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A time of change: Mesolithic occupation at Cramond, Edinburgh during the 9th millennium BC

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1. ABSTRACT

In 1995 small-scale excavations undertaken at Cramond, Edinburgh revealed a number of pit and post hole features related to temporary or intermittent Mesolithic occupation. These features and associated deposits produced sizeable assemblages of charred plant remains and lithic material.

Cramond appears to be the first of an increasing number of securely dated narrow-blade microlithic sites excavated in recent times along the Forth Littoral. Together with substantial house sites such as Echline Fields, East Barns and Howick, Cramond produced a narrow-blade microlithic industry associated with occupation during the mid-9th millennium bc. As such it remains the earliest narrow-blade type assemblage yet discovered in Britain and provides a jumping off point for the discussion of Mesolithic responses to a rapidly changing environment in terms of population movement and technological change.

2. INTRODUCTION AND METHODOLOGY

In the early summer of 1995, a series of small-scale archaeological excavations were carried out by the City of Edinburgh Council Archaeology Service (CECAS) and the Edinburgh Archaeological Field Society (EAFS) on Mesolithic deposits initially identified by EAFS during excavations undertaken between 1988 and 1997.

The EAFS investigations consisted of a series of eight hand-excavated trenches that sought to identify remains associated with the periphery of Cramond Roman Fort. Results from these excavations indicated that the area had been subject to extensive 17th-century landscaping during the construction of Cramond Village (Dean 1993, 1994).

Two of these Trenches (D and E) were found to contain evidence of Mesolithic occupation in the form of up to four phases of activity, including a probable contemporary ground surface and a centrally positioned group of shallow intercutting pits. A series of contemporary stake holes were also identified within the south-eastern corner of Trench D. The excavation of the pit features produced numerous fragments of carbonised hazelnut shells together with a directly associated narrow-blade lithic assemblage. Further lithics of the same narrow-blade tradition were recovered from immediately adjacent contexts.

This paper represents the publication of the site and seeks to elaborate on the questions and issues regarding the emergence of the narrow-blade microlithic tradition within Scotland initiated by Alan Saville in the first assessment of the Cramond site published in 2008.

Specialist reports were undertaken on the lithic assemblage and carbonised plant remains together with an assessment of the local palaeogeography of Cramond (see 2.3 'Palaeogeography' below) which are published here. The lithic report was produced by Dr Saville in 1995 and no reassessment or rewriting has been undertaken.

Catalogue descriptions have been included for illustrated lithic artefacts only. A full catalogue of the material and specialist reports is available within the site archive.

2.1 Location

The excavations associated with the Mesolithic occupation of the Cramond site lie within the grounds of Cramond House at the north-western edge of Edinburgh (Illus 1). The site is located on the eastern bank of the River Almond (NGR: NT 1899 7698) overlooking the Forth Estuary and is situated on a glacial terrace approximately 30m to the south of known raised beach deposits.

2.2 Background

Until recently the Mesolithic of the Forth Estuary and its immediate environs was restricted both in scale and scope. Apart from the excavations at Cramond, the only other published site of note at the time of its excavation was that of the small occupation site at Fife Ness on the north-eastern headland of Fife and excavated in 1996 (Wickham-Jones & Dalland 1998).

In recent years the southern side of the Forth Littoral has seen the excavation of several robust pit-house sites such as Echline Fields situated 8km to the west at the nearby Queensferry Crossing (Robertson et al 2013), East Barns to the east at Dunbar (Gooder 2007; Engl & Gooder 2021), and Howick, Northumberland (Waddington 2003, 2007). These sites have all provided well-stratified and chronologically secure evidence for a narrow-blade microlithic industry appearing in north-eastern Britain during the 9th millennium bc.

Within the immediate environs of the Cramond site itself, various excavations at Cramond Roman Fort have produced several small assemblages of narrow-blade lithic material (see 4 'The lithic artefacts' below; Engl 2006, 2017). These assemblages most probably represent the re-deposition of material within secondary contexts given the substantial landscaping that has occurred within the past two thousand years of Cramond's occupation.

In 1998 a programme of fieldwalking undertaken by members of EAFS identified a scatter of narrow-blade lithic material in fields belonging to Dalmeny Estate east of Cramond (Jones 1998). Combined with the evidence obtained from Cramond and the Queensferry Crossing, this suggests a concentrated focus of Mesolithic activity along the southern shore of the Forth Estuary.

Illus 1 Site location showing position of Trenches A–H. (© AOC Archaeology Group)

2.3 Palaeogeography

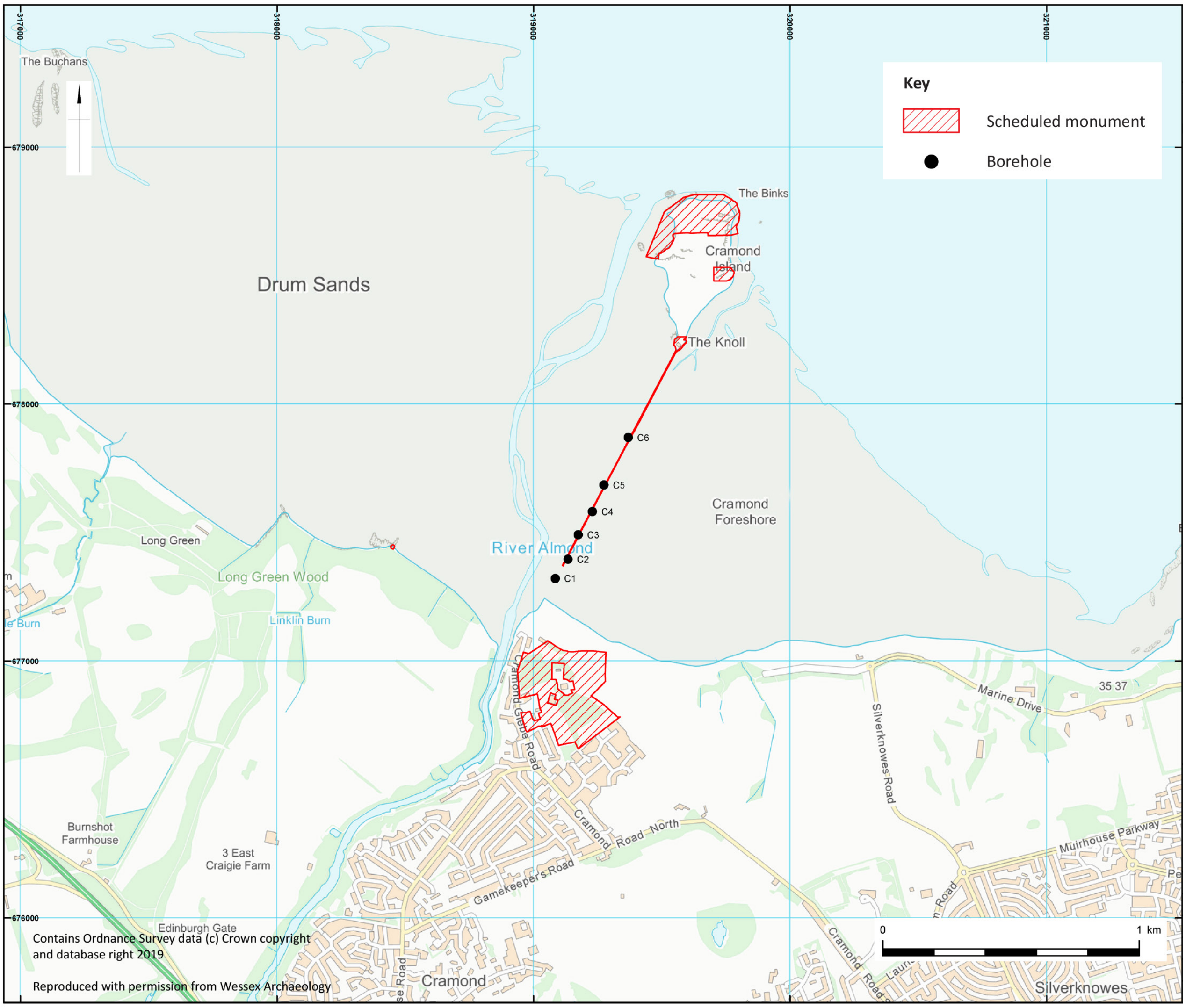
Andrew Bicket

2.3.1 Relative sea level context

The landscape around Cramond has been affected by a range of geological processes since the last Ice Age. This has influenced the configuration of landforms, relative sea level (RSL) and the subsequent archaeological potential in the area (Illus 2). Smith et al (2010) suggest that there has been approximately 5m of uplift occurring in central Scotland since the mid-Holocene. Examined in the context of RSL change during the Holocene, eustatic (global) trends in sea level are typically rising but punctuated by large-magnitude events causing rapid changes in sea level (eg meltwater pulses and tsunamis) (summarised in Bicket & Tizzard 2015). In parallel, changes in isostacy (land rebound/subsidence following deglaciation) induce complex patterns of RSL change across Scotland and are characteristic of the Forth Valley (Smith et al 2010; Shennan et al 2018).

Therefore, establishing the palaeo-shoreline at a given location along the Firth of Forth (and much of Scotland for that matter) is challenging on local-to-regional spatial scales and requires local records of geomorphology, geology and archaeology to establish with confidence where the coasts may have been within a particular century.

Trends in RSL change vary markedly from west to east along the Firth of Forth (Illus 3), with RSL in the last 10,000 years typically 'always higher than now' in the upper valley, trending towards



Illus 2 Map of Cramond foreshore area showing boreholes sunk in the 1970s. (© AOC Archaeology Group)

'lower than now' prior to 8,000 years ago in East Lothian (Smith et al 2010; Shennan et al 2018). However, after 8,000 years ago, RSL in the Forth Valley generally appears to have been 'higher than now', peaking around 7,000 years ago, and reducing to present levels throughout the late Holocene.

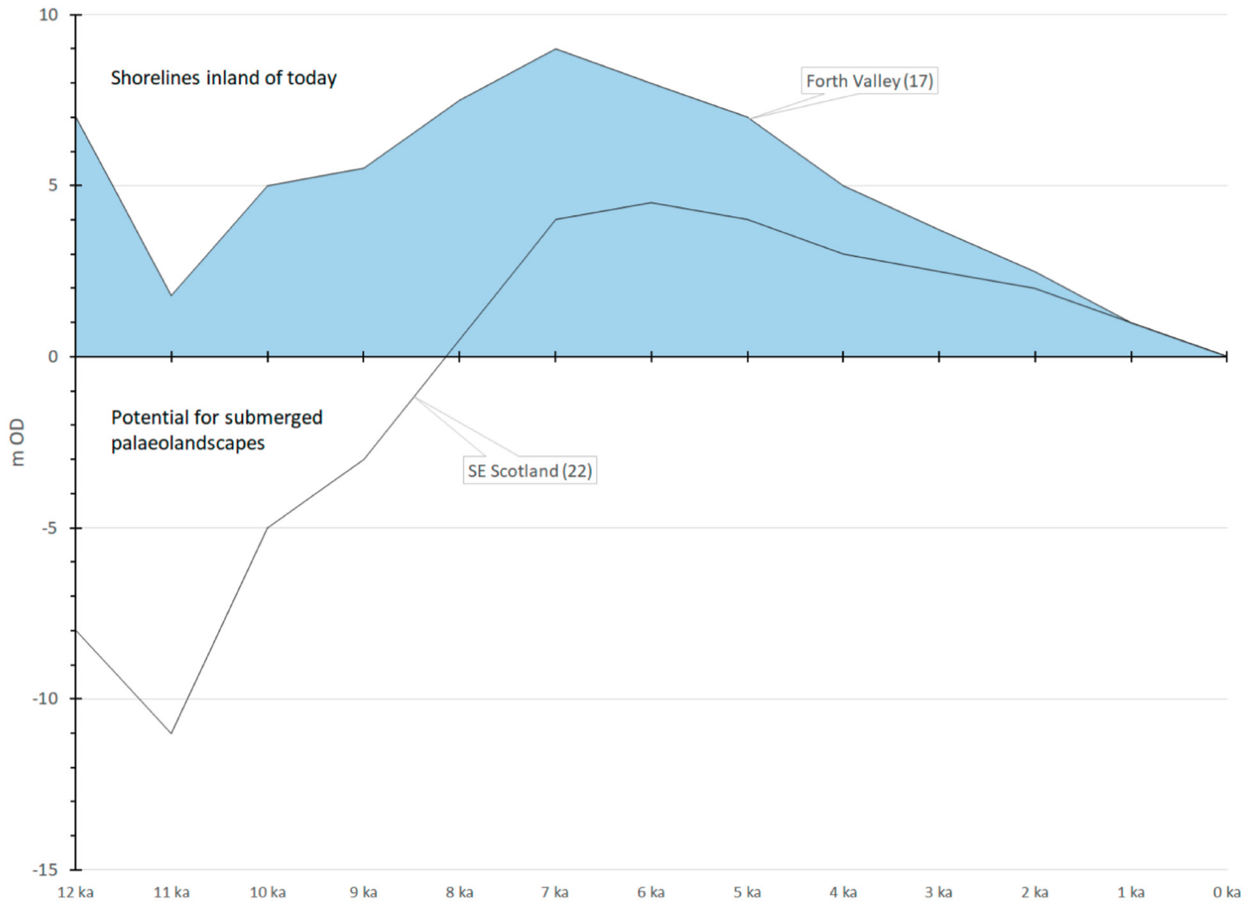
The Cramond site appears to lie between a landscape that has been emerging since the start of the Holocene and one with a more complex history of submergence followed by emergence. Before 8000 bp, relative sea levels are likely to have been lower in the immediate site environs and earlier Mesolithic sites may well have been lost to inundation.

