF4960 (386), SF4911 (379), SF4762 (302), SF4399 (272) and SF4089 (175): microliths fragments; SF4411 (302), SF4523 (302), SF4087 (175) and SF4082a (173): crescent microliths; SF4210 (142) and SF4749 (302): oblique truncation. SF4082a: mudstone, all others chert

cases the edge-blunting was to one lateral edge only. There were four examples of obliquely truncated pieces, including SF4210 (illus 21). There were also three notched pieces and a single piercer. This piercer had abrupt, concave retouch to either side of a small distal point; it also had alternate abrupt, concave retouch to the lateral edges and is unlike the other pieces in the collection. Other miscellaneous edge retouch numbered 15 with one example of semi-invasive retouch to a thick piece, which is a possible scraper (SF4367, illus 20).

The ripple-flaked flint oblique arrowhead is unique in the assemblage, in terms of date, form and its pressure-flaked production. This piece is later Neolithic in date in contrast to the rest of the assemblage.

Distribution

Most of the features at Echline Fields contained at least a small quantity of lithics. With the exception of four pieces from Area D, the assemblage can be dated to the Mesolithic, both by typology and by associated radiocarbon dates. The highest concentrations were found at Sunken-floored Structure 273, Oval Structure 519 and Ring groove Structure 283 and radiocarbon dates from all of these suggest they are broadly contemporary.

Sunken-floored Structure 273

By far the highest concentration of pieces was associated with Sunken-floored Structure 273, accounting for 67% of the entire Echline Fields assemblage. The construction and first phase of house use can be dated to between 8452 and 8238 cal BC (SUERC-39764, SUERC-39769, SUERC-42918, SUERC-42919), which is broadly contemporary with the date of use for Oval Structure 519 and its associated Ring groove Structure 283. A second phase of occupation has been dated to between 7352 and

7047 cal BC (SUERC-40216, SUERC-42917, SUERC-42920).

The earliest dates were retrieved from the pits and post-holes making up the structural elements of the dwelling, though these contained the lowest concentrations of lithics; 133 pieces in total. No clear patterns of distribution could be discerned from the cut features, but four stood out with higher concentrations of finds: (399); (437); (441); and particularly (493). All of the 126 pieces found in (493) were burnt. This may indicate the lithics represent a small, discrete dump from a single activity.

The layers above the features seemed to form two main deposits, a lower deposit (252), (302/379) with a high concentration of lithic artefacts (571 pieces) and upper deposits (272), (304), (377), (378), (380), (385), (386), (387) and (423) with a lower concentration of lithic artefacts (196 pieces). The lower deposit seemed to be a mixture of primary occupation and secondary use; dates from the two phases of occupation were retrieved from here (SUERC-40216, SUERC-42917, SUERC-42919, SUERC-42920) and the micromorphology carried out supports the possibility this layer was an in-situ floor deposit with gradual transitional change to the upper deposit, as indicated by Shillito (2012). This layer contained a very high ratio of chips and may be a location where lithics were being knapped or debitage was being dumped, however, as most of the chips were fragmentary pieces it is also possible they were broken in situ by trampling or post-depositional processes. This layer is also where most of the microliths from site were retrieved and also where five of the seven crescent microliths were found, the other location was Oval Structure 519 to the north.

The upper deposit showed a possible pattern of distribution as most pieces were found in the west (illus 14), but as this deposit was formed after the structure was out of use it bears no relation to activities within the building interior.

Oval Structure 519 and Ring groove Structure 283

The radiocarbon dates from these structures indicate activity between 8423–8251 cal BC (SUERC-39760, SUERC-39761, SUERC-40088), a date range broadly contemporary with pit (142), (illus 5) and Sunken-floored Structure 273.

The only contexts from Ring groove Structure 283 which contained substantial numbers of lithics were ditch (266), containing 15 pieces, and ditch (268) which contained 41. Unsurprisingly, ditch (274/276), disturbed by animal activity, contained a single blade, despite being larger than the other ditches combined; this can be attributed to the disturbed nature of the feature. Ditch (266) held a scraper and two edge-retouched pieces whilst ditch (268) contained two cores, two scrapers and two microlith fragments.

Oval Structure 519 had nine features which yielded lithic artefacts (167), (171), (173), (175), (187), (193), (220), (228) and (232). Pit (176) contained eight of the retouched pieces, including three edge-blunted pieces, two crescents, two atypical microliths, a microlith fragment and a scraper. Only the lithics from pit (176) had a higher proportion of burnt pieces (46%), which can probably be explained by its posited function as a hearth.

Northern pit arc

To the north, and adjacent to Structure 519 and Ring groove Structure 283, was a series of large pits, several of which form an arc (illus 5). Mesolithic chipped stone was retrieved from eight of these pits (132), (142), (146), (147), (155), (161), (163) and (241) one of which, pit (142), was radiocarbon dated to 8454–8276 cal BC (SUERC-39759).

Three pits contained the vast majority of lithics from this area; (163) containing 32 (147) containing 27 and (132) containing 14. These features share the closest proximity to Oval Structure 519 and the quantities of lithics from

the pits decreases dramatically the farther they are located from the oval structure; eg from south to north: (142) 8, (146) 2, (155) 1, (161) 1 and (241) 2. These low levels, combined with later prehistoric pits in the vicinity, may suggest that the Mesolithic chipped stone derives from surface scatters that became displaced and incorporated into these features at a later date.

Most of the lithics from this area take the form of broken debitage with chert the most common material type; however, a concentration of 22 pieces of quartz debitage was found in pit (163). Apart from a scraper from pit (132) all retouched pieces and a core from this area were from pit (147).

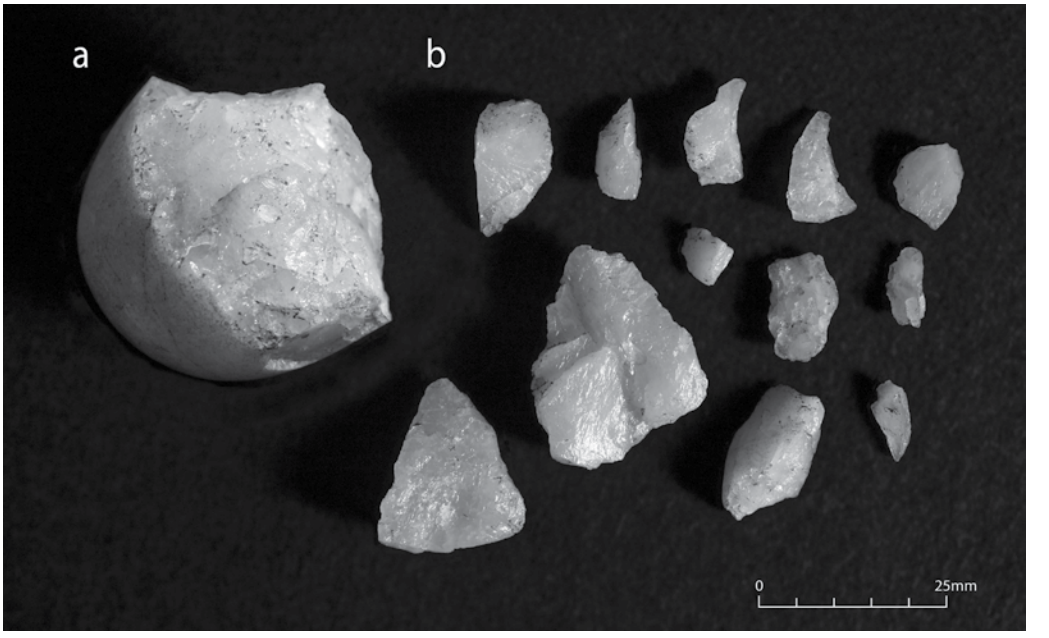
Area D

Pit (002) in Area D (illus 1) was located 320m south from the other later Neolithic features. This single fill pit contained four pieces of flint and sherds from 11 Grooved Ware vessels. All the lithics were of a fine-grained flint, brown, grey or grey mottled in colour and very fresh in condition. Two of the pieces were diagnostic of a later Neolithic date. The first of these is a ripple-flaked, oblique arrowhead (SF4017, illus 24) which, despite the missing tip, is an attractive and well-made tool. The second is the distal end of a large trapezoidal-sectioned blade. The remaining flake and chips were fairly undiagnostic, but their material type and secure context indicates they are almost certainly contemporary with the others. The discovery of oblique arrowheads alongside Grooved Ware is a well-documented association (Green 1980) and these can be dated typologically to between 3400 and 2500 BC.