At Cramond, useful landscapes can help define the configuration of the palaeolandscape during the Holocene, especially the raised tidal flats, terraces and raised marine deposits located around the mouth of the River Almond (Illus 2). Evidence for landscape changes during the Quaternary are also preserved underwater and offshore in the marine environment. At Cramond, 1970s borehole logs provide a useful transect of the sedimentary development of the (now) intertidal zone north of Cramond (Illus 2) and imply this occurred during the early Holocene.

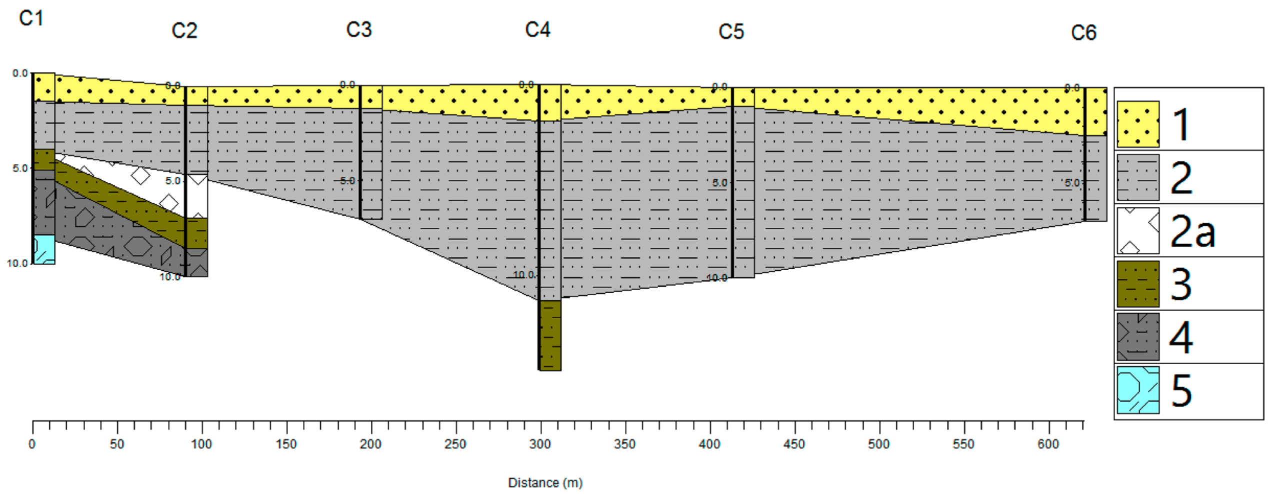
2.3.2 Early prehistoric palaeolandscape potential

The geotechnical records indicate a thick sequence of sediments that could be investigated in the future to provide a dated palaeoenvironmental evaluation of the coastal change at Cramond. A simple transect of inferred stratigraphy is presented here (Illus 4).

If these models of RSL are an informative guide, then these sequences of marine sediments may correlate with early Holocene phases of lower-than-now sea level (that is, before 8,000 years ago), generally contemporary with early prehistoric archaeological evidence nearby. The sequences, especially Unit 3, may reflect post-glacial marine transgression, perhaps with a palaeo-shoreline near borehole C4, roughly halfway to Cramond Island, several hundred metres across the intertidal zone. Detailed geochronological and palaeoenvironmental



Illus 3 Cramond relative sea levels. (© AOC Archaeology Group)



Illus 4 2D projected transect showing boreholes C1–C6. (© AOC Archaeology Group)

analysis of geotechnical samples would greatly inform an understanding of the palaeolandscape development during the early Holocene in this area and the relationship between the expanded position of the coast, Cramond Island and the early prehistoric lithic archaeology at Cramond.

Integrated geoarchaeological hypotheses can and should be tested further in Scotland and this would be recommended as a high-potential priority for the area around Cramond. The results of such studies would aid both the honing of RSL models (through local palaeoenvironmental records and identification of sea level index points) and the search for nationally significant early prehistoric archaeology and palaeolandscapes around Scotland's coasts.

2.4 Methodology

Two trenches (D and E) each measuring 4.5m by 2.0m were subject to a programme of hand excavation. All surviving archaeological deposits were fully excavated and recorded. Prior to excavation, both trenches were cleared of covering vegetation and re-deposited topsoil which had accumulated over the Mesolithic deposits during the previous winter. Lithic artefacts recovered during this initial cleaning were allocated to context numbers (1400) and (1500) from Trenches D and E respectively.

A 100% wet-sieving sampling strategy was implemented in order to retrieve fine fraction lithic artefacts, with environmental material recovered by flotation. In order to facilitate the potential for artefactual spatial distribution analysis (both vertically and horizontally) the trenches were gridded out and subdivided into metre squares. Each square was further subdivided into 0.50m quadrants. Each square was excavated in 5cm spits.

3. EXCAVATION

3.1 Trench D

The initial excavations undertaken by EAFS during 1993 and 1994 (Dean 1993, 1994) had revealed that a series of post-medieval and later 19th-century levelling and demolition deposits overlay the uppermost Mesolithic deposit (1401) to a depth of *c* 0.50m. The results of the 1995 excavations revealed two Mesolithic phases of deposition/activity overlying the C-horizon subsoil (1460).

3.1.1 Phase 1 (Illus 5a)

The primary excavated deposit was a mottled layer of dark-yellow and orange-brown clay sandy-silt (1424/1429), which covered the base of the trench in places to a maximum depth of 0.20m. This layer appears to represent the interface between the original ground surface (1401/1408) contemporary with the primary phase of Mesolithic occupation and underlying subsoil. The upper levels of this layer contained struck lithics.

This appears to represent the main phase of occupation and comprises a group of intercutting, shallow pits located within the centre of the trench and associated with a group of stake holes situated within the south-east corner of the trench (see Illus 6). The majority of deposits associated with the pit features contained quantities of burnt hazelnut shells and lithic material.

The primary pit [1430] within the sequence consisted of a shallow oval cut with irregular near-vertical sides. The pit was filled by two deposits of dark-brown clay sandy-silt (1420) and (1426). The feature was truncated by further pits [1425] and [1432] on both its western and eastern edges and was also partially truncated by a pit of post-medieval date excavated in 1994 by the EAFS.

A shallow pit [1432] was located along the eastern side of the primary pit [1430]; this feature was roughly oval in plan and was filled by a clayish sandy-silt deposit. The remains of a truncated, small semi-circular pit or post hole feature [1425] appeared stratigraphically contemporary with the pit. The eastern side of this feature had again been removed by the post-medieval pit. This pit/post hole feature was filled by a dark grey-brown sandy clay-rich silt, which again contained quantities of burnt hazelnut shells and struck lithics. Apparently contemporary with both of these features was a thin deposit of dark-brown clay-rich sandy-silt (1427) which overlay the western side of pit [1430].

Located to the east of the primary pit [1430] was the remains of a further shallow oval pit feature [1459]. The pit was heavily disturbed by an animal burrow, though an undisturbed fill of sandy clay-rich silt (1428) survived across the base and eastern side of the feature.

This central group of pit features was sealed under a roughly circular layer of mid-brown clay-silt (1409), which again produced quantities of burnt hazelnut shells and lithic artefacts.

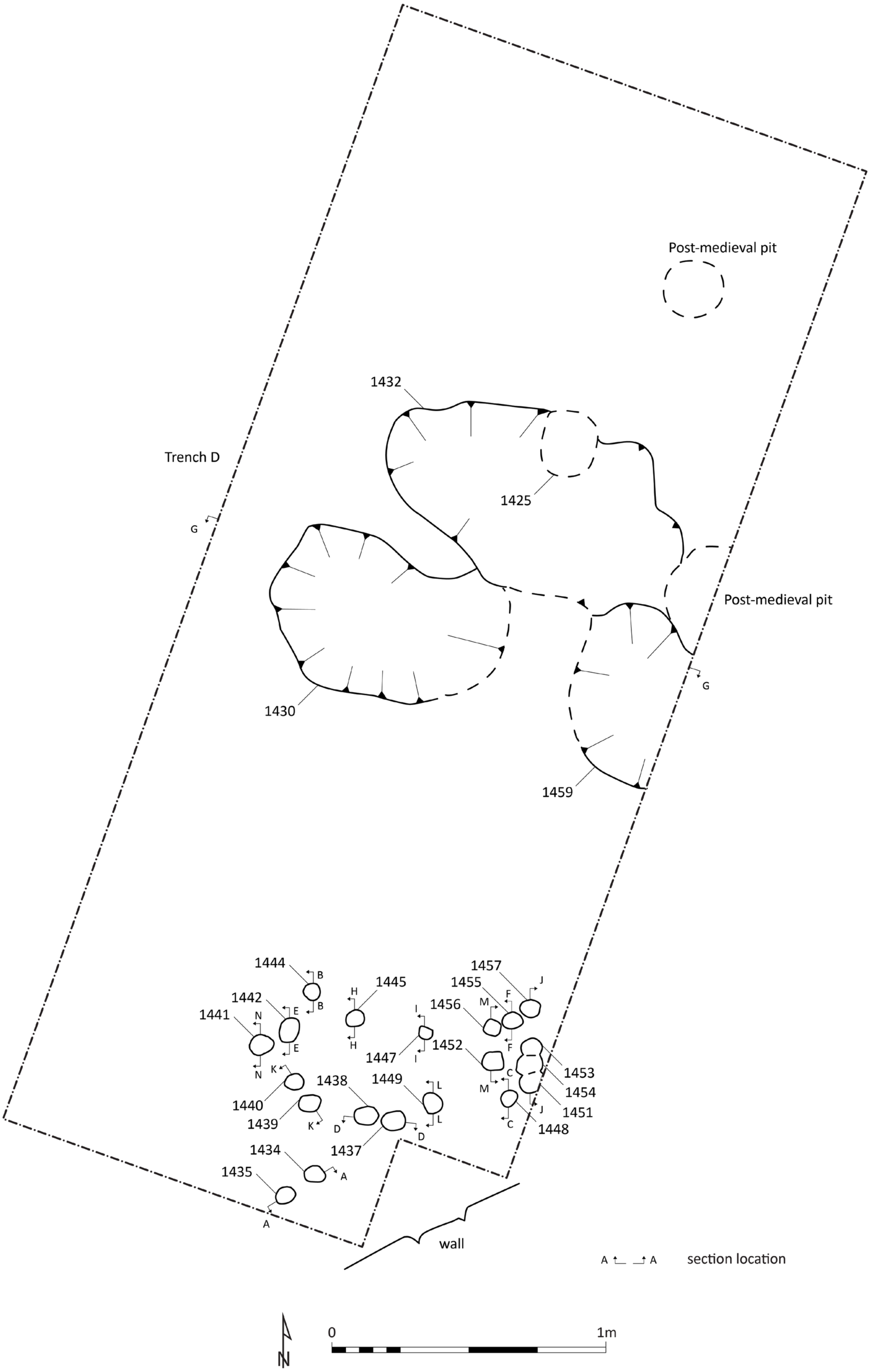
A cluster of 20 stake holes were located within the south-east corner of the trench (Illus 6). The stake holes all displayed similar dimensions (diameters ranging between 0.04m and 0.07m and depth between 0.04m and 0.15m) and were filled with a homogeneous sandy clay-silt. Eight of the stake holes contained the usual mix of lithic material and burnt hazelnut shell. The dense concentration of the stake holes, lack of discernible pattern and the limited scale of the trench excavation reduces the scope for any meaningful structural discussion.

The above features were sealed under a mixed buried soil of orange-brown sandy clay-silt (1401/1408), which ranged from 0.12m to 0.34m in depth. This layer contained the main concentration of lithic artefacts.