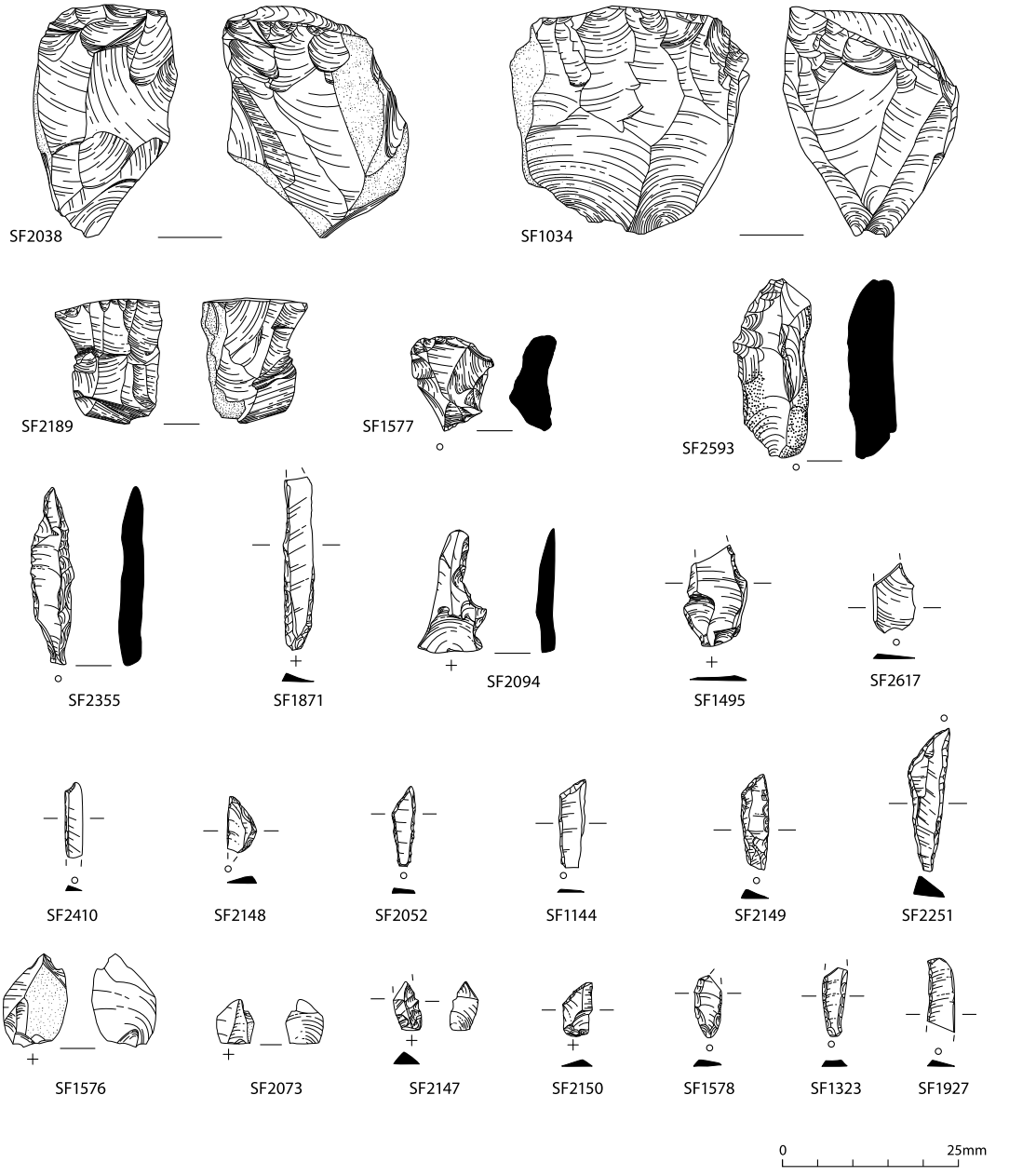
CASTLANDHILL

Primary technology

The reduction techniques at Castlandhill are also typical of a later Mesolithic, narrow



ILLUS 22 Castlandhill: photo of quartz core from SF1010, C1103 and quartz debitage SF1041a-l, C1130



Illus 23 Castlandhill: selection of lithic artefacts. SF2038 (1025), SF1034 (1104), SF2189 (1088): cores; SF1577 (1104) and SF2593 (1134): scrapers; SF2355 (1088) and SF1871 (1104): edge blunted; SF2094 (2094): notched; SF1495 (1104) and 2617 (1242): microlith fragments; SF2410 (1094), SF2148 (1088), SF2052 (1025), SF1144 (1170), SF2149 (1088) and SF2251 (1092): scalene triangles; SF1576 (1104) and SF2073 (1104): microburins; SF2147 (1025), SF2150 (1088), SF1578 (1104), SF1323 (1027) and SF1927 (1048): microlith fragments. SF2189 and SF1927: chalcedony; SF1577, SF2593, SF2052, SF2149, SF2251 and SF1323: flint; SF2355, SF1871 and SF2094: mudstone; SF2038, SF1034, SF1495, SF2617, SF2410, SF2148, SF1144, SF1576, SF2073, SF2147, SF2150 and SF1578: chert

TABLE 4
Castlandhill: lithic assemblage summary

Group	*Structure 1280 and surrounding pits*	*North-eastern pit group*	*Eastern pits*	*Central pit and post setting*	*Western hearth features and Structure 1179*	*Western pits*	*Outlying pits spread 153, unstratified*	*Total*
Type:								
Debitage total	(825)	(52)	(24)	(588)	(12)	(10)	(33)	(1544)
Blades	63	4	2	65	2	3	9	148
Flakes	255	24	10	159	8	1	12	469
Chip	493	22	9	359	2	6	9	900
Indeterminate/chunk	14	2	3	5	–	–	3	27
Cores total	(12)	(2)	–	(9)	(1)	–	–	(24)
Split pebble		1	–		–		–	1
Bipolar	1	–	–	–	–	–	–	1
Single platform	3	1	–	4	1	–	–	9
Dual platform	3	–	–	–	–	–	–	3
Multi-platform	4	–	–	5	–	–	–	9
Irregular	1	–	–	–	–	–	–	1
Microburns	5	–	–	–	–	–	–	5
Retouched pieces total	(52)	(6)	(2)	(24)	(3)	(3)	(5)	(95)

Group	*Structure 1280 and surrounding pits*	*North-eastern pit group*	*Eastern pits*	*Central pit and post setting*	*Western hearth features and Structure 1179*	*Western pits*	*Outlying pits spread 153, unstratified*	*Total*
Microliths		–	–	–	–	–	–	–
Scalene triangle	19	–	–	9	1	–	–	29
Crescent	1	–	–	1	–	–	–	2
Atypical	3	–	–	1	–	–	–	4
Fragment	15	1	–	9	2	1	2	30
Edge blunted blades	2	1	–	2	–	–	–	5
Obliquely truncated flake	1							1
Notched	1	–	–	1	–	–	–	2
Scraper	3	2	2	1	–	1	1	10
Piercer	1							1
Possible burin	1							1
Edge retouched	5	1	–	–	–	1	2	9
Semi-invasive retouch	–	1	–	–	–		–	1
Total	889	60	26	621	16	13	38	1663

blade industry. A notable difference between Castlandhill and Echline Fields lies in the higher occurrence of quartz technology (illus 22). Three of the cores were of milky quartz, all single platform cores. Each was found within a different feature group, all belonging to different phases. It is presumed that chert, with its more predictable fracture, would have been the more attractive material of the two, which suggests there was a convenient quartz source in the vicinity or that, at times, chert was not as easily collected. Reasons why chert may have been not as easily collected are likely to include numerous factors and there is no evidence from the site upon which to base speculation.

Multi-platform reduction was the most common (Table 4 and illus 23) by a small margin of nine single-platform cores to 12 multiple-platform cores, the remaining cores were irregular or bipolar. The single-platform cores were extensively worked around most of a small unprepared platform. In three of the examples, frequent hinge terminations had resulted in a bulbous end opposing the platform. It may have been at this point that these small cores were discarded as exhausted and unworkable. The multiple-platform cores (illus 23) were larger and presumably this made reorientation and further reduction possible. Of the cores with multiple platforms, three are opposing platform cores which, in each instance, show extensive reduction of 80%–100% of one platform, with only a few removals from the opposing end.

As in the Echline Fields assemblage, many of the pieces retained some area of cortex, although primary pieces were rare. Existing cortical surface on the cores varied between 10% and 90% with most being around 50%. This is not a percentage of the total original cortical surface, only a calculation of the coverage after reduction. Again, as at Echline Fields, there is an example of a core with an entirely cortical face and tabular shape.

Core curation on site was supported by one lateral core-trimming flake and three apparent platform-trimming flakes. All those identified were from the Oval Structure 280 and surrounding pits. There is no evidence that core curation was occurring in features associated with post-5000 BC radiocarbon dates, though the lower concentrations of material in these features suggests this may be unrepresentative.

Secondary technology

Chert was the most common material for tools, with 63 examples. Other materials included; an agate scraper, three chalcedony microlith fragments, a mudstone edge-retouched piece, a mudstone notched piece, mudstone microlith fragment, a quartz scraper, a quartz microlith fragment, a quartz oblique truncation, quartz scalene triangle and 18 flint tools of various types. Microliths (illus 23) significantly outnumbered any other tool type, with scalene triangles the most frequent form. Average microlith dimensions were 9.6mm by 3.5mm.

Scalene triangles and fragmentary microliths numbered a similar amount (Table 4) and were the most common microliths. Scalene triangles were found in three groups of features; Western hearth features and Structure 1179; Central pits and post setting; and Oval Structure 1280 and surrounding pits. They can be very variable in size with 20mm by 5.5mm by 1.5mm (SF2251, illus 23) representing the largest and 6mm by 3mm by 1.5m SF1493 representing the smallest. The retouch is most typically applied on one entire lateral edge and an obliquely angled end – although retouch to both laterals occurs on several. Microburins (a by-product of microlith production) numbered five, all from the same context, (1302).

The notched pieces were not numerous but included one interesting example, SF2094 (illus 23). This piece had a deep, wide, abruptly retouched notch to most of its right lateral edge and was compete, with an intact platform. It is possible this represents an unfinished piece before the proximal end was broken off, which would have left what is known as a microburin,

a by-product of microlith production. Two examples classed as microlith fragments included SF1495 and SF2617, which appear to have broken through a notch to the right lateral, both are proximal fragments with platform intact. This form of retouch and similar breakage pattern was noticed on other pieces in the assemblage (SF1495, SF2617) and it is unclear if these represent similar notched pieces that have broken at the medial or another form of microlith.

Unlike Echline Fields, the edge-blunted pieces were all blades, numbering five. Scrapers were also much lower in number than was noted at Echline Fields; the Castlandhill scrapers had an average dimension of 18mm by 16mm by 6mm.

Distribution

The areas and features at Castlandhill are discussed below, in chronological order. The vast majority of material came from the Oval Structure 1280 and Surrounding Pits; and central pits and post setting**.** The groupings below are very general and mostly based on proximity. Castlandhill is a complicated palimpsest of activity and it has not been possible to identifying phases and dates for all the features.

Oval Structure 1280 and surrounding pits

A pit (1048) included in this grouping returned the earliest radiocarbon date from this site, 6825–6603 cal BC (SUERC-39750), providing a date for one of the dual-platform cores and several scalene triangles. The most interesting concentration from this group derives from intercutting features (1104), (1111), (1122), (1131), (1145) and (1147). These features alone contained 579 pieces and the highest concentration of tools (30). Unfortunately, these intercutting pits cannot be positively associated with radiocarbon dated pit (1048) and their dating remains uncertain, however their contents bear some similarities to the group of features directly to their west (1088), (1090), (1092), (1094) and (1134).

In comparison, the post-holes of Structure 1280 contained only 15 pieces, no cores or no tools.

North-eastern pit group; Eastern pits

The North-eastern pit group consisted of three groups of intercutting pits with four other pits positioned within the vicinity (illus 7 and illus 8). Farther to the east were intercutting pits (1210) and (1213) (see illus 7) which could not be positively associated with the North-eastern pit group. In total, lithics were retrieved from eight contexts (1067), (1076), (1132), (1215), (1220), (1223), (1235) and (1253). Both the Eastern pits and the North-eastern pit group contained a mixture of material types but both also contained rarer examples. The Eastern pits contained black and white marbled silica which is rarer on the site. The North-eastern pit group contained quantities of an orange-red chalcedony, unique to pit (1215), of which there was a microlith fragment, SF1204. Other tools included a backed blade (1076), a scraper (1223), a semi-invasively retouched piece (1235) and a scraper and edge retouched piece (1220). Pit (1220) also held a single platform core, the only core found in the east of the site.

The three groups of intercutting pits provide a sequence for some of the lithic deposition. Of these groups one pit (1076) is associated with a radiocarbon date of a date of 5294–5048 cal BC (SUERC-39751) (illus 8). This provides dating for the backed blade SF1166 and as pit (1076) cuts pit (1235) the invasively retouched piece, SF1055, contained within, must either be contemporary with or pre-date the backed blade.

Central pits and post setting

From this grouping of features a radiocarbon date was retrieved from pit (1078), dating to 4896–4710 cal BC (SUERC-39748), which contained 32 pieces, including two microlith fragments, two multi-platform cores and notched piece SF2094.

This grouping of features contained the second highest quantity of pieces from the entire

site but most came from features from the same area (1088), (1090), (1092), (1094) and (1134). Pits (1134) and (1094) are stratigraphically earliest, next in the sequence are post-holes (1090) and (1092) which cut the pits, and finally medieval pit (1088) cuts all but (1092). It is impossible to know if the lithics contained within the later features were disturbed from within pits (1094) and (1134). These features yielded 447 lithic artefacts in total; 94 (1088), 25 (1090), 102 (1092), 221 (1094) and 5 (1134). This is not only a high percentage of pieces from this area but of the entire site. This is matched only by the lithic quantities from intercutting pits (1104), (1111), (1122), (1131), (1145) and (1147); Oval Structure 1280 and surrounding pits (illus 8) which, although discussed in a different grouping, contains both similar quantities and types. It is possible they had a similar function, length of use or date.

Western hearth features and Structure 1179; Western pits

To the west of the site was a group of hearth features and pits, seemingly scattered around a post-built structure (illus 10). Directly north of this group were scattered pits whose date and relationship to each other is unclear (see illus 7). Very few lithics were found in the west of the site and were spread amongst a total of ten features –(1170), (1183), (1185), (1190), (1192), (1227), (1229), (1239), (1254) and (1275) – with tools and a core found within seven; single platform core SF1050 (1185), three microlith fragments SF1145 (1183), SF1132 (1192), SF1149 (1254), a scalene triangle SF1144 (1170) (illus 23), an edge retouched piece SF1129 (1190) and a scraper SF1138 (1229). Despite the small numbers, these included a mixture of material types, including mudstone, agate, chalcedony, quartz, flint and chert.

Two radiocarbon dates retrieved from the intercutting hearths provided evidence for at least two phases, with the stratigraphically earliest hearth (1246) dating to 4584–4372 cal BC (SUERC-39753) and the secondary hearth (1185) dating to 4652–4452 cal BC (SUERC-39752). A post-hole (1264) from Structure 1179 truncated hearth (1246) indicating the structure must post-date this hearth's use. These were the latest dates retrieved for Mesolithic occupation at the site. Other than the quartz platform core, none of the lithics are associated with radiocarbon dated contexts, however, as scalene triangle SF1144 was found in a post-hole from Structure 1179, it may post-date 4584–4372 cal BC (SUERC-39753) if not found to be residual.

The low number of lithics from the west does not indicate an area of any intensive industry. Successive visits are indicated by the intercutting hearths but there is no indication that this area was used for prolonged periods of repeated knapping events and the higher tool ratio would seem suggestive of loss or discard.

DISCUSSION

The mixture of different tool types present at Castlandhill and Echline Fields presents a challenge when attempting to identify specific or specialised activities. Indeed, this range in itself seems indicative of a wide-ranging suite of activities (Waddington 2007: 106). The mixture of tools include those suitable for cutting, scraping, piercing and stabbing, which means other material remains should be considered when interpreting function of structures or areas.

Structure 273 at Echline Fields belongs to a small but growing group of sunken-floored, Mesolithic buildings found throughout Britain and Ireland, including: Broom Hill, Hampshire (O'Malley & Jacobi 1978); Howick, Northumberland (Waddington 2007); Cass Ny Hawin I and II, Isle of Man (Fraser Brown pers comm); and East Barns, East Lothian (Gooder 2007).

Detailed comparison of material culture from these sites is difficult at present as many are yet to be fully analysed and published. The Howick assemblage included similar lithic technology of 'backed blades, crescents,

isosceles triangles, points and other narrow blade forms' (Waddington 2007: 105) and East Barns has similarly been confirmed as having a 'narrow blade technology' assemblage (Gooder 2007). Echline Fields provides the earliest radiocarbon date yet for such a structure (cf East Barns, *c* 8000 cal BC AA-54960, AA-54961, AA-54962, Gooder 2007: 52–3; Howick, *c* 7800 cal BC, Waddington 2007: 105).

There is a striking similarity between the lithics at Echline Fields and those found at Cramond, Edinburgh (Saville 2008). Cramond, less than five miles to the east of Echline Fields, along the shore of the Firth of Forth, is broadly contemporary, dated to around 8400 cal BC (Saville 2008: 211). The assemblage type therefore appears to be specific to the mid-9th millennia of the area, rather than specifically to Sunken-floored houses. At the time of its publication, the Cramond site provided the earliest dated narrow blade assemblage in Britain (Saville 2008: 211–13). Echline Fields provides supporting evidence that narrow blade technology was present in northern Britain much earlier than was previously believed. These sites remain a small study group, but Saville's premonition of a 'radical … challenge to accepted views' (2008: 213) is gathering steam.

Castlandhill is more likely to represent ephemeral, temporary occupation, returned to season after season for its attractive coastal location for a period of over 2,500 years. Close comparison to other lithics assemblage is inhibited due to intercutting features, the strong chance of intrusive or residual artefacts and the lack of association to C14 dated contexts. In four instances, lithics are associated with C14 dated features: pit (1084), 6825–6603 cal BC; pit (1076), 5294–5048 cal BC; pit (1078), 4896–4710 cal BC; and hearths (1246) and (1185) dating to 4584–4372 and 4652–4452 cal BC respectively.

Within the Forth estuary and extended area, several C14 dated sites are broadly contemporary with activity at Castlandhill. The oldest date from Castlandhill has no comparable contemporary sites within the Forth estuary area. Sites in the area from the early 6th millennium also occur to the south-west at Meiklewood, Stirling (6920 ± 80 uncal BC (OxA-1159), (ScARF 2012), Carriden, West Lothian (6030 ± 55 uncal BC (OxA-7852), (ScARF 2012) and Inveravon, West Lothian (5435 ± 60 uncal BC (GU-1886) and 5955 ± 180 uncal BC (GU-2334), (ScARF 2012).