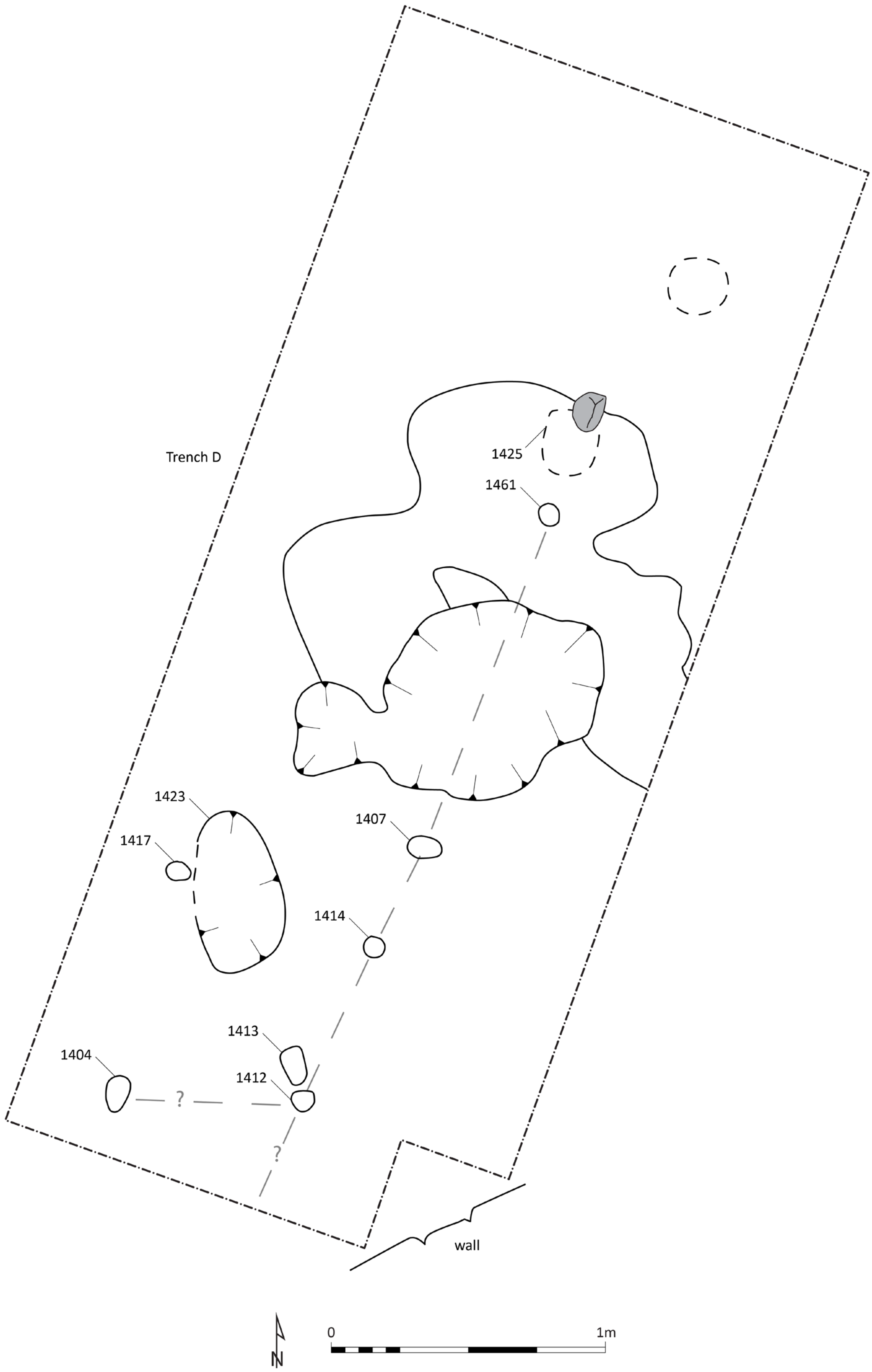
It is possible that this layer originally formed the ground surface associated with the above features rather than appearing to overlie them as was recorded during the excavation process. The general similarity between the fills of the above features and this layer is likely to have resulted in their late identification. Differences between the fills and layer (1401/1408) only really became apparent at the interface between (1401) and the lighter (1424/1429). This latter layer is therefore probably an artificial boundary reflecting a natural interface between the original ground surface and the underlying subsoil (1460).

3.1.2 Phase 2 (Illus 5b)

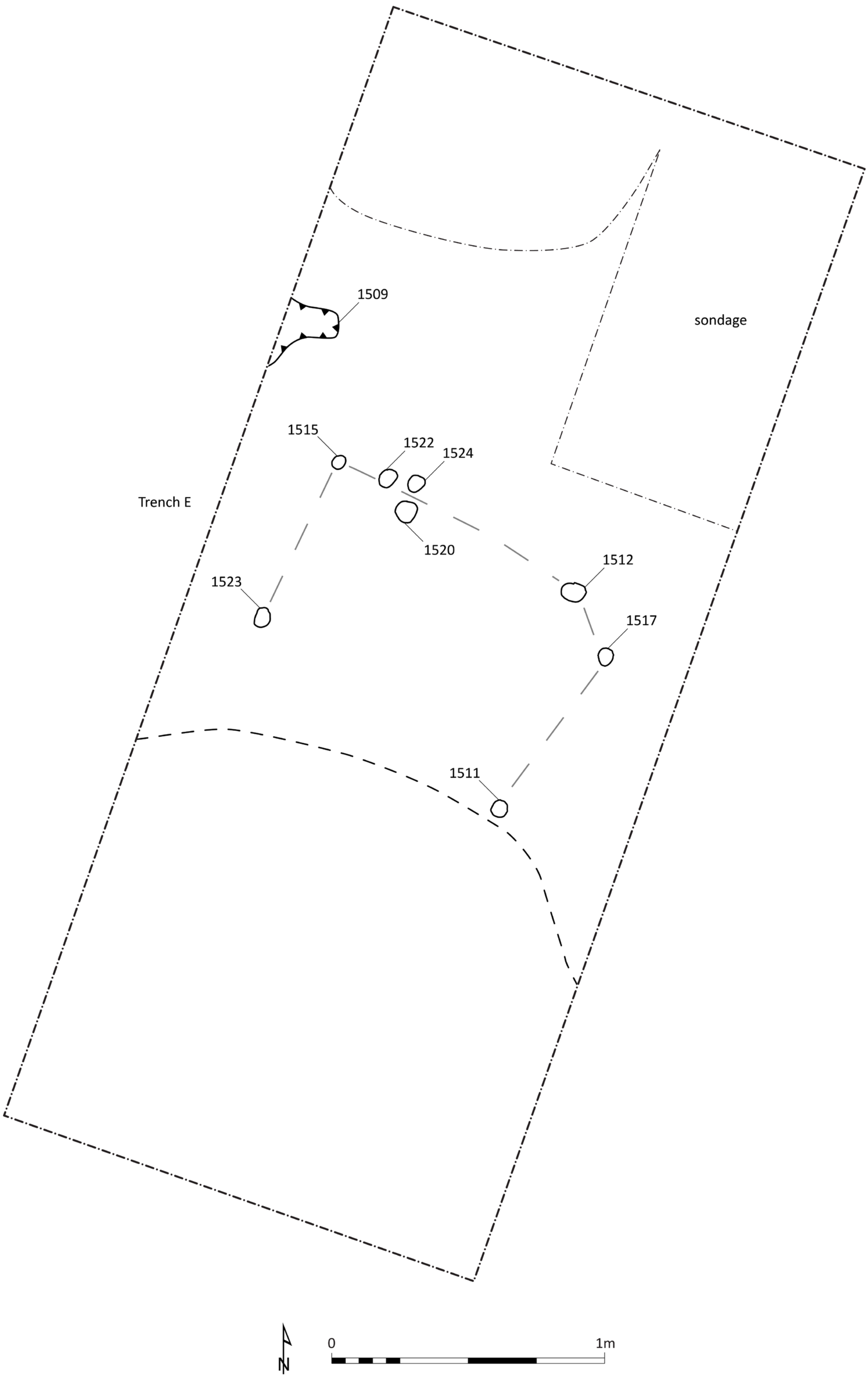
Cut into the surface of layer (1401/1408) was a group of seven undated stake holes of uniform size and depth (diameter 0.05–0.07m, depth 0.06–0.08m). Five of these stake holes [1407], [1412],



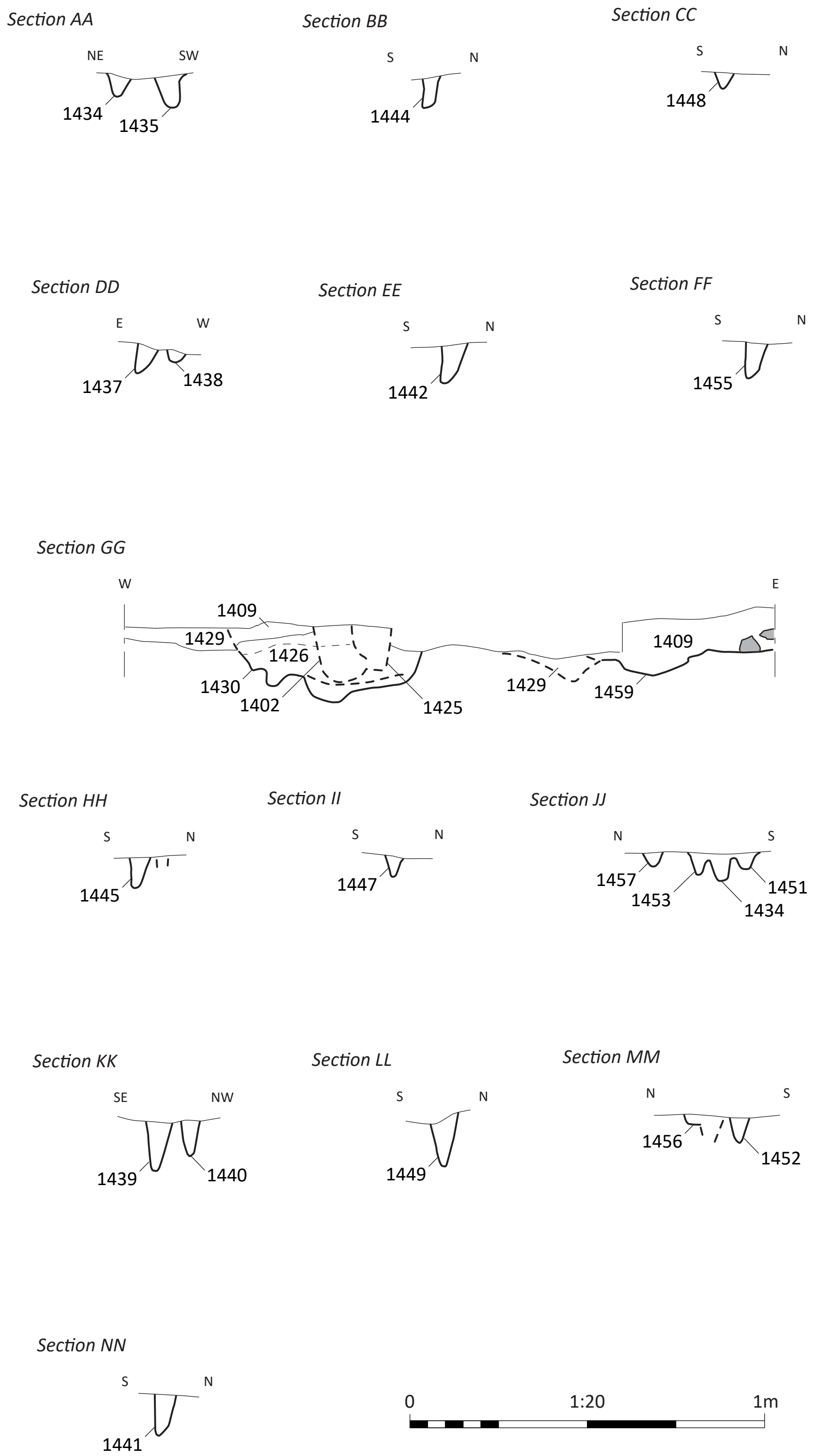
Illus 5a Trench D Phase 1. (© AOC Archaeology Group)



Illus 5b Trench D Phase 2. (© AOC Archaeology Group)



Illus 5c Trench E. (© AOC Archaeology Group)



Illus 6 Profiles of stake holes within Trench D. (© AOC Archaeology Group)

[1413], [1414] and [1461] clearly form part of a north/south fence-line running down the centre of the trench.

Located to the west of this fence-line was the possible truncated base of a small oval pit [1423]. The pit was filled by a dark grey-brown sandy silty-clay (1422), which contained a small quantity of lithic artefacts. It is possible that this feature relates to a secondary Mesolithic phase of occupation, though given the shallow nature of the feature and history of the site, a later date cannot be discounted.

3.2 Trench E

The results from the previous year's excavations undertaken by the EAFS had demonstrated that post-medieval activity on the site had had a demonstratable effect upon the survival of earlier deposits, and two post-medieval pits had truncated all such deposits from the southern half and north-west corner of the excavation trench (Illus 5c). In addition, a sondage was also excavated within the north-east corner of the trench to assess the character of Mesolithic deposits when first discovered in 1994.

The 1995 excavations revealed a single phase of activity, and the earliest deposit was a thin (0.02m thick) layer of mottled brown clay-silt directly overlying the C-horizon subsoil. This deposit is a continuation of the layer (1424/1429) identified in Trench D.

A total of eight stake holes and a small-pit/post hole was recorded cutting into the deposit (1506). The stake holes were all circular in plan (with diameters of 0.06–0.08m), with six of the features forming a north-west/south-east alignment across the trench, with two further features [1511] and [1523] appearing off-set to the south.

Located to the north-west of this group of stake holes, and partially underlying the western baulk, were the truncated remains of an irregular-shaped pit/post hole [1509]. This feature was filled by a deposit of dark-brown silty-sand (1508), containing charcoal and lithic material.

Three deposits of mid-brown, sandy clay-silt (1504/1505, 1502, 1501) were recorded across the trench, most probably representing variations within the same general layer. The lowest of these deposits (1504/1505), overlying natural geology, was situated in the centre of the trench to a depth of 0.04m. The uppermost deposit (1501) occurred as an irregular, almost circular, spread overlying the eastern side of the trench to a maximum depth of 0.11m. This upper deposit appears to mirror the underlying group of stake holes, though this effect may be superficial and a result of post-medieval truncation of the site.

4. THE LITHIC ARTEFACTS

Alan Saville

In total some 3,500 lithic artefacts were examined for this report. These were recovered during various episodes of archaeological work undertaken at Cramond from 1971 to 1995. Most of these artefacts were recovered from the targeted 1995 excavations in Trenches D and E, with over 80% (n = 3,179) of the total from Trench D alone. Each artefact was macroscopically examined and recorded. A full catalogue is given in Appendix 1 of the site archive. Wet sieving, using a fine mesh, of most of the contexts excavated in 1995 resulted in the retention of all small spalls and chips and other minute fragments of struck lithic artefacts, and these rather dominate the assemblage. Pieces less than 3 to 4mm in size were excluded from the catalogue unless they exhibited retouch.