Most of the dates retrieved from Castlandhill were from the first half of the 5th millennium BC and it seems the site was more frequently revisited during this millennium. Mesolithic dates from the 5th millennium are fairly well represented throughout Scotland (see ScARF 2012) and farther south at Howick, Northumberland. There were no particularly late C14 dates retrieved from the 5th millennium BC, the latest being 4584–4327 cal BC, although it has been established that Structure 1179 must post-date this, but by how much is uncertain.

POTTERY

INTRODUCTION

Prehistoric pottery was found during the trial trenching and area excavation at Echline Fields. The assemblage, weighing 26kg and comprising 373 sherds and 19 fragments, was retrieved from five single fill pits (002), (034), (040), (323) and (417).

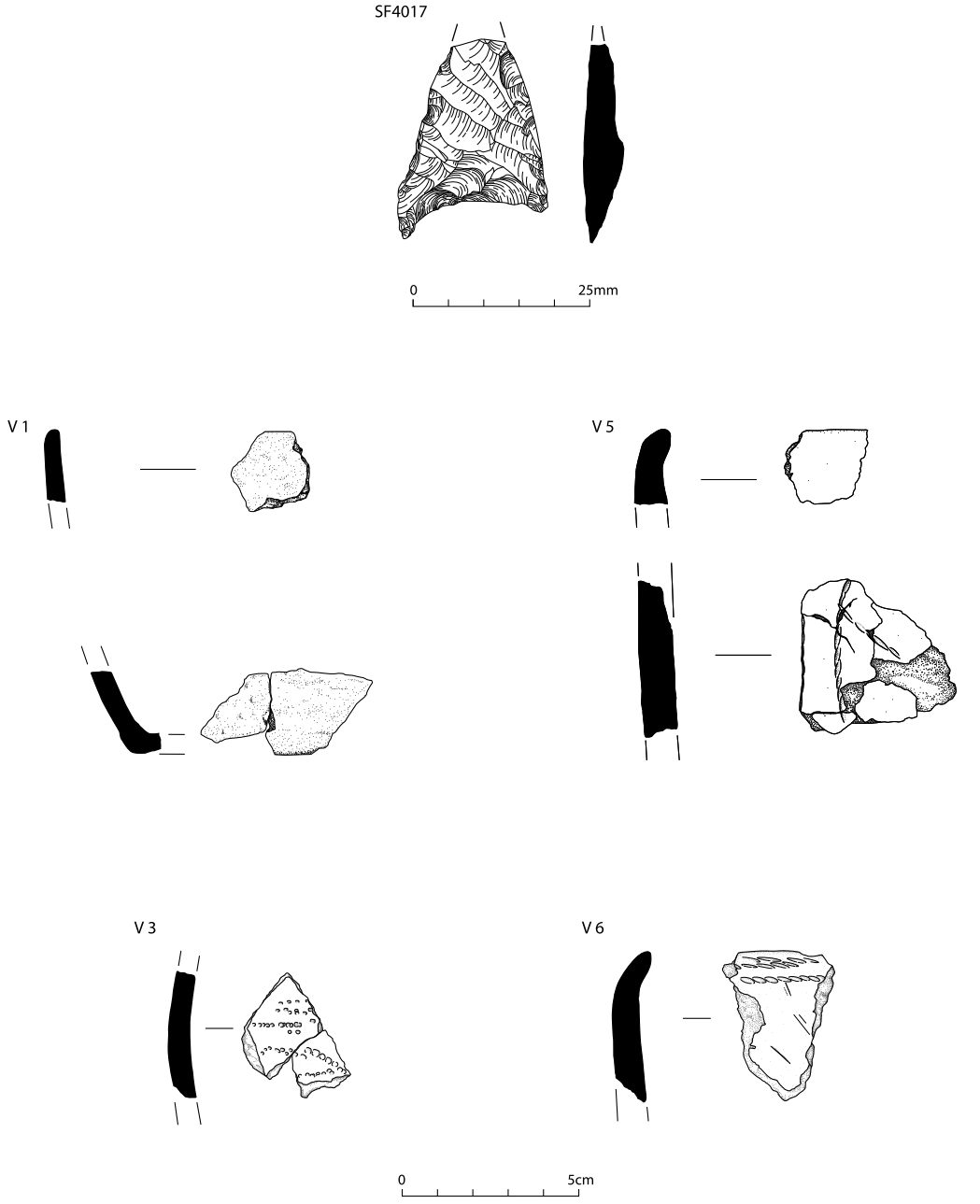
The pottery represents a minimum of 17, possibly 18 vessels. The majority date from the mid to late Neolithic, between the mid-4th and mid-3rd millennium BC. The assemblage includes Grooved Ware and Impressed Ware, in addition to several undiagnostic sherds of unknown type. A summary of the assemblage is given in Table 5.

METHODOLOGY

The pottery analysis was carried out using a hand-lens and stereomicroscope where

TABLE 5
Echline Fields: pottery assemblage summary

Vessel #	*Sherds*	*Represented*	*Location*	*Feature*	*Context*	*Type*	*Pottery dating*	*Associated C14 date*
V1	18	5%	Area D	Pit 002	003	Undecorated Grooved Ware	*c* 3200 BC–2500 BC	–
V2	3	–	Area D	Pit 002	003	Undecorated Grooved Ware	*c* 3200 BC–2500 BC	–
V3	1	–	Area D	Pit 002	003	Grooved Ware	*c* 3200 BC–2500 BC	–
V4	1	–	Area D	Pit 002	003	–	–	–
V5	1	–	Area D	Pit 002	003	Grooved Ware	*c* 3200 BC–2500 BC	–
V6	1	–	Area D	Pit 002	003	Grooved Ware	*c* 3200 BC–2500 BC	–
V7	1	–	Area D	Pit 002	003	Grooved Ware	*c* 3200 BC–2500 BC	–
V8	1	–	Area D	Pit 002	003	–	–	–
V9	1	–	Area D	Pit 002	003	–	–	–
V10	3	–	Area D	Pit 002	003	–	–	–
V11	1	–	Area D	Pit 002	003	–	–	–
V12	2	–	Southern pit alignment	Pit 034	035	–	–	1379–1123 cal BC (SUERC-39754)
V13	308	50%	Northern pit	Pit 040	041	Impressed Ware	*c* 3600 BC–2900 BC	3337–2936 cal BC (SUERC-39758)
V14	2	–	Northern pit	Pit 040	041	Impressed Ware	*c* 3600 BC–2900 BC	3337–2936 cal BC (SUERC-39758)
V15	6	10%	Central pit	Pit 323	324	Undecorated Grooved Ware	*c* 3200 BC–2500 BC	–
V16	3	–	Central pit	Pit 323	324	Grooved Ware	*c* 3200 BC–2500 BC	–
V17	2	–	Southern pit alignment	Pit 417	418	–	–	–



ILLUS 24 Echline Fields: vessels 1, 3, 5, 6 and arrowhead SF4017 from pit (002)

necessary. Measurements are in millimetres (mm) and grams (g) unless stated otherwise. The following abbreviations have been used: thickness (Th), diameter (Dia), small find (SF) and vessel (V). Vessel numbers were assigned to each sherd or group of sherds that derived from the same pot. The term fragment is applied to any sherd below 10mm. The pottery is described by feature and then discussed as a group at the end.

DESCRIPTION OF POTTERY BY FEATURE

Vessels 1–11 – Pit (002)

This pit contained the largest number of vessels, though each was represented by relatively few sherds (Table 5). There are six examples of Grooved Ware, both decorated and undecorated, and a further five undiagnosed vessels.

The undecorated Grooved Ware includes V1 (illus 24), V2 and V7, though as V7 is represented by only one small rim sherd it cannot be conclusively identified as undecorated. All three vessels have rounded or slightly pointed, upright or inturned rims. The remaining parts of V2 and V7 indicate probable barrel-shaped profiles. V1 is bucket-shaped with walls which kick out from the base, similar in form to Sheridan's vessel shape 'b' from the Links of Noltland assemblage (Sheridan 1999: illus 2.3, 116). V1 was the only flat base present in the entire assemblage.

The decorated examples include V3, V5, and V6 (illus 24). Both V5 and V6 have gently pointed, inturned rims, similar to V2 and V7. The form of V3 is unclear as only small body sherds remain. V5 and V6 are both impressed with twisted cord. Three horizontal lines have been applied to the exterior of the rim of V6 and a horizontal and diagonal line is applied to the body of V5.

The decoration on V3 takes the form of very small, fairly shallow circular and sub-square impressions. While this type of 'pin-pricked' decoration is not immediately associated with Grooved Ware, it has been noted on several other Grooved Ware vessels (Haggarty, 1991: 66, sherd 21; Armit et al 1994: 120, sherds 11a–c; MacSween 2000: 103–4, sherds 3a and 3b). The impressions are arranged in rough lines and on one sherd, the viewer would be forgiven for thinking the vessel belonged to a comb-impressed beaker. This was also apparent on a vessel from Strathclyde (Armit et al 1994: 122) where the author suggested a possible attempt at mimicking comb impression.

The remaining sherds (V4, V8–V11) are undiagnostic body sherds, ranging in thickness between 8 and 13mm.

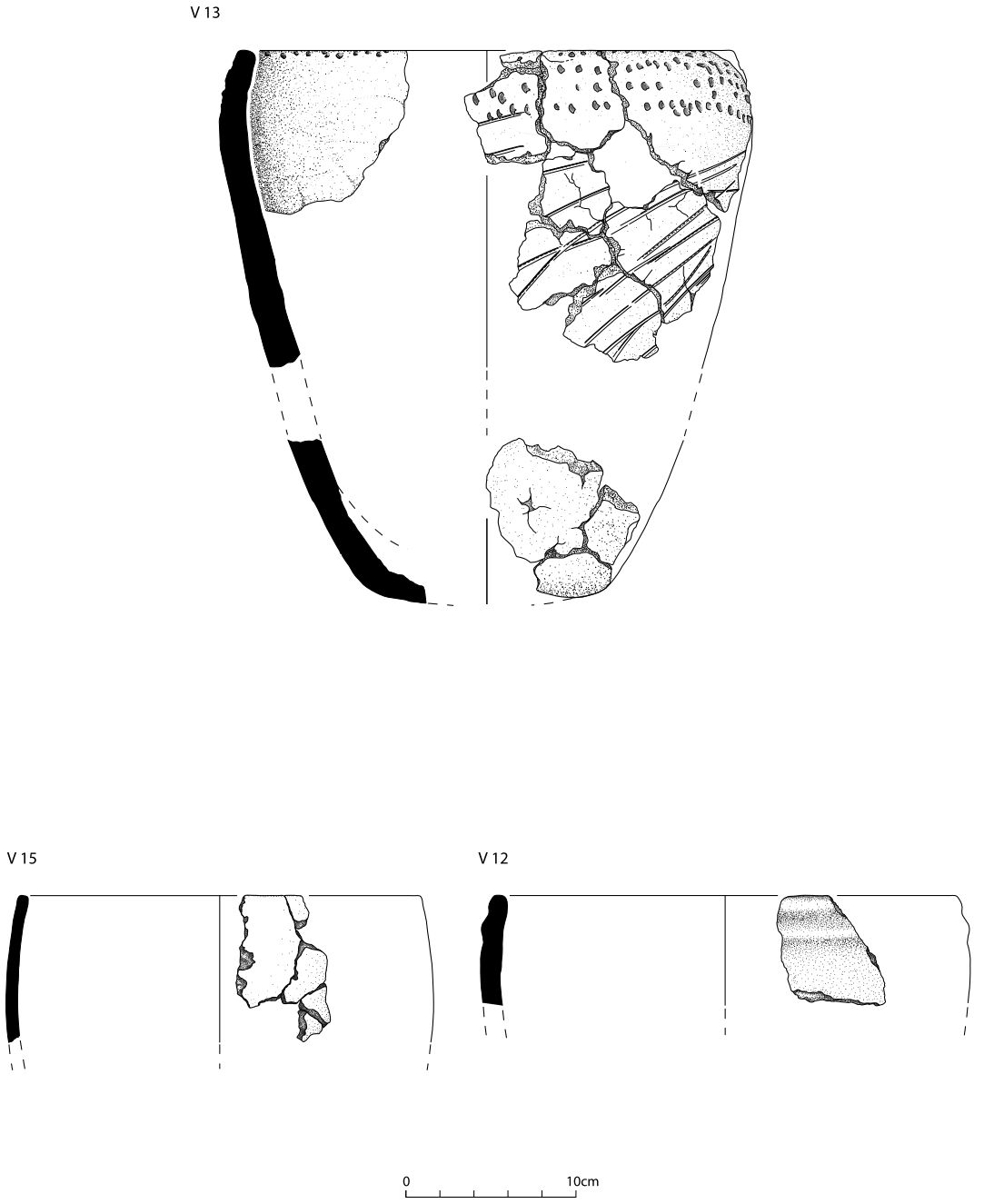
Vessel 12 – Pit (034)

The vessel from Pit (034) (illus 25) consists of two sherds showing a thick, upright rim decorated with horizontal rilling. The identification of this vessel is uncertain. Comparative examples can be found of Impressed Ware (Sheridan forthcoming a, P75), Grooved Ware (McInnes 1963–4, Cat No 102, Fig 4, 67) and domestic Beaker (eg McInnes 1963–4, Cat No 175, Fig 10, 76; Sheridan forthcoming b, P60). However, the associated middle Bronze Age C14 date of 1379–1123 cal BC (SUERC-39754) is significantly later than any of these forms. The return of a second middle Bronze Age C14 date from Pit (214) (SUERC-39762) further supports activity from this period. There is no evidence which would indicate the sherd is residual or conversely, that the dated material is intrusive. It seems likely that the sherd is middle Bronze Age, of a less commonly seen type.

Vessels 13 and 14 – Pit (040)

This pit contained the largest quantity of sherds representing two, possibly three vessels.

At least 50% remains of V13 (illus 25) remains. It is large with straight walls, an inturned rim and a fairly small saggy base. The upper portion (*c* 50mm) and rim are decorated with impressions which vary from sub-square to sub-circular and half moon. The impressions appear to have been created by the same tool, which varies due to being held at different



ILLUS 25 Echline Fields: Impressed Ware vessel 13 from pit (040), Undecorated Grooved Ware vessel 15 from pit (323) and Bronze Age vessel 12 from pit (034)

angles or pushed to different depths. Below the impressions are fairly random incised diagonal lines. These mostly follow the same direction, but there are also diagonals crossing in the opposite direction (not depicted on illus 25). Most of these scores are fairly deep and U-sectioned; and a few of the lines show striations that suggest the implement used may have been grass, straw or reed. As noted, this vessel also has a substantial proportion of its base, which is rather small and saggy in shape.

Amongst the sherds from V13 are a rim and body sherd of a different vessel, V14, or possibly two different vessels. The rim sherd is upright, rounded and decorated with twisted cord which has been applied vertically to the exterior, crosses over the rim and continues vertically into the interior for 40mm, to where the sherd is broken along a coil join. The body sherd is uneven with possible fingernail impressions.

V13 belongs to the class of Impressed Wares; however the shape of the walls, base and incised decoration is reminiscent of Grooved Ware (eg saggy base, Haggarty 1991: 66, 24b; incised decoration, Barclay & Russel-White 1993: Pot 65). Little remains of V14 and no comparatives could be found. Interestingly, the decoration to the interior of the rim is a very common feature on Grooved Ware.

Vessels 15 and 16 – Pit (323)

These two vessels are both Grooved Ware. V15 is undecorated whilst V16 is decorated with linear grooves. V15 does not have the angled walls and kicked-out base of V1. It is straight-sided with a very slight curvature, which is not so pronounced as to be comparable to V2, V5 and V6.

V16 only consists of three small body sherds but the horizontal and diagonal U-sectioned grooves are one of the most widely known and iconic types of decoration known from Grooved Ware.

The small number of pieces from V16 and the lack of decoration on V15 means only a broad date range of 3200 to 2500 BC can be suggested.

Vessel 17 – Pit (417)

Only two thick (12–14mm) body sherds were retrieved from this pit. There is no indication of date and the fabric is local and similar to others in the assemblage.

DISCUSSION

The features from which pottery was recovered were fairly isolated and cannot be linked to structures or even each other. The only features which may show a pattern of distribution is the seeming pit alignment in the south of the excavation area suggesting pits (034) and (417) can be attributed to the same, unidentified, activities.

Impressed Ware dates earlier than Grooved Ware, though there was possibly a period of overlap where both were in use (MacSween 2007: fig 33.4, 37.1; Lochrie 2012). Thus all the vessels could have been deposited between 3200 and 2900 BC. Deposition in Pit (040) could have been as early as 3337 cal BC (SUERC-39758), and deposition in Pits (002), Area D (illus 1) and (323) (illus 4) may have been a little later, up to 2500 BC. Closer dating is not possible due the long period of the use of Impressed Ware and to the poor understanding of the time span of Grooved Ware.

It is particularly interesting that in two instances there are vessels which appear to share motifs popularised on different wares. This occurs on the Grooved Ware-esque decoration to V13 and V14, Pit (040), and the 'faux' comb-impressed effect upon V3, Pit (002). In this small assemblage – and there is certainly not enough scope to expand further upon this – it may be that this was a time of change and innovation where different vessel types were influencing and inspiring potters.

Pit (002), with its many vessels represented by low numbers of sherds, was located 304m from the other pits. It also contained a ripple-flaked oblique arrowhead (see Lithics), supporting the late Neolithic date for the pottery. The low percentage of vessel represented and

the small size of sherds would seem to indicate that, despite the well executed and attractive arrowhead, this pit was domestic in origin. It might be expected that domestic refuse would be accompanied by structures and other signs of occupation. However, a similar lack was noted at the broadly contemporary Meadowend Farm, Clackmannanshire (Jones et al forthcoming), where it was explained as either loss through truncation or due to light structures which rested upon rather than cut into the ground and left little trace (Jones et al forthcoming)

Pit (040), on the other hand, stands in strong contrast to the other features and suggests ritual rather than domestic activity. The pottery from this pit included a large number of sherds, mostly from one vessel (V13). During excavation, much of this vessel was found lying broken but in situ, indicating a large portion had been crushed after deposition. Around 50% of the vessel is present, most of one side. Amongst the sherds of this vessel were a couple of abraded sherds from another vessel. A similar scenario was noted at the unpublished site of Mountcastle Quarry, Fife (Lochrie 2008), where two Grooved Ware vessels were found in the same pit, one substantially complete whilst the other was represented by only a few token sherds. The pit at Mountcastle Quarry was an isolated solitary pit and was interpreted as some form of ritual deposition. The level of abrasion upon the single rim sherd of V14 temptingly leads to the suggestion of it being an heirloom or relic piece; implying there was a mixture of both domestic and ritual activity during the mid to later Neolithic at Echline Fields.