The Cramond lithic assemblage is of particular interest because of its association with the carbonised hazelnut shells, several of which were radiocarbon dated to around 8400 cal bc. These are the earliest absolute dates returned so far for Mesolithic presence in Scotland. The contexts dated all came from features in Trench D, and the artefacts they contained are listed in Table 1. These artefacts serve to characterise the Mesolithic lithic assemblage sufficiently to permit extrapolation to all the lithic material recovered from the 1995 Trench D contexts labelled from (1400) onwards. The lithic assemblage from these contexts diagnostically matches those from the dated contexts exactly and can be regarded as the basic, uncontaminated Cramond Mesolithic sample of 2,771 artefacts. This sample is itemised in Table 2 and forms the basis for the following analysis. By far the most prolific context was (1401), the general 'old ground surface' horizon, which contained 1,487 artefacts (53.6% of the total). Apart from the contexts listed in Table 1, the other contexts producing significant numbers were 1400 (12 artefacts), 1408 (67 artefacts), 1420 (32 artefacts), 1422 (17 artefacts), 1424 (120 artefacts), 1428 (21 artefacts) and 1429 (234 artefacts). All the remaining contexts with artefacts contained fewer than ten artefacts each.

4.1 Raw material

The Cramond sample is dominated by the use of Southern Uplands type chert, mostly of the blue/green-grey coloured variety with a smaller presence of the purple-grey type. This chert has been exploited chiefly from non-gravel, non-riverine sources displaying angular and relatively unabraded external surfaces, though a small number of pieces of chert do exhibit rounded, smooth cortical exteriors indicating a gravel or river-bed derivation. Many of the cores, core fragments and flaked lumps exhibit stained matt surfaces representing fracture zones within the original chert seams. Other varieties (of varying grain size and consistency) and colours (brown, dark grey, black and spotted) of chert are present in small numbers, presumably

Table 1 Artefacts from contexts dated by radiocarbon determinations

Type	Context 1402	Context 1409	Context 1426	*Total*
Unretouched flakes	39	526	128	*693*
Core fragments	0	3	0	*3*
Flaked lumps	0	3	0	*3*
Microliths	1	12	10	*23*
Microburins	0	7	9	*16*
Lamelles à cran	0	1	0	*1*
Scrapers	0	3	2	*5*
Miscellaneous retouched pieces	4	20	5	*29*
Unclassified burnt pieces	1	4	0	*5*
Total	*45*	*579*	*154*	*778*

Table 2 Artefacts from Trench D contexts excavated in 1995

Type	Chert	Flint/ Chalcedony	Quartz	Baked mudstone	Quartzite	*Total*
Unretouched flakes	2114	412	31	1	2	*2560*
Cores	9	2	0	1	0	*12*
Core fragments	12	0	1	0	0	*13*
Flaked lumps	9	0	0	0	0	*9*
Microliths	49	17	0	0	0	*66*
Microburins	36	14	0	0	0	*50*
Lamelles à cran	2	0	0	0	0	*2*
Scrapers	13	3	0	0	0	*16*
?Piercers	2	0	0	0	0	*2*
Serrated edged flake	1	0	0	0	0	*1*
Truncated blade	1	0	0	0	0	*1*
Edge-trimmed flake	2	1	0	0	0	*3*
Miscellaneous retouched pieces	14	4	0	0	0	*18*
Unclassified burnt pieces	14	4	0	0	0	*18*
Total	*2278*	*457*	*32*	*2*	*2*	*2771*
Percentage	82.20	16.49	1.15	0.07	0.07	

reflecting the opportunistic use of any suitable (ie flakeable) cherty material.

The flint, usually light-to-medium grey in colour but with some brown and cream examples, is more problematic to characterise. It all occurs in the form of derived small pebbles with smooth exteriors, but much of it may in fact be a chalcedonic silica (chalcedony for brevity), rather than the specific raw material of Cretaceous chalk derivation that archaeologists usually mean by flint. That is to say that the silicious rock identified here as flint/chalcedony almost certainly includes materials of divergent diagenesis and geological (and geographic) context of formation. Identification is complicated by the very small size of the average artefact and its lack, or insignificant retention, of cortex. Apart from the fact that 43 artefacts were sufficiently enigmatic in appearance to be listed as of unidentified raw material (one piece was subsequently identified as a spotted hornfels; Suzanne Miller pers comm), many of the flint and chert artefacts are listed in the catalogue with a qualifying question mark, and it would be misleading to suggest anything other than relative accuracy in the indicated proportion of chert to flint/chalcedony in the sample.

Artefacts of milky-white pebble quartz, with rounded water-worn external surfaces (but of vein quartz origin), form a small element within the sample. Although many of the quartz pieces are borderline artefacts, without absolutely clear striking platforms or other diagnostic features, there are some undoubtedly struck pieces which indicate that quartz was on occasion utilised. The two quartzite flakes, from different cores, are definitely struck, but it is uncertain whether they reflect purposeful knapping for flakes or the modification of quartzite cobbles or blocks for other reasons. The baked mudstone (green/grey/buff/brown in colour) was clearly available, on the evidence of one of the cores (Illus 7: 509), in the form of water-worn pebbles, and was regarded as a suitable raw material for the manufacture of microliths (Illus 8: 638, 1753), though it appears on the whole to have been a rare commodity.

The raw material type used for implements is roughly in accord with the proportions of different raw materials in the overall assemblage, though it could be argued that the figures suggest an underlying preference for flint/chalcedony over chert in the case of microliths/microburins (ie the flint–chert ratio is 1:5.1 overall, and 1:2.8 for microliths/microburins).

In terms of acquisition, it is clear that the flint/chalcedony, quartz, baked mudstone, quartzite, and some of the chert was collected in pebble form from gravel or riverine sources, presumably from superficial exposures which are likely to have been available relatively close to the site at Cramond. The bulk of the chert was not collected in this way and may conceivably have been quarried (Warren 2001: 218–25). Suitable occurrences are insufficiently well researched to speculate on origin but there are certainly possibilities for sources within the Lothians (Wickham-Jones & Collins 1978).

4.2 Typology

4.2.1 Cores and unretouched flakes

The 12 cores in the 1995 excavated sample are all small platform cores, intended principally for the production of bladelets. In terms of conventional typology, six are basically single-platform (A2) cores (Illus 7: 887, 573 & 618), four are two-platform cores (Illus 7: 399 & 1944), and three have three or more platforms (Illus 7: 140). The weight range is from 4.1 to 27.1g (mean 12.4g; standard deviation 6.76), the maximum dimension range is 21.7 to 38.5mm (mean 29.7mm; standard deviation 5.12), and the maximum surviving flake scar length range is 11.3 to 26.3mm (mean 20.7; standard deviation 4).

Core rejuvenation flakes are frequent, removing both platform fronts and platform edges (Illus 9: 710, 2237, 4020). Distinctive preparation of platform front edges is clear from the number of flakes/blades with abrasion on the dorsal face of their proximal ends.

Faceting of platforms is very rare, and only nine examples were noted from the sample. Flakes with shattered platforms are quite common, also some with acute linear platforms, though in only one or two instances did this hint at anvil flaking, for which there was otherwise little positive evidence. No hammerstones or abraders were recovered from the excavations.

The core fragments and minimally flaked lumps add nothing to the typological picture gained from the complete cores, except in the case of a very small fragment of what appears to be a bipolar scalar-type anvil-struck core (2125 from context 1409). This example is in white quartz, and the method of reduction in this case presumably reflects the relative intractability of the raw material.

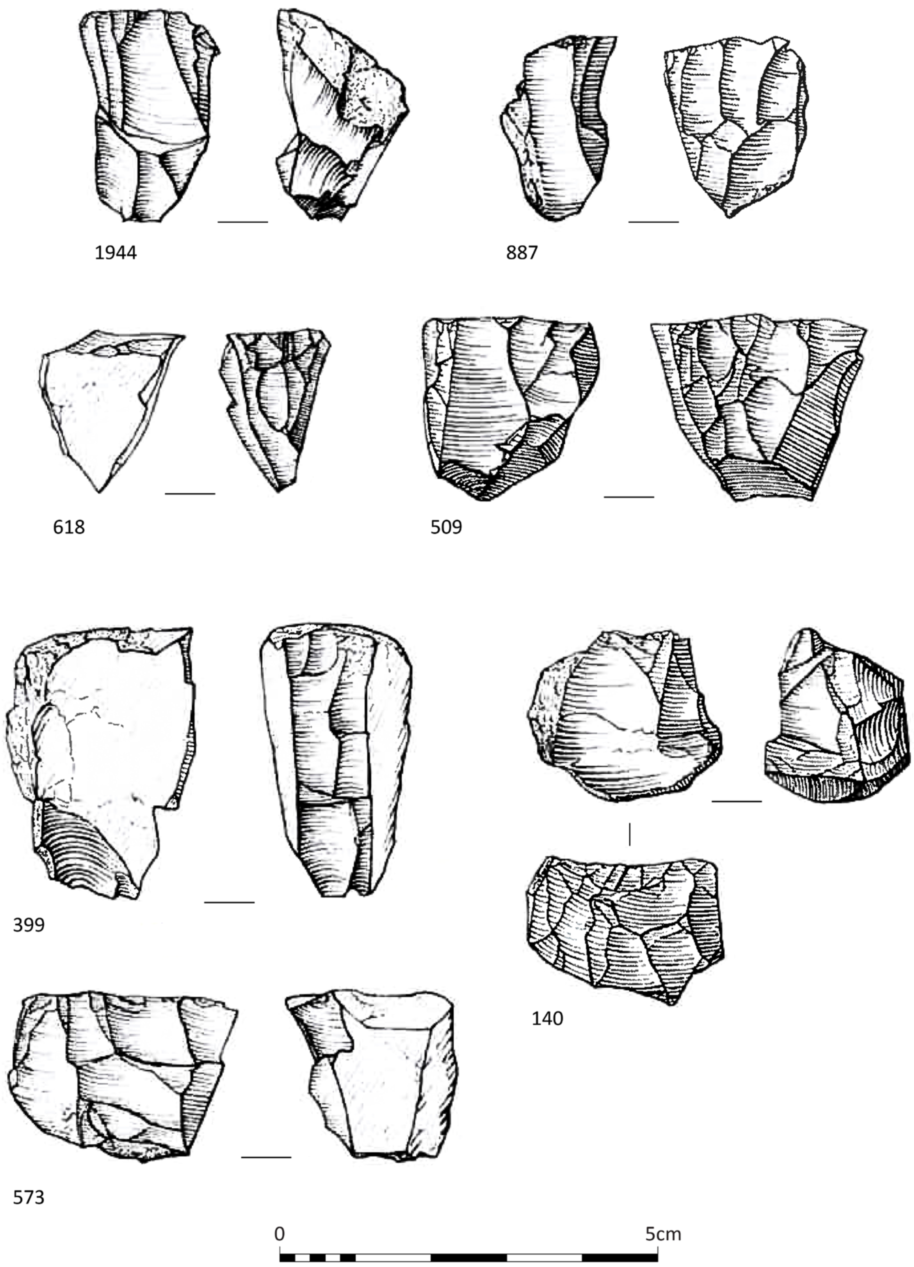
The overall total of 2,560 unretouched flakes recovered from the excavations of Trench D included 677 (26.4%) pieces recorded as complete. These comprise seven primary flakes, 160 secondary flakes and 510 tertiary flakes, with a combined weight of 281.4g. The mean weight of 0.4g is a good pointer to the very small size of most of these flakes, and when measured only 64 (9.5%) of the complete flakes were longer than 20mm, the dimension above which metrical data are normally used to indicate shape characteristics. As previously explained, the large number of small-size flakes – really spalls, chips or other micro-debitage – results from the high level of recovery obtained by wet sieving.

The sub-sample of 64 complete flakes 20mm or longer (comprising 51 chert, 8 flint/chalcedony, 3 unknown, 1 quartz and 1 quartzite examples) was analysed in the usual way, as shown in Tables 3 & 4, but it is really too small a sample to give a satisfactory picture of the intended product of on-site reduction. In particular, although there is a lamellar index (L/B 1.5 or above) for the sub-sample of 61%, the data in Table 4 under-represent the blade-like nature of much of the flake product, which is otherwise clear from consideration of the cores, the broken flakes/blades and the implements, especially the microliths. Some of the few examples of unretouched blades are illustrated as a corrective to this picture (Illus 9: 574, 844, 805, 831, 4608, 1211, 1217, 1225).

4.2.2 Microliths, microburins and *lamelles à cran*

Most of the 66 microliths in the sample are unclassifiable fragments. The 30 more complete examples could be classified as follows:

- 16 scalene triangles (Illus 8: 638, 1815, 1442, 2089, 766, 764, 1599, 3776, 3854, 2583, 2541, 3953, 4592)



Illus 7 Platform cores. (© AOC Archaeology Group)

Table 3 Complete unretouched flakes: length

Length (mm)	Primary	Secondary	Tertiary
20–30	2	28	21
30–40	1	9	3
Total	*3*	*37*	*24*

Table 4 Complete unretouched flakes: length/breadth index

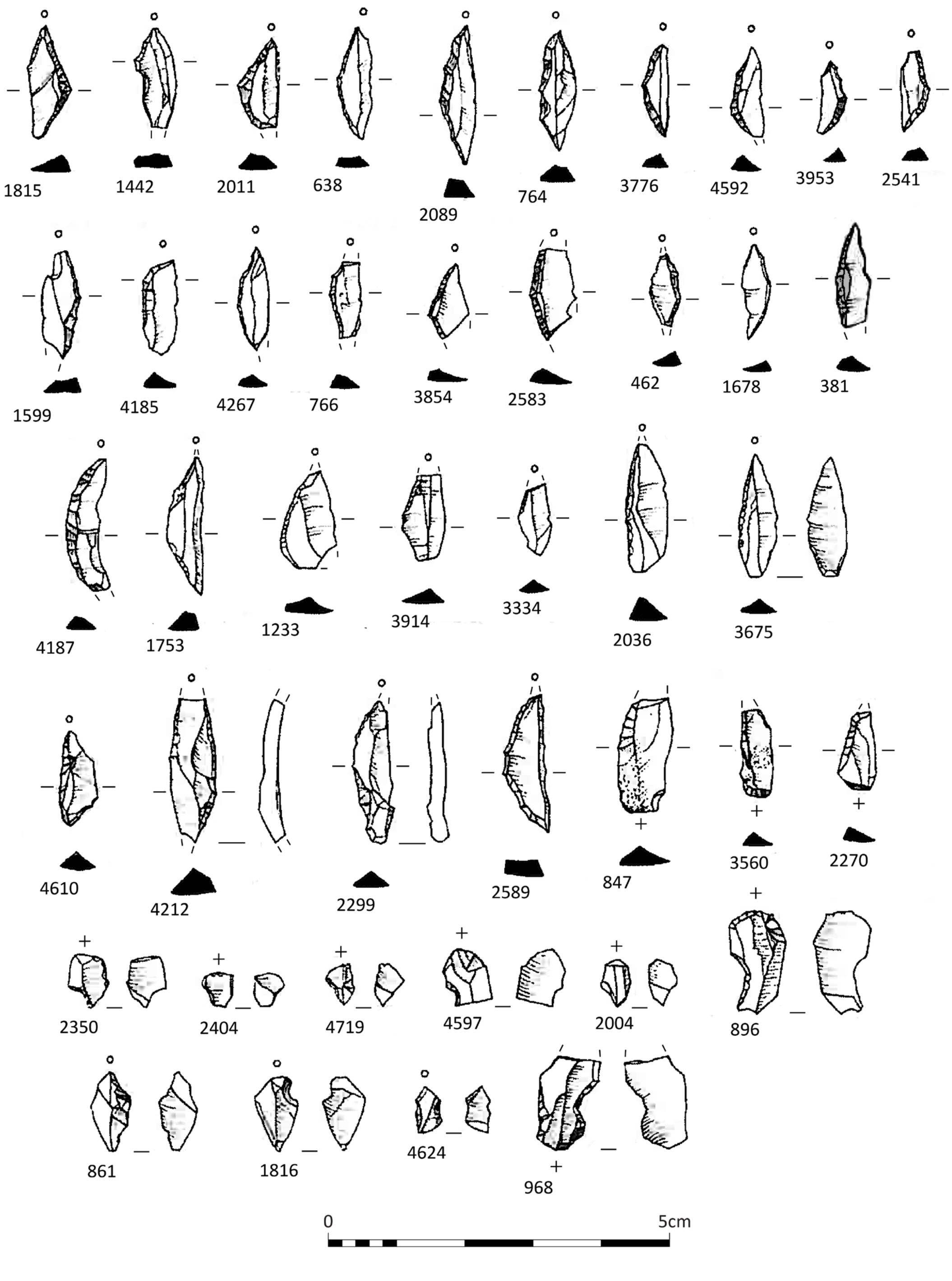
L/B index	Primary	Secondary	Tertiary	Shape
>2.6	0	2	6	Very narrow
2.5–2.1	0	2	2	Narrow
2.0–1.6	0	13	9	Medium/narrow
1.5–1.2	3	15	5	Medium/broad
1.0–0.6	0	5	2	Broad
<0.6	0	0	0	Very broad
Total	*3*	*37*	*24*	

- 2 crescents (Illus 8: 1678, 1753)
- 4 obliquely blunted points (Illus 8: 2036, 3334, 3914, 1233)
- 1 obliquely blunted point with inverse basal retouch (Illus 8: 3675)
- 1 edge-blunted point (Illus 8: 4610)
- 6 atypical (Illus 8: 2299, 2270, 847, 3560, 2589)

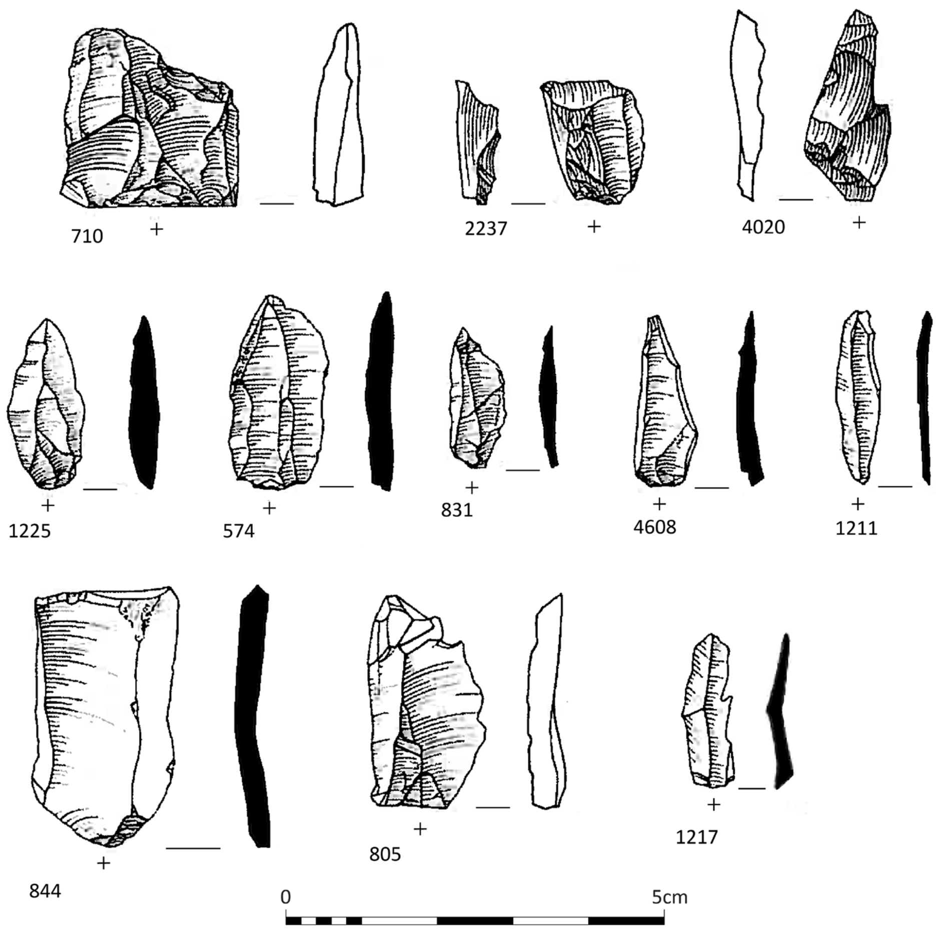
While this is only a small sub-sample, it does give a clear indication of the basic microlith typology, which is narrow-blade and predominantly 'geometric', and this picture is not contradicted by the apparent form of any of the unclassifiable fragmentary pieces. The scalene triangles include several which are borderline triangle/crescent and vice versa with the crescents, but it is significant that the definite triangles are all narrow and scalene, not in any sense small versions of isosceles or equilateral forms. The obliques are not broad types nor always simple (eg Illus 8: 764 has additional retouch), and one example (Illus 8: 3675) has inverse basal retouch on what appears to have originally been a rounded base, now slightly damaged. The atypical forms include two bladelets with oblique blunting (Illus 8: 2270, 847), and a crescentic form which has a naturally blunt right edge (Illus 8: 2589). Bi-directional anvil or enclume retouch is rare among the Cramond microliths, Illus 8: 2089 being one of the few examples to show this trait. Blunting of the left edge of the microlith blanks is, as usual, more common than on the right.

Fifteen of the microliths are complete enough to use for measurement (comprising 10 scalene triangles, 1 crescent and 4 obliques). The weight range is 0.0 to 0.3g (mean 0.15g), the length range is 8.5 to 21mm (mean 14.7mm; standard deviation 3.3), the width range 3.6 to 7.5mm (mean 4.9mm; standard deviation 1.04), the thickness range is 1.5 to 3mm (mean 2.1mm), and the length/breadth index range from 1.4 to 4.7 (mean 3.1; standard deviation 0.84).

The 50 microburins in the sample subdivide into 28 butt types (Illus 8: 896, 2004, 2350, 2404, 4719), 20 tips (Illus 8: 1816, 861), and one double (Illus 8: 4624). Three of the butt types have a typical straight-snap truncation rather than an oblique one and may thus be miss-hits (Illus 8: 4597). All but one of the butt types have the notch on the left side, and all the tip types have the notch on the right side, except one atypical example which has the notch worked inversely from the dorsal rather than the ventral surface. The double example is anomalous and may betoken a 'second go' after



Illus 8 Microliths and microburins. (© AOC Archaeology Group)



Illus 9 Core rejuvenation flakes, bladelets and flakes. (© AOC Archaeology Group)

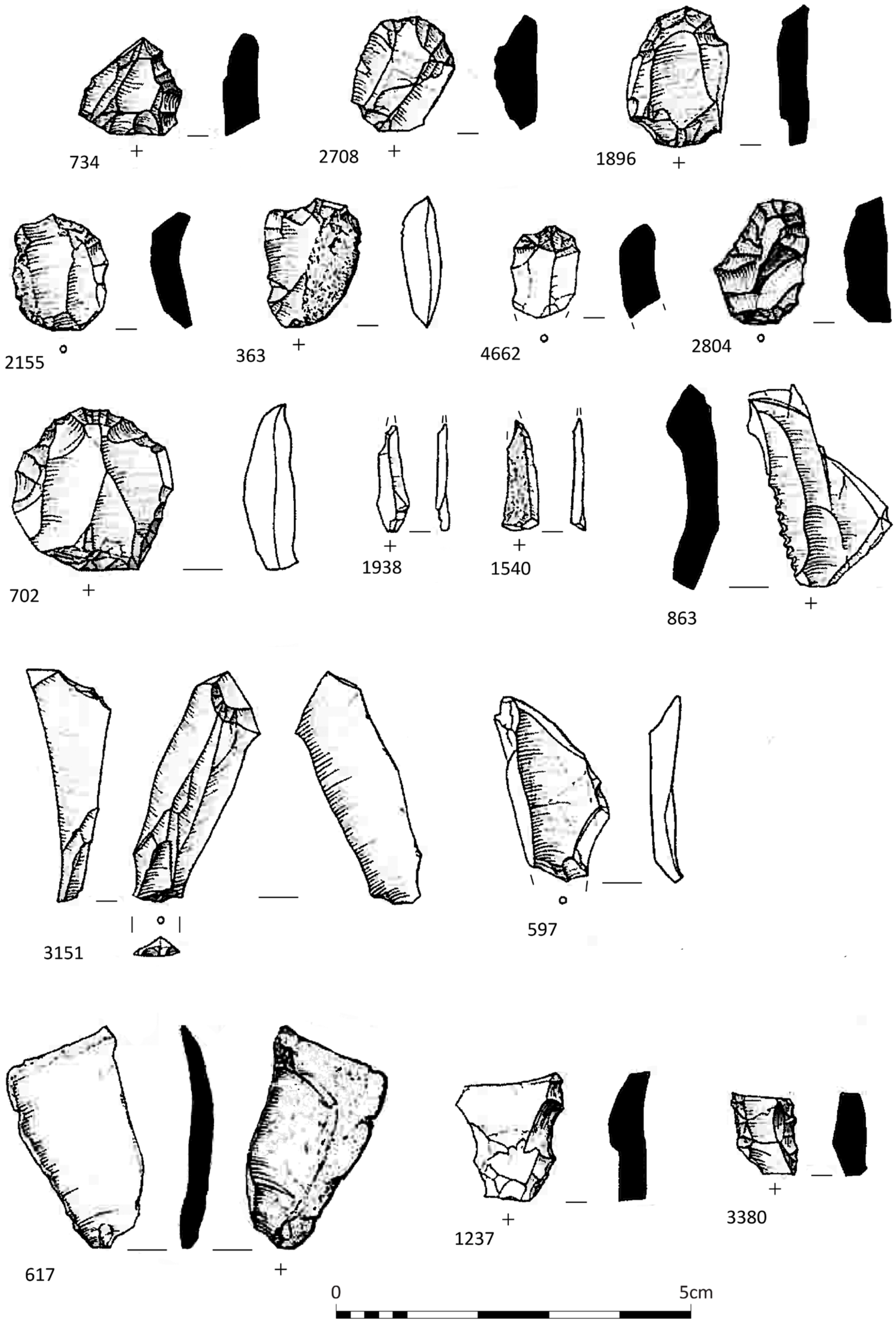
an initial miss-hit failure. The average size of the microburins is extremely small; only five are larger than 10mm and four are only 4mm or less. Of the 30 butt types, the mean length is 7mm, the mean width 6mm; and of the 20 tip types the mean length is 8mm and the mean width 5mm.

There are two notched bladelet segments (*lamelles à cran*) with a snap above the notch which probably represent microburin/microlith miss-hits (Illus 8: 968).