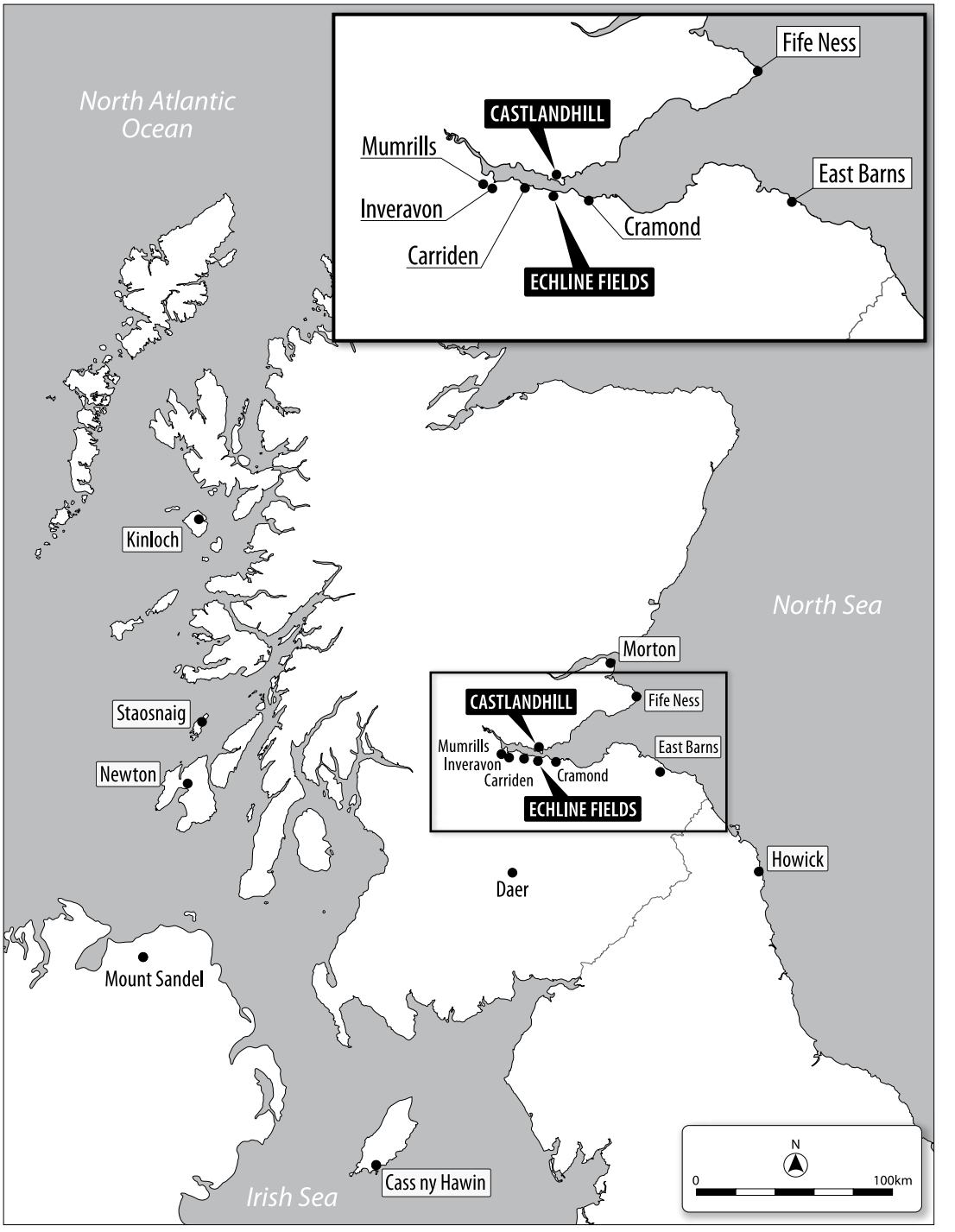
DISCUSSION

ECHLINE FIELDS AND CASTLANDHILL IN THE MESOLITHIC PERIOD

Chronology and overview of sites

The remains identified at both sites span a substantial part of the Scottish Mesolithic, providing an opportunity to examine settlement characteristics across a broad time frame. The first evidence of settlement at Echline Fields precedes its northern coastal neighbour at Castlandhill by at least 1,000 years and was founded in the earliest phases of the period. The structural and pit features across the Echline Fields site are contemporary and the radiocarbon dates cluster around 8300 cal BC. Sunken-floored Structure 273 can therefore be described as the earliest robust dwelling found in Scotland at present. A second cluster of dates from the structure at around 7100 cal BC infers a hiatus of over 1,000 years before the site was reoccupied. In contrast to Echline Fields, Castlandhill provides evidence of a sequence of habitation phases in the Mesolithic, spanning a period of around 2,000 years, from approximately 6800 cal BC to 4400 cal BC.

Echline Fields and Castlandhill add to the growing number of identified Mesolithic sites situated along the Forth coastline, three of which are closely dated; Cramond, Echline Fields and East Barns (illus 26). Excavations at Cramond (Saville 2008), less than 8km to the east of Echline Fields, have identified the earliest evidence for Mesolithic activity, with charred hazelnut shell from a series of pits and stake-hole settings radiocarbon dated to 8630–8210 cal BC. Associated lithics from these features have provided the earliest dated narrow blade assemblage in Britain (Saville 2008: 211). At East Barns, a sunken-floored structure with central hearth was interpreted as a robust house that may signify near-permanent settlement (Gooder 2007: 57). Radiocarbon dating provided an occupation date of around 8000 cal BC; potentially within a few centuries of the Echline Fields structure (Gooder 2007: 52). There are evident similarities between the two structures: in both cases similar-sized post-holes, angled inwards, enclosed a sunken cut of comparable form. Initial inspection of the East Barns assemblage has shown charred hazelnut occurred throughout the deposits



ILLUS 26 Northern Mesolithic sites discussed in the text

(Gooder 2007: 51), while bone was recovered in very small quantities and only identifiable in one incidence as seal. The significant quantity of lithics reflected a narrow blade industry and coarse stone implements, mainly bevelled pebbles, were also recovered (Gooder 2007: 52).

At the site of Fife Ness, at the eastern limit of the Forth estuary, remains characterised by an arc of pits with a central hearth were identified. Charred hazelnut shells provided a range of radiocarbon dates indicating the site was occupied between 7600 and 7400 cal BC (Wickham-Jones & Dalland 1998: 6). The lithic assemblage included debitage, cores, regular blades and flakes; all made of flint with the dominant retouched form being crescent microliths. A comparatively high number were burnt. The small scale of the site and dominance of a particular form of microliths suggested a specialised activity site. It has been postulated that this activity may have been the smoking of meat and/or fish, due to the presence of a hearth and the abundance of marine resources as well as migratory birds in the area (Wickham-Jones & Dalland 1998: 17).