4.2.3 Scrapers

The 16 scrapers are all 'short' examples on flakes or blade segments. Typologically they comprise 11 end scrapers (Illus 10: 702, 1896, 363, 4662, 2708), one end-and-side, one double end (Illus 10: 2155), one side (Illus 10: 734), one atypical (Illus 10: 2804) and one unclassified fragment. Thus, end scrapers predominate, and are sometimes on blanks with the bulbar end either accidentally or deliberately snapped off (Illus 10: 4662). Most are simple convex-edged examples with semi-abrupt retouch; angular or overhung edges are rare. Many of the scrapers are 'classic' Mesolithic forms, such as the atypical extensively edged example (Illus 10: 2804), the side scraper (Illus 10: 734), and some of the end scrapers (eg Illus 10: 1896, 4662), while more refined types (eg Illus 10: 702) are unusual.

Only ten of the scrapers were intact enough for measurement. The weight range is from 1.2 to 3.9g (mean 1.8g; standard deviation 0.8); the length range is from 13.2 to 22.5mm (mean 17.5mm; standard deviation 2.66); the width range from 13.2 to 22mm (mean 15.2mm; standard deviation 2.47); the thickness range from 4.5 to 7.9mm (mean 6mm; standard deviation 1.2); and the length/breadth index range from 0.9 to 1.4 (mean 1.2). There is a



Illus 10 Implements. (© AOC Archaeology Group)

distinct uniformity here, obviously conditioned to a degree by the potential size given the character of the raw material exploited.

4.2.4 ?Piercers

Only two possible piercing tools were identified. One (Illus 10: 1938) is a small bladelet spall, obliquely blunted at the tip; the other (Illus 10: 1540) is again a bladelet, with slight retouch at the top right-hand side below the broken tip. The latter is reasonably robust while the former is perhaps too fragile to have functioned as a piercer.

4.2.5 Serrated-edge flake

There is one irregular plunging flake of chert with eight coarse indentations along a length of 13mm on the lower left edge (Illus 10: 863). This retouch is more akin to tools sometimes described as 'saws' rather than to micro-denticulates.

4.2.6 Truncated flake

A plunging core rejuvenation flake of unusual orange chert has been truncated at the proximal end (Illus 10: 3151). There is very slight trimming or utilisation on the upper left side inversely, and associated edge-gloss on both dorsal and ventral faces.

4.2.7 Edge-trimmed flakes

There are only three examples, and they have relatively minor trimming and/or utilisation modification. Two of these are 'edge' tools (Illus 10: 597), the third is a bladelet with an area of both dorsal and inverse trimming on the left side.

4.2.8 Miscellaneous retouched pieces

This catch-all category for all those modified pieces which cannot otherwise be classified will inevitably include numerous fragments of microliths, microburins, edge-trimmed flakes and scrapers. The only obvious fragments of implement types which are not otherwise represented in the sample are two instances of proximal blunted blade segments, one with unilateral blunting (Illus 10: 1237), the other with bilateral blunting (Illus 10: 3380).

4.3 Distribution

Most of the contexts excavated in 1995 from Trench D were removed on a grid of 36 0.5m × 0.5m squares. In all 2,842 lithic artefacts could be assigned to squares. The highest total in any one square was 251, the lowest 15 (mean 79; standard deviation 48.48). The densest areas of the distribution correspond approximately with the central 'pit' features [1430], [1432] and [1459], and with the clustering of stake holes at the south end of the trench (see Illus 5a, 5b & 5c). The fact that a significant proportion of the artefacts are in contexts that represent the fills of features means that the distribution cannot be analysed in a simplistic fashion as indicative of horizontal discard across a flat surface, but in fact there is little obvious patterning to be observed when the distributions of the different types of artefact are examined, other than that the cores and core fragments are predominantly at the south end of the trench. The distribution of microliths and microburins mirrors the overall distribution pattern.

The number of unclassified burnt pieces in the sample is quite low at 23 (0.8%), which suggests the absence of any hearths or fire-pits in the immediate vicinity. There were in addition a further 83 classified artefacts which exhibited signs of burning to a lesser or greater degree, and the combined distribution of these and the unclassified burnt pieces perhaps hints that a focus for burning may exist further to the south of the trench.

4.4 Other Trench D contexts

The main sample obtained from the 1995 excavations in Trench D can be supplemented by the 173 artefacts recovered from the excavation of more superficial contexts in 1993 (contexts numbered 350 onwards), which are listed in Table 5. Significant here are the additional ten cores, compared to 137 flakes, probably an artificial bias created by the lack of sieving and the selective recovery of larger pieces during excavation by hand. However, there is clearly some chronological admixture in the material from these contexts, most obvious in that a core, a core fragment and a flaked lump are of completely fresh flint relating to significantly post-Mesolithic knapping and deposition. This means that evaluating the artefacts from these contexts in terms of Mesolithic activity must be restricted to those pieces which are distinctively Mesolithic typologically and which in terms of condition are in character with those from the main sample. Effectively this restricts analysis to the microliths, microburins, scrapers and some of the cores.

The two microliths comprise one edge-blunted or large crescent form (Illus 8: 4212), with blunting on the convex right-hand side, and one unclassified fragment. The microburins (2924) and (2998) are both butt types notched on the left-hand side and the scrapers comprise one double-side type (2925) and one atypical side scraper (3060). The distally truncated flake (3061) is a very small and thin proximal segment and its status as an implement remains uncertain.

The cores which are definitely Mesolithic types include a small flake core (2992) and a core on a large lump of grey-green chert (3012), which with a weight of 43g and a maximum dimension of 49mm gives an indication of what appears to be the largest size of raw material being brought to the site. Intriguingly there is one three-platform flake core (3049) on a white quartz pebble from context 363 but this cannot be ascertained as definitely Mesolithic.

4.5 Trench E

This trench produced a small collection of 235 pieces from the contexts excavated in 1995, and a further 34 pieces from those more superficial contexts excavated in 1993 (Tables 6 & 7). The former (contexts 1501 etc) seems to represent exclusively Mesolithic material, while the latter (contexts 400 etc) are clearly contaminated with later items, most obviously the gunflint (3305, context 400) and the strike-a-light (3308, context 401).

The seven microliths comprise three unclassified fragments, a scalene triangle (Illus 8: 4185), and three crescents (Illus 8: 381, 462, 4187), and the two microburins are both butt types ((3117) and (3225)), notched on the left-hand side, of which one is a straight-snap type.

The marked fall-off in density of Mesolithic artefacts and the absence of features to the north of Trench D confirms that the focus of Mesolithic settlement activity appears spatially restricted, though the distribution of both artefacts and features may have been heavily impacted on by later activity.

4.6 Other trenches and casual finds

The small number of lithic artefacts found elsewhere at Cramond is summarised in Tables 8, 9, 10 & 11.

Table 5 Artefacts from Trench D contexts excavated prior to 1995

Type	Chert	Flint/ Chalcedony	Quartz	Baked Mudstone	Quartzite	*Total*
Unretouched flakes	105	23	7	1	1	*137*
Cores	8	1	1	0	0	*10*
Core fragments	5	1	0	0	0	*6*
Flaked lump	0	1	0	0	0	*1*
Microliths	0	2	0	0	0	*2*
Microburins	2	0	0	0	0	*2*
Scrapers	2	0	0	0	0	*2*
Truncated flakes	1	0	0	0	0	*1*
Misc retouched pieces	6	1	0	0	0	*7*
Unclassified burnt pieces	1	0	0	0	0	*1*
Total	*130*	*29*	*8*	*1*	*1*	*169*
Percentage	77	17.2	4.73	0.6	0.6	

Table 6 Artefacts from Trench E contexts excavated in 1995

Type	Chert	Flint/ Chalcedony	Quartz	Baked mudstone	*Total*
Unretouched flakes	156	49	11	1	*217*
Cores	3	0	0	0	*3*
Core fragment	1	0	0	0	*1*
Flaked lump	1	0	0	0	*1*
Microliths	3	2	0	0	*5*
Microburins	1	1	0	0	*2*
Scraper	1	0	0	0	*1*
Miscellaneous retouched pieces	4	0	0	0	*4*
Total	*170*	*52*	*11*	*1*	*234*
Percentage	72.65	22	4.7	0.5	

Table 7 Artefacts from Trench E contexts excavated prior to 1995

Type	Chert	Flint/ Chalcedony	Quartz	*Total*
Unretouched flakes	11	8	0	*19*
Cores	2	1	0	*3*
Core fragments	3	0	1	*4*
Microliths	1	1	0	*2*
Scraper	1	0	0	*1*
Strike-a-light	0	1	0	*1*
Gunflint	0	1	0	*1*
Miscellaneous retouched pieces	1	2	0	*3*
Total	*18*	*14*	*1*	*34*

The single additional microlith (Illus 8: 4267), from Trench G (context 510), is a near-complete scalene triangle. Otherwise, this material is of very mixed character and probably spans a wide chronological range. Two artefacts which could be Mesolithic, and which would expand the typological range available in the sample, are a worn-edge piece (Illus 11: 5017), found in 1986 (unstratified), and a flint miscellaneous retouched piece which is probably a damaged 'long' end-of-blade scraper (3338, unstratified), found in 1976.

Black pitchstone is not represented in the Mesolithic sample but from elsewhere there are three pieces: unretouched flakes from Trench III in 1975 (3452) and Trench A in 1988 (3343), and a fine unretouched blade (Illus 11: 5000) from Trench I in 1976. It is not impossible that any of these pieces could relate to Mesolithic activity, but it is inherently more likely that they are of later (Neolithic/Early Bronze Age) date in terms of our current understanding of the use of this Arran-derived raw material (Saville 2003: 345–6). The baked mudstone flake from Trench F in 1995 is a miscellaneous retouched piece with minor retouch on the right-hand edge of what is the distal part of a broad blade with a hinged terminal. In contrast to the lighter mudstone from the Mesolithic sample, the colour of this artefact is grey-black, and it cannot necessarily be seen as Mesolithic either.

Table 8 Artefacts from Trenches A, B and C: all contexts

Type	Chert	Flint/ Chalcedony	Quartz	Pitchstone	*Total*
Unretouched flakes	19	18	2	1	*42*
Cores	5	3	0	0	*8*
Core fragments	1	1	0	0	*2*
Flaked lumps	1	3	0	0	*4*
Piercer	0	1	0	0	*1*
Miscellaneous retouched pieces	7	5	0	0	*12*
Unclassified burnt piece	0	1	0	0	*1*
Total	*33*	*32*	*2*	*1*	*70*

Table 9 Artefacts from Trenches F, G and H: all contexts

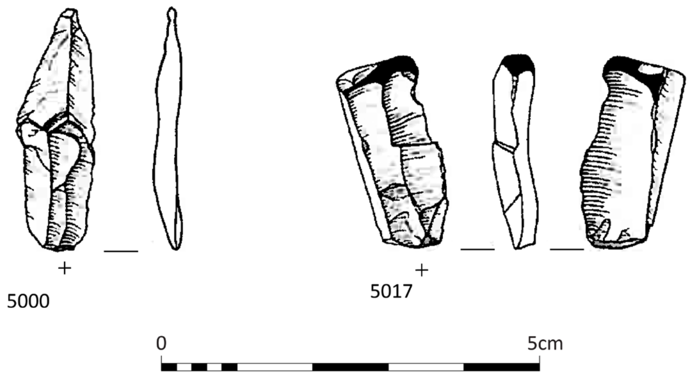
Type	Chert	Flint/ Chalcedony	Quartz	Baked mudstone	*Total*
Unretouched flakes	16	3	2	0	*21*
Cores	2	3	0	0	*5*
Core fragments	1	1	0	0	*2*
Flaked lump	0	1	0	0	*1*
Microlith	1	0	0	0	*1*
Lamelle à cran	0	1	0	0	*1*
Miscellaneous retouched pieces	2	3	1	1	*7*
Total	*22*	*12*	*3*	*1*	*38*

Table 10 Artefacts from 1975–8 Trenches I, III, V and VI: all contexts

Type	Chert	Flint/ Chalcedony	Pitchstone	Unknown	*Total*
Unretouched flakes	14	5	2	0	*21*
Cores	7	0	0	1	*8*
Core fragments	2	1	0	0	*3*
Flaked lumps	2	0	0	0	*2*
Scraper	0	1	0	0	*1*
Miscellaneous retouched pieces	0	3	0	0	*3*
Total	*25*	*10*	*2*	*1*	*38*

Table 11 Artefacts from the Cramond area 1971–97

Type	Chert	Flint/ Chalcedony	*Total*
Unretouched flakes	16	4	*20*
Core fragment	1	0	*1*
Worn-edge piece	1	0	*1*
Miscellaneous retouched pieces	2	0	*2*
Total	*20*	*4*	*24*



Illus 11 Pitchstone bladelet and worn-edge piece. (© AOC Archaeology Group)

5. PALAEOENVIRONMENT

The Cramond site was inhabited during the rapid climatic amelioration associated with the end of the Loch Lomond Interstadial. This transition saw the swift spread of pioneer tree and shrub species such as birch (*Betula* sp), hazel (*Corylus avellana*), pine (*Pinus* sp) and willow (*Salix* sp).

Pollen records obtained from sites north of the Forth at Pickletillem, Fife (Whittington et al 1991a) and Black Loch, Fife (Whittington et al 1991b) show a mixed woodland cover dominated by hazel established in Eastern Scotland by the early 9th millennium bc.