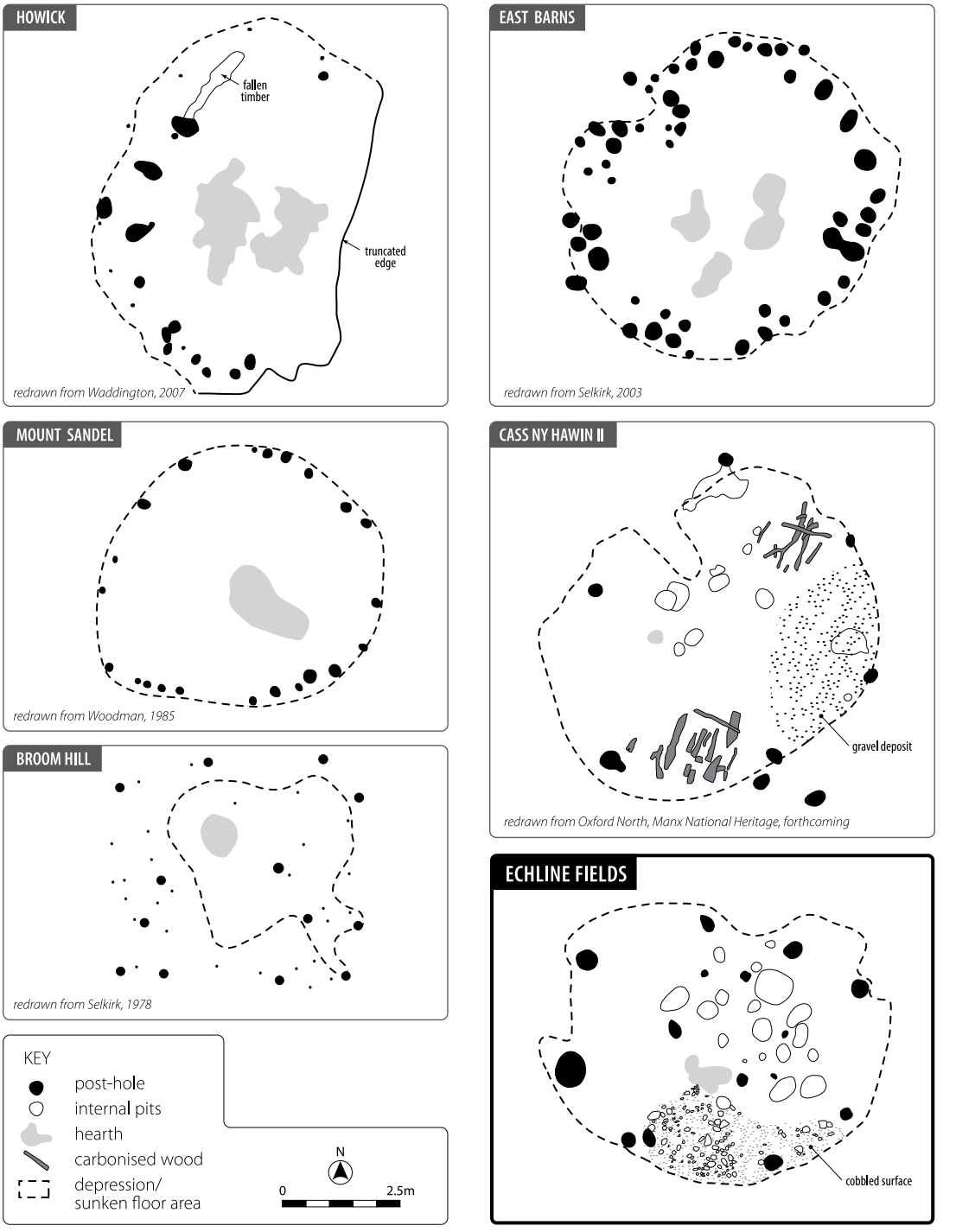
The earliest phase of occupation at Castlandhill occurred slightly later than Fife Ness, at around 6800 cal BC, with subsequent activity spanning two millennia, up to approximately 4400 cal BC. Later Mesolithic activity has also been identified on several sites in Falkirk. A barbed antler point dating to 5000 cal BC was recovered from the foreshore near Carriden (Saville 2001), while at Inveravon a substantial shell midden produced a range of radiocarbon dates from around 5000 to 2300 BC. The 2m-high mound was located at *c* 15m OD (contemporary sea level) and with no apparent hiatus of accumulation it seems to have been used for several thousand years before finally falling out of use; possibly as a result of the receding shoreline (MacKie 1972). A further shell midden found in Mumrills at 11–15m OD was radiocarbon dated to approximately 4000 cal BC (Bailey 1992, ScARF 2012).

Structures

At Echline Fields, many of the structural elements conform to the common suite of stake-hole, post-hole and gulley formations that are associated with the Mesolithic period and prove difficult to assign function. They have been variously interpreted as windbreaks, temporary shelters and food smoking/drying installations. Two structures on the site, Sunken-floored Structure 273 and Oval Structure 519, consisted of an enclosing ring of post-holes around central hearths. In Oval Structure 519, the lack of available internal space would seem to preclude its function as a dwelling. The size and form of both the overall structure and individual post-holes is similar to the Mesolithic remains identified at Fife Ness (Wickham-Jones & Dalland, 1998), where an arc of pits surrounding a hearth was postulated as the remains of a structure for smoking meat or fish. The presence of bird, fish and small mammal bones in Oval Structure 519 adds further credence to this interpretation of function.

In contrast, Sunken-floored Structure 273 is likely to be the remains of a sunken-floored building with in-situ floor deposits; deviating from the more ephemeral nature of the other features. The structural elements comprised an outer post ring formed of eight paired posts, with the two largest flanking the entrance into the structure. The posts had been set into the ground at the edge of the living area and, based on the sections, each pair angled inwards. To provide structural stability it can be postulated that they may have rested on a lintel supported by the inner ring of post-holes. The solid build of the structure suggests that it was roofed with something substantial, such as wild grass or reed thatch, bark or turf (Waddington et al 2003). The abundance of hazel derived from small branches within internal deposits, along with the recovery of burnt clay, also intimates use of wattle and daub.

The Echline Fields structure adds to a group of sites found across the UK and Ireland that



ILLUS 27 Mesolithic sunken-floored structures in the UK and Ireland

reflects the complexity of settlement beginning to emerge from the earlier Mesolithic record. A number of robust, sunken-floored houses have now been recorded at coastal locations that were constructed around 8000 cal BC and appear to form a particular 'house horizon'. These include East Barns, East Lothian (Gooder 2007: 52); Mount Sandel, Northern Ireland (Woodman 1985) Howick, Northumberland (Waddington 2007: 105) and Broom Hill, Hampshire (O'Malley and Jacobi 1978) (illus 27). Each of the sites in the group displays an investment in construction that infers a degree of sedentism or extended residence not traditionally identified with this early period. The mechanisms responsible remain to be understood, although Waddington (2007) suggests population pressures deriving from the land bridge to mainland Europe resulted in the necessity for territorial expression in resource-rich areas. Subsequent isolation of Britain through rising sea levels, along with social alterations, may have reduced those pressures and the need for such robust dwellings as territorial markers.

A further Mesolithic building has recently been excavated on the Isle of Man at Cass-Ny-Hawin (Brown et al forthcoming). A preliminary comparison of the houses at Echline Fields, East Barns and Cass-Ny-Hawin II reveals striking architectural similarities. All are comparable in scale and form; with the plans of the sunken floor cuts closely corresponding. A particular shared detail is a concavity midway along the floor cut, on the side to the left of the entranceway, which may have fulfilled a similar function in each case. The apparent continuity of design, maintaining nuances of form, suggests a successful transmission of knowledge and thought between the settlements. The proximity of distance (65km) and time (within a few centuries) between the Echline Fields and East Barns houses supports such a connection. The Cass-Ny-Hawin II structure is yet to be radiocarbon dated; although an adjacent house on the site dates to 7660 ± 100 uncal BC and 7695 ± 95 uncal BC (Woodman 1987: 13). The forthcoming data from post-excavation analysis will allow comparison between both the Forth estuary sites and this more southerly example. Two sites in the west of Scotland also share sunken floors. At Newton, Islay, a depressed rectangular area with three angled post-holes represents a dwelling dated between 7400 and 6100 cal BC (McCullagh 1989; ScARF 2012). At Staosnaig, Colonsay, a sub-circular pit in which final use is dated to around 6500 cal BC originally functioned as a hut base (Mithen et al 2000).

At Castlandhill, structural remains survived in the form of several post-hole settings. Their associated functions proved more enigmatic than those at Echline Fields, although evidence for potentially roofed dwellings was indicated by the six-post, Oval Structure 1280 and 12-post, open-sided Structure 1179.

The six-posted Oval Structure 1280 has few comparisons in Mesolithic literature. The profiles of several post-holes showed they were inclined towards the centre and their substantial dimensions are comparable with the earlier sunken-floored building at Echline Fields. With the 12 posts of Structure 1179, posts would have similarly leant inwards and may have been tied at the centre much like a North American teepee. The post-hole at the eastern end perhaps held a support for a ridge pole (1156) (illus 10). A number of structures known across the Scottish Mesolithic are based on inclined stakes, with the majority in a circular pattern (Wickham-Jones 2004: 238). However, with relatively few excavated structures for comparison, there are few direct parallels. The post-holes of the structure are more substantial than the stake-hole arcs found at sites such as Kinloch, Rum, and Morton in Fife (Coles 1971; Wickham-Jones 1990).

Although truncated with no surviving floor deposits, the size and shape of Structure 1179 is not dissimilar to the arrangement of post-holes found in sunken-floored examples. Similar post-circles were excavated at Elgin and also

compared to the East Barns house on the basis of form (Suddaby 2007); despite truncation of the site leaving little in the way of artefacts or ecofacts and the absence of floor deposits or a sunken floor.

Economy

The wide ranges of tool types identified at both locations infer the sites hosted domestic settlement where a variety of activities were undertaken; rather than specialised sites. The assemblages show a remarkable homogeneity of narrow blade technology that represents continuity in form from the mid-9th millennia to mid-5th millennia BC.

The sites produced contrasting faunal and palaeoenvironmental assemblages with which to consider the various subsistence activities that took place. The Echline Fields assemblage provided evidence for the processing and consumption of both marine and terrestrial resources, derived from both hunting and gathering. Thin-section micromorphology concluded the basal fill of Sunken-floored Structure 273 was likely to represent in-situ floor deposits (see above; Shillito 2012). Although evidence was limited, the structure seems to have been a focus for the processing and/or consumption of large mammals; as indicated by a concentration of burnt bone that included identifiable species of wild boar, deer and possibly wolf (see above, Smith 2012). These are presumed to have been wild species which had been hunted for their meat as well as their hides, sinews, bones, fat and other by-products.

Micromorphological analysis of the floor deposits also identified sparse fragments of burnt marine shell. This technique provided the only evidence for the collection and consumption of molluscs on the site, despite its coastal location. The notable absence of shell is most likely a consequence of the acidic soils in the area.