However, given the herbaceous pollen values at both Pickletillem and Black Loch showing the presence of various grasses (Poaceae) and sedges (Cyperaceae), it is likely that the Cramond site would have occurred within a mosaic landscape of hazel-dominated mixed woodland interspersed with more open areas.

5.1 Carbonised plant remains

Mhairi Hastie & Rosie Bishop

5.1.1 Introduction

Within the excavated Trenches D and E, a programme of 100% sampling was implemented, and samples were taken on a 0.5m grid with spits taken at every 0.05m. This resulted in over 500 samples being retained for palaeoenvironmental analysis. The retained samples were fully processed by CECAS staff, using a Siraf-style flotation tank to retrieve all lithic artefacts and palaeoenvironmental remains. The samples were separated into two fractions – flots and retents – and a selection of these was submitted to Headland Archaeology for detailed analysis. A further quantification of the charred plant remains was undertaken by Rosie Bishop and is combined within this account, a copy of which is available within the site archive.

5.1.2 Methodology

Initial assessment of a sub-sample of the flots and retents carried out by Headland Archaeology in October 2000 indicated that the samples contained very little palaeoenvironmental material except for carbonised hazelnut shells and small quantities of wood charcoal. Post-excavation analysis therefore focused on the distribution and significance of hazelnut remains recovered from both the retents and the flots.

The main objectives of the post-excavation analysis were:

1. To determine the presence or absence of hazelnut shell within each sample and to consider the distribution of these across the excavation area.
2. To determine the presence or absence of any other palaeobotanical remains.
3. To compare the hazelnut shell assemblage recovered with similar assemblages from other Mesolithic sites in the light of research concerned with hazelnut processing and use.

The retents submitted to Headland Archaeology were scanned by eye and the relative abundance of hazelnut shell present in each was recorded. The flots were scanned using a binocular microscope (magnification ×10) to identify the presence of hazelnut shell and other palaeobotanical remains.

5.1.3 Results

Approximately 552g of charred hazelnut shell (>1mm) was recovered from the pits (Table 12). The nutshell was highly fragmented, with less than 11% of the nutshell coming from the 4mm sieve fraction (Illus 1 archive only) and the majority of the fragments (by weight and mass) falling in the <12.5% fragment size category (>99%) (archive only). The highly fragmented nature of the assemblage is further indicated by the abundance of nutshell from the 1mm sieve fractions (*c* 50%; archive only). No whole hazelnuts or half shells were present, and only one possible kernel fragment was recovered. The identification of this kernel fragment was tentative and was based on the similarity of the interior and exterior surfaces of the fragment to modern charred hazelnut reference material examined using a stereomicroscope.

The hazelnut shell was predominately concentrated within pits [1430] (273.3g), [1425] (223.66g) and [1432] (41.27g), and only a small quantity was recovered from pit [1459] (13.33g). Hazelnut fragment sizes were uniform within the different contexts of pits [1430], [1459] and [1432],

Table 12 Summary of the charred hazelnut shell remains from pits [1425], [1430], [1432] and [1459]. (* 1mm masses were estimated using a sub-sample: see 5.1.2 Methodology. F = fragments)

Context [Pit]	1402 [1425]	1420 [1430]	1426 [1430]	1427 [1430]	1428 [1459]	1431 [1432]	*Total*
Number of samples	5	2	19	1	7	14	*48*
Total sample volume (litres)	13	7	66	3	23	45	*157*
Hazelnut shell (>4mm)	254F 13.81g	170F 9.16g	530F 25.93g	26F 1.3g	25F 1.11g	138F 6.3g	*1143F 57.61g*
Hazelnut shell (>2mm)	3671F 44.5g	2368F 30.08g	9080F 107.38g	432F 4.91g	566F 7.17g	1810F 23.26g	*17927F 217.3g*
Hazelnut shell (>1mm) mass *	165.35g	19.33g	71.96g	3.25g	5.05g	11.72g	*276.65g*
Total fragments	3925	2538	9610	458	591	1948	*19070*
Total mass (g)	223.661	58.566	205.274	9.457	13.329	41.272	*551.56*
Fragments/litre	301.92	362.57	145.61	152.67	25.7	43.29	*121.46*
Mass/litre (g)	17.2	8.37	3.11	3.15	0.58	0.92	*3.51*
Estimated number of whole nuts (using 2mm + 4mm nutshell)	138.85	93.42	317.42	14.77	19.71	70.36	*654.54*
Estimated number of whole nuts (using 1mm + 2mm + 4mm nutshell)	532.53	139.44	488.75	22.52	31.74	98.27	*1313.24*

with 28–38% of the fragments in the 1–2mm size category, 50–57% of the fragments in the 2–4mm size category and *c* 8–16% of the fragments in the >4mm size category (archive only). In contrast, pit [1425] contained a greater proportion of fragments within the 1–2mm sieve fraction (74%).

Using the method proposed by Carruthers (2000) for >1mm nutshell, it is estimated that the pits contained the nutshell from approximately 1,313 whole nuts: the nutshell from 651 whole nuts was concentrated within pit [1430] and the nutshell from 533 whole nuts within pit [1425] (Table 12). It is important to note that there is no standardised nutshell quantification method, and that hazelnut shell has not been routinely recovered from the 1mm sieve fractions at all Mesolithic sites in Scotland (Bishop et al 2014), and so the quantity of small fragments may be underestimated at some other sites. In order to allow comparison with these assemblages, the calculation was repeated using only the >2mm sieve fractions. This produced much lower estimates for the nuts on site: 655 whole nuts in total, with 426 of these occurring within pit [1430] and 139 nuts in pit [1425].

5.1.4 Other palaeobotanical remains

Other charred plant remains recovered from the samples were extremely sparse and consisted of small numbers of charred seeds and cereal grains, including two cleavers fruits (*Galium aparine* L) and several poorly preserved and abraded barley grains (*Hordeum* sp) from contexts (1409) and (1420/1426) (Table 13).

5.1.5 Discussion

A moderately large quantity of carbonised nutshell (derived from approximately 1,313 whole hazelnuts) was recovered from most of the deposits excavated in Trench D but was concentrated in and around two contexts (1425) and (1420/1426), both of which had been partially truncated by a later medieval pit. The larger context (1420/1426) represents two horizons of fill of pit [1425], approximately 0.76 × 0.59m in plan and 200–300mm deep, with slightly sloping edges down to an irregular base. There was no evidence to suggest that the nutshell had been burnt in situ.

The quantity of nutshell is consistent with the idea that hazelnuts were collected and processed on a medium-to-large scale for consumption. A similar distribution of hazelnut shell to that observed at Cramond has been recorded on other Scottish Mesolithic sites, for instance Fife Ness, Fife (Wickham-Jones & Dalland 1998) and Manor Bridge, Scottish Borders (Hastie 2002). These sites consist principally of restricted flint scatters

Table 13 Other charred plant remains recovered from Cramond (identifications from Hastie (2003) are incorporated within this results table)

Context	Grid square	Level	Carbonised plant remains
1402	D54	L	Indeterminate seed × 1
1409	D61	?	*Hordeum* sp (barley) grain × 1
1420	D54	K	*Hordeum* sp (barley) × 2
1426	D54	Q	*Hordeum* sp (barley) grain × 1
1426	D53	K	Indeterminate root/tuber (2mm) × 2; Indeterminate seed × 2
1426	D54	K	cf Poaceae (small grass) grain × 1
1426	D54	?	*Hordeum* sp (barley) grain × 1
1426	D54	M	*Galium aparine* L (cleavers) fruit × 1
1426	D54	L	*Galium aparine* L (cleavers) fruit × 1
1426	D53	K	Indeterminate cereal grain × 1
1428	D64	J	Indeterminate seed × 1
1431	D53	N	cf *Corylus avellana* L (cf hazel) cotyledon fragment × 1

associated with a number of shallow pits containing carbonised hazelnut shell, flint debitage and burnt stone/flint. In all cases wood charcoal is surprisingly sparse.

The estimated number of hazelnuts in the pits at Cramond was substantially smaller than the number recovered from the Mesolithic features at Staosnaig, Colonsay, where an estimated 30,000–40,000 whole nuts were retrieved from a large pit approximately 4.5m in diameter (Carruthers 2000). Again, despite the presence of burnt flint, fire-cracked rocks and charred plant remains, there was no evidence for in situ burning at Staosnaig, and thus this was likely a storage pit. It was considered that nuts were roasted on the site, in smaller pit-ovens nearby (Mithen et al 2000: 435).

Nevertheless, the number of fragments recovered at Cramond is comparable (even if the 1mm sieve fraction is excluded) to the quantity recovered from the robust Mesolithic house sites of East Barns, East Lothian (>234.38g: *c* >560 nuts) (Gooder 2007; Bishop et al 2014: 28) and Echline Fields (12,188F: 292.8g: *c* 697 nuts) (Robertson et al 2013), and would appear more substantial than the other published quantified Mesolithic hazelnut assemblages from Scotland, which all have <10.5g of nutshell or the shell from fewer than 25 nuts (Bishop 2013; Bishop et al 2014). Moreover, considering that only about 20–25% of nuts become charred during pit roasting (Score & Mithen 2000: 512) and that there has been some truncation of the Mesolithic features at Cramond, the fragmented remains most likely derive from the collection and use of a much larger number of Mesolithic hazelnuts.

The nutshell in the later pit [1425] was considerably more fragmented than the nutshell recovered from the other features. This suggests that the truncation and post-depositional disturbance of this feature has contributed to the fragmentation of the nutshell in this pit. In contrast, the nutshell in the other pits was considerably less disturbed by post-depositional processes. Considering the uniformity of the nutshell fragment sizes in pits [1430], [1459] and [1432], and the absence of whole nuts or larger fragments in the stratigraphically earlier contexts (eg context (1420) compared to context (1426) or (1427)), it seems likely that the nutshell was broken prior to deposition in the pits rather than being crushed in situ within the pit as a result of trampling, compaction of the pit fills or bioturbation (cf Carruthers 2000: 410).

The presence of carbonised nutshell in Mesolithic pits is primarily interpreted as the discard of waste generated either through roasting the hazelnuts prior to consumption or storage, or through the burning of hazelnut shells as fuel. The exact function of the pits, however, is not usually established. Hazelnuts burn with a hot flame, therefore hazelnut shell may have been used for special industrial purposes. It has also been suggested (Mason pers comm) that the nutshell may have been deliberately collected for use as fuel where wood resources were rare or valued for other purposes, or that it could have been a by-product resulting from the collection of hazelnuts for consumption.

There is evidence to suggest that roasting nuts would not only aid long-term storage but would also assist factors such as shelling, flavour and palatability, as well as grinding. If the nuts were also to be transported, roasting would not only aid removal of the shell and thus decrease the weight and bulk of the nuts but also dry the kernels so that they would be less likely to spoil (comments from the Bioarchaeology Discussion Group 1996, University of London: Mason pers comm) (Bishop et al 2014).

5.1.6 Conclusion

Apart from the generally high incidence of hazelnut shell in the Trench D deposits at Cramond, the concentration of hazelnut shell-rich material within the fill of two central pits contexts is particularly marked. It is unclear from the archaeological record whether this was a result of deliberate infilling or the accumulation of material in these features through natural processes. The most likely function of these features is as pits dug for other purposes such as hazelnut storage pits, or roasting pits/pit-ovens.

The closest parallels to the Cramond situation are the roasting pits or pit-ovens that have been identified on other Mesolithic sites. The lack of evidence for in situ burning might seem surprising, but some experimental work has indicated a likelihood for any remnants of fire placed on roasting pits to have been raked aside once the roasting procedure was finished (Score & Mithen 2000). Experimental nut roasting indicated that a small proportion of the nuts would become charred during the roasting procedures, and that when the nuts became carbonised on the outside, the kernel was prone to disintegration, leaving only fragmentary shell pieces. In addition, it was observed that the shells from roasted nuts would fragment into small pieces once removed from the kernel. Both are consistent with the hazelnut fragments recovered from Cramond.

The frequency of the hazelnut shell recovered from Cramond suggests that hazelnuts were processed on a medium-to-large scale for consumption at the site. Though the nutshell was relatively fragmented overall and would have been subject to some post-depositional breakage, the uniformity of the size of the nutshell fragments within pits [1430], [1459] and [1432] suggests that it was primarily fragmented prior to deposition within the pit. The relatively small size of the fragments is consistent with the possibility that the nuts were charred as a result of roasting and cracking them prior to re-deposition within the pits.

The barley grains were clearly intrusive in the Mesolithic deposits and their poor preservation most likely reflects physical damage caused by bioturbation, as well as the carbonisation process. Given the presence of the Roman and medieval phases above the Mesolithic features and the truncation of some of the Mesolithic contexts, it is unsurprising that a small number of intrusive cereal grains have worked their way down into these earlier layers, as a result of root and earthworm action or animal burrowing.

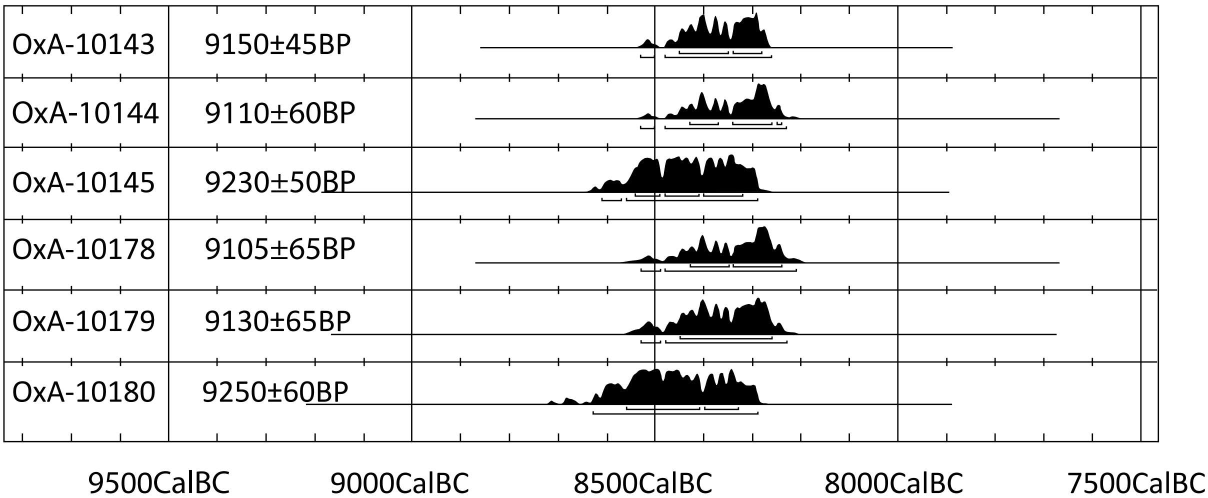
Charred cleavers fruits have been recovered from two other Mesolithic sites in Scotland, at Staosnaig, Colonsay (Carruthers 2000) and Northton, Harris (Bishop 2013). Cleavers is a common weed of open and disturbed ground (Stace 2010) and may have been common around the site. Although the leaves and stems are edible, these are best harvested prior to formation of the fruits (Burrows 2005: 50), and so these sticky fruits were most likely to have been naturally deposited on site by the wind or animals, or accidentally transported attached to human clothing. However, given the presence of the intrusive cereal grains and that only two cleavers fruits were recovered, these remains are not securely associated with the Mesolithic phase of occupation at the site.

6. RADIOCARBON DATING

A tight sequence of six radiocarbon AMS dates were obtained from carbonised hazelnut shell samples (Lawson 2001; Ashmore 2004) (Illus 12). The sampled material was recovered from the central pit features and spreads excavated within Trench D (Table 14) and as such are considered to be directly associated with the artefactual assemblage recovered at Cramond (Saville 2008: 210–11).

The dates revealed that the occupation fell around the middle of the 9th millennium bc (8630–8210 cal bc) and reflect an essentially short-term and possibly repeated occupation, most probably by the same or similar social group.

Cramond is currently the earliest of the recently excavated Mesolithic Forth Littoral sites with nearby Echline Fields (Robertson et al 2013) and East Barns (Engl & Gooder 2021) producing secure dates of 8278–8022 cal bc and 8200–7954 cal bc respectively. Further along the coast the site of Howick in Northumberland (Waddington 2007) revealed an occupation around 7800 cal bc.



Illus 12 Cramond radiocarbon determinations and their calibration (OxCal v3.10). (Atmospheric data from Reimer et al (2004). OxCal v3.10 Bronk Ramsey (2009): cub r:5 sd: 12 prob usp [chron])

Table 14 Radiocarbon date designations

Number	Sample	Material	Context	Description	Deposition	Radiocarbon age (bp)
OxA-10143	CR95/74/1409	Seeds, hazelnut shell	1409	Circular spread Deposit sealing 1425, 1430 & 1432	Primary	9150±45
OxA-10144	CR95/283/1402/M	Seeds, hazelnut shell	1402	Fill of pit 1425	Primary	9110±60
OxA-10145	CR95/291/1409	Seeds, hazelnut shell	1409	Circular spread Deposit sealing 1425, 1430 & 1432	Primary	9230±50
OxA-10178	CR95/956/1426/M	Seeds, hazelnut shell	1426	Fill of pit 1430	Secondary	9105±65
OxA-10179	CR95/958/1426K	Seeds, hazelnut shell	1426	Fill of pit 1430	Secondary	9130±65
OxA-10180	CR95/1066/1431	Seeds, hazelnut shell	1431	Fill of scoop 1432	Primary	9250±60
UBA-36379	CR95 S.933 C.1428	Hazelnut shell (*Corylus avellana*)	1428	Fill of pit 1459	Primary	9003±67
UBA-36380	CR95 S.083 C.1420	Hazelnut shell (*Corylus avellana*)	1420	Fill of pit 1430	Primary	8835±50

7. DISCUSSION

Though limited in both scope and scale, the excavations undertaken at Cramond have produced a closely grouped series of radiocarbon dates, suggesting a focus of Mesolithic occupation activity occurring during the mid-9th millennium bc.

Conneller (2022: 172) has recently termed the period 8200–7000 bc the Middle Mesolithic, a period of change, with an increasing variation of both human life-ways and inhabited environments. More specifically, this is illustrated by an increase in cut features and post-built structures associated with the emergence of hazel within the pioneer biota of the emerging post-glacial woodland.

The occupation of Cramond with its relatively large hazelnut assemblage and well-stratified cut features would appear to be an early illustration of this change, emerging within the Mesolithic of Eastern Scotland albeit at a slightly earlier date. The evidence revealed at Cramond and the inland site of Manor Bridge, Peebles (Warren 2001), where hazelnut-rich pits provided evidence of occupation dating between 8400 and 8200 bc, suggests that hazel and its associated human usage was well established in this area at least as early as the mid-9th millennium. This open mosaic woodland landscape may have had a fairly limited range within Eastern Scotland during this period, possibly restricted to the coastal fringe and major river valleys such as the Forth and Tweed.

Cramond is the earliest of the southern Forth Littoral sites that also include East Barns (Gooder 2007; Engl & Gooder 2021), Echline (Robertson et al 2013) and Howick (Waddington 2007). These last three sites consist of robust house structures constructed at the turn of the 8th millennium bc. These sites including Cramond all appear to occupy similar environmentally productive locations along the southern coast of the Firth of Forth. The house sites of the Forth Littoral have been identified as the archaeologically visible signs of possible Mesolithic population movement related to the rapid inundation of the North Sea during the period 8000–7500 bc (Waddington 2007).

In his initial publication of the Cramond site, Saville (2008) noted the association of narrow-blade technology with radiocarbon dates centring around 8400 cal bc (actual range *c* 8600–8200 cal bc). These are not only the earliest dates produced so far for the Mesolithic in Scotland but remain the earliest dates from Britain with this microlith component (Saville 2004: 207). It was determined that the dates and their material associations formed a coherent, internally consistent series which could be accepted as a reliable indicator of their true age, approximately at the time of deposition. In fact, alongside sealed deposits found at the recently excavated house sites of East Barns (Engl & Gooder 2021), Echline Fields (Robertson et al 2013), Howick (Waddington 2007) and Low Hauxley (Waddington & Bonsall 2016), which have all produced sizeable narrow-blade microlithic assemblages, Cramond provides a strong example of direct association within the archaeological record for the Mesolithic period in Britain.

The question of such an early date for the narrow-blade assemblage identified at Cramond has created some discussion. It has been asserted (Conneller et al 2016; Conneller 2022: 179) that the Cramond assemblage demonstrates a transition from Early to Late Mesolithic lithic types and is in fact an example of a 'basally modified assemblage' based on the presence within the assemblage of a point with inverse basal retouch (Illus 8: 3675). This artefact provides a potential link to the 'Honey Hill' type assemblages – in which this microlith form is the 'type fossil' – currently thought to relate to the end of the Early Mesolithic/beginning of the Later Mesolithic and dated very approximately to the period 9000–8500 bp/8500–7300 cal bc (Reynier 1997; Barton & Roberts 2004: 344).

This viewpoint has been rebutted by Waddington et al (2017) on the basis that apart from the single basally modified point, the Cramond assemblage is, alongside the other Forth Littoral sites, indisputably narrow-blade in form, with directly comparable core technology, microlith types and other tool forms.

The occurrence of an inverse basally retouched microlith within the Cramond assemblage should therefore perhaps be regarded as anomalous – after all it is odd that no one argues for the Kinloch site being of Neolithic date, despite the presence of two well-stratified leaf-shaped arrowheads in one of the earlier pits (Wickham-Jones pers com). It should therefore be accepted that the Cramond assemblage is essentially, as it appears at face value, a very early example of a Later Mesolithic-type scalene-triangle-dominated industry. In England and Wales the earliest dates for such industries are in the 8600–7500 bp/8000–6200 cal bc bracket (Barton & Roberts 2004: 346; David & Walker 2004: 317).

The lithic assemblage produced at Cramond, though relatively small, is sufficient to characterise the lithic assemblage as being of a 'narrow-blade' type. The assemblage contains a microlith spectrum dominated by 'geometric' types, especially scalene triangles although these have a generally more 'crescent-like' appearance than those recovered at both East Barns and Echline Fields. Microliths are the chief designated tool-type within the assemblage, with scrapers the only other category with a significant presence. This pattern is a familiar one in Scottish Mesolithic sites, whether small or large assemblages are involved (McCullagh 1989; Wickham-Jones 1990; Wickham-Jones & Dalland 1998; Mithen 2000; Engl 2021), and in itself is entirely unexceptional.

In fact, there are some specific points of comparison with other Scottish Mesolithic assemblages when the overall small size and likely limited range of the Cramond assemblage is allowed for. In terms of technology the Cramond industry might be somewhat unusual in containing only platform cores without any substantial evidence of bipolar anvil knapping. This technique appeared to be a significant component of the *chaîne opératoire* at East Barns (Engl 2021), where the technique was used extensively in order both to work intractable quartz pebbles and to extend the working life of both flint and chert platform cores.

The mean size of the microliths at Cramond (14.7mm in length) matches very similar figures produced from sites both on the west coast of Scotland such as Colonsay, Islay and Rùm (Saville 2004: 188) and from the fellow sites of the southern Forth Littoral such as East Barns (Engl & Gooder 2021) and Echline Fields (Robertson et al 2013). The Cramond microburins are perhaps on the small side when mean sizes are compared with those from Colonsay and Islay (Mithen 2000, vol 2: 580) and they also appear far more numerous at Cramond when contrasted with the relatively low microburin to microlith ratios in other assemblages (Wickham-Jones 1990; Mithen 2000). If the unstratified worn-edge piece (Illus 11: 5017) is correctly to be seen as part of the Mesolithic assemblage, on the basis of its frequent Mesolithic occurrences elsewhere (Saville 1977), then it not only adds a new implement type to the Scottish Mesolithic repertoire, but also provides an indirect confirmation of the use of fire on site, if the interpretation of this tool-type as a fire-making implement is accepted (Stapert & Johansen 1999).

Saville's tentative view was that this technological change to narrow-blade assemblages within the British Mesolithic was happening first within northern Britain. Waddington (2007) has built on this initial hypothesis, stating that on current evidence the appearance of narrow-blade technology closely associated with substantial house structures and a coastal way of life appears to have emerged around the North Sea Basin during the 9th millennium bc. This hypothesis has been supported in both the publications of the Echline (Robertson et al 2013) and East Barns (Engl & Gooder 2021) sites.

The drivers of Mesolithic technological change and population movement are likely to be complex, with a variety of regional and ecological factors in play. Conneller (2022: 178) states that rather than tracking an east–west population movement, the radiometric dates produced by the sites of the Forth Littoral may in fact be a reflection of the rise of hazel within the early post-glacial environment of north-eastern Britain during the 9th millennium.

Hazel is found in abundance within all of the sites of the Forth Littoral, with all except Cramond providing evidence of a mixed economy. This included the exploitation of terrestrial woodland mammals such as pig, deer and auroch, together with marine resources such as seal (East Barns, Howick), fish (Echline) and shellfish (Howick). It is perhaps worth noting that the inland site of Manor Bridge (Warren 2001) also produced hazel-rich pits dated to between 8400 and 8200 bc. This site is close to the River Tweed and would, like the coastal, hazel-rich sites of Cramond and Fife Ness (Wickham-Jones & Dalland 1998), be located in an optimum location for the exploitation of hazelnuts.

Given the limitations of the excavation undertaken at Cramond, the site cannot be adequately described as another example of a 9th-millennium bc Mesolithic house site, such as those excavated at Echline Fields (Robertson et al 2013), Howick (Waddington 2007) and East Barns (Engl & Gooder 2021), as this will only be determined by a much fuller investigation of the site. In its existing excavated form Cramond appears to be a small site, which, given the quantity of Mesolithic material within the immediate locale, is likely to be a small part of a much wider occupation focus. Cramond is likely to represent a repeatedly visited camp site that was associated with the processing of significant quantities of hazelnuts such as proposed for the later site at Fife Ness (Wickham-Jones & Dalland 1998).

Nevertheless, despite its archaeological restrictions Cramond remains a well-contexted site that appears to push back the boundaries of narrow-blade technology within Britain to the mid-9th millennium. The Cramond site was occupied during a period of rapid environmental change in which a significantly warming climate led to the rapid recolonisation of northern Britain by a variety of biota including hazel. This warming also led to the inundation of the North Sea Basin. These environmental changes do appear in tandem with the emergence of narrow-blade technology and can be seen as part of the adaption of Mesolithic populations to the emergence and exploitation of a broader range of physical environments.

Whether this occupation came about as the result of large-scale population movements associated with the inundation of the North Sea, as proposed by Waddington & Bonsall (2016), or simply as a result of a gradually expanding population related to milder environmental conditions, the adoption of the technology is likely to have produced many regional and chronological differences. These hypotheses