Foraging activity was also represented by the presence of charred hazelnut shell in deposits. Pollen information from this region suggests that hazel would have been plentiful in the landscape and this is reflected in the use of this tree type as a resource for food and wood fuel. Indeed, hazel was the exclusive wood type identified in samples from the building, indicating deliberate selection of a probable abundant resource. As with the burnt bone, the larger quantities of hazelnut shell and charcoal was mostly recovered from those deposits associated with Sunken-floored Structure 273. The Castlandhill site produced limited evidence for subsistence activities. A sparse amount of charred hazelnut shell was recovered, along with small quantities of burnt bone. The bone was not identifiable to species level and could not indicate the size of mammal represented. The assemblages principally derived from the fills of post-holes associated with the central post setting and Oval Structure 1289, as well as an adjacent pit.

The lithic assemblages provide an important resource for investigating both site-specific activities and broader settlement patterns. There is a striking similarity between the lithics at Echline Fields and those found at Cramond which, at around 8400 cal BC, is broadly contemporary (Saville 2008: 211). The East Barns site displayed narrow blade technology (Gooder 2007: 51) and the Howick assemblage also included similar lithics of 'backed blades, crescents, isosceles triangles, points and other narrow blade forms' (Waddington 2007: 105).

This sample of sites adds to the corpus of early dates for narrow blade technology in northern Britain.

Mobility

The enclosing post-built structures at Echline Fields and Castlandhill provide explicit examples of robust dwellings. They can be seen in contrast to a number of Mesolithic sites where only short arcs of stake-holes survive; indicative of temporary, non-habitation structures.

Waddington's model of Mesolithic settlement categorises sites in terms of modes of residency as reflected in the permanency of structures and the amount of artefacts and

occupation debris (Waddington 2007: 107–8). Although only postulated as a framework, such a model poses a problem in terms of truncated sites, where occupation surfaces and deposits are absent and even artefacts may be scarce (eg Elgin (Suddaby 2007)). The relatively low levels of occupation material, particularly in relation to the Castlandhill structures, might suggest seasonal or short stay occupation of the sites; however the structures appear to be far from the temporary, insubstantial form expected when considering the evidence from other sites of this type. Furthermore, the access afforded to both estuarine and terrestrial resources at both locations means more established settlement was an attractive option. Year-round occupation has been suggested at East Barns and Howick on the basis of substantial structures associated with ecologically diverse locations (Waddington et al 2003; Waddington 2007; Gooder 2007).

Analyses of the environmental and bone assemblages to better characterise occupation of the sites has proved inconclusive; the evidence can be argued to support both seasonal and long-stay patterns. Seasonal wintering camps may be suggested by the hazelnut processing that took place, as the nuts ripen in early autumn. The recovery of bird bones might also indicate a winter presence, since the proliferation of over-wintering and migrating birds in the Forth estuary during this period would provide a more attainable resource than at other times of the year. Furthermore, the location of the dwellings' entrances to the south-west would offer shelter from the north-easterly winds that prevail in autumn (Wickham-Jones & Dalland 1998: 17). Such evidence thus supports a tentative autumn/winter residence, but does not exclude occupation extending beyond that.

It can be argued that the charred hazelnuts may not derive from intentional roasting for immediate consumption, but from accidental burning during drying for storage (McCullagh 1989: 43). If hazelnuts were being dried for storage, consumption would not have been immediate, therefore the presence of hazelnut shell cannot clearly determine seasonality. The bone assemblage as a whole was too small to infer hunting patterns and was unable to offer any seasonal indicators. Wild boar bone retrieved at Echline Fields was that of an adult rather than newborn; the latter would have inferred spring-time consumption (Lapudzki et al 2009: 59). Radiocarbon dating of the sunken-floored structure's floor deposits provided a broad phase of occupation lasting up to 200 years, but thin-section micromorphology could not discern any hiatus in occupation to better resolve phases of activity, beyond the gap of 1,000 years provided by the radiocarbon dates. The analysis indicated an occupation floor layer followed by periods of gradual and rapid infilling; tentatively suggesting the site was returned to over a long period of time. The archaeological resource is therefore limited in attempting to establish episodes and durations of residence, but the structural remains in particular provide pertinent evidence for an overall characterisation of settlement. The Echline Fields site is considered to be a domestic base, with the sunken-floored structure occupied for a significant period of the year, likely to at least span autumn and winter. The investment of time and energy in its construction indicates an anticipated, extended residence as opposed to a short-stay camp. The internal area is broadly similar to that of the East Barns house, where it was estimated that the structure could accommodate a mixed group of up to six or seven adults and children (Gooder 2007: 51). The potential existence of associated dwellings, lost through truncation or outside the development area cannot be ruled out; however such 'aggregated settlement', as noted by Waddington (2007), is difficult to discern archaeologically, since a palimpsest of activity and settlement phases may equally be represented. The structures at Castlandhill also appear to indicate a degree of effort that does not suggest short-stay occupation; however the lack of internal floor deposits and hearths meant that the life cycle of individual structures could not be ascertained.

A comparison of the radiocarbon dates from the sites with contemporary sea level has proved insightful in providing possible contributing factors behind the gaps in occupation at both sites (illus 15). The data suggests a logical correlation between settlement and perceived optimal marine conditions. Periods of abandonment were associated with both low and rising sea levels, which would have resulted in either increased distance to the shore and reduced resources, or the risk of inundation. It remains to note that the same locations were utilised by Mesolithic groups periodically for up to 2,000 years. This may testify to the resource-rich landscape, but also to a cultural landscape where the memory of the sites could have been sustained across generations (Bradley 2002). The location of Castlandhill, in a sheltered bay (illus 1), would have made the site favourable as an embarkation point for travel and exchange along the Forth and beyond.

Wider settlement

Previously, the limited early Mesolithic evidence in Scotland was taken to imply that settlement was less established, or later, than farther south in Britain (Saville 2008: 213). The sites from this period now identified along the Forth estuary and beyond begin to contradict such a picture.

The lithic assemblages from Cramond, Echline Fields and East Barns succinctly demonstrate the significance of these sites, and in particular their contribution to migration and settlement theories. Traditionally, the presence of broad blade microliths was seen to define the early Mesolithic period (Tolan-Smith 2008: 140), with the narrow blade form following later and disseminating outwards from Southern Britain. The Forth sites add to the evidence for an early presence of narrow blade assemblages in Northern Britain; implying that the groups utilising such technology were present along the east coast of Scotland in the mid-9th millennia BC.

Evidence therefore continues to develop that proposes a rapid expansion of Mesolithic settlement in Scotland as Finlay et al (2002) have suggested; with precedence in the Norwegian archaeological record around 9000 cal BC of the sudden colonisation of a rich, arctic coastal area (Bjerck 1995: 140). Inevitably, the relatively small number of recorded early Mesolithic settlement sites presents challenges to developing such hypotheses on population movements, however, as the archaeological resource expands, so too does our understanding of this period.

SUBSEQUENT PREHISTORIC ACTIVITY

Echline Fields produced the only evidence for later prehistoric settlement; comprising a small number of relatively isolated pits of later Neolithic date and pits of middle Bronze Age date and an undated circular structure tentatively attributed to the Bronze Age.

Three pits (002), (040) and (323) were dated to the middle to late Neolithic period on the Grooved/Impressed ware pottery finds. Pits (040) and (323) were located within the excavation site area, while Pit (002) had been identified to the south during trial-trenching (Humble 2011).

The pit fills seem to principally derive from domestic deposition, indicated in feature (002) by the small number and size of sherds that originate from a total of 11 vessels; despite the presence of an arrowhead. A scattering of pits previously excavated in the vicinity (Johnson 2008) recovered mid to later Neolithic Impressed Wares, while a similar pattern of pits containing probable domestic refuse is also mirrored at the site of Meadowend Farm, Clackmannanshire, on the northern bank of the Firth of Forth (Jones forthcoming).

One pit (040), however, intimated ritual deposition. The fill contained a large number of sherds from a single in-situ vessel, together with a few sherds from a second. Selective

deposition of this type, where token pieces of pottery are interred as part of a meaningful act, has been documented as an occurrence at several Beaker sites (Woodward 2002). Woodward also suggests acts of this type may be a symptom of the move from pots signifying the community and household to pots signifying an individual (Woodward 1995; 2002: 1042).

The palaeoenvironmental assessment of samples from the pits found that hazel remained the dominant wood type. The overall species assemblage, although limited, suggests that during this time the local woodland at Echline Fields was fairly open, dryland birch-oak-hazel woodland together with alder.

Middle Bronze Age activity was identified from the radiocarbon dating of two pits; one associated with a cluster to the north and the other with the alignment to the south of the site (illus 2). A small number of pottery sherds were recovered, but no additional evidence to better indicate functionality beyond general refuse (see above).

Analysis of samples from Circular Structure 410 on the east side of the site did not provide any viable evidence to assist with dating or function. The lack of any associated Mesolithic finds at least infers it post dates that period.

CONCLUSION

The excavation and analyses of both sites has provided a body of data that makes a significant contribution to Mesolithic studies. In addition to providing a synthesis of the sites themselves, wider issues of hunter-gatherer society have been considered that further emphasise the complexity of this pioneering period and the way in which this field of study is rapidly progressing. As such sites continue to be identified, theories regarding the colonisation and settlement of Britain at this time continue to be enhanced.

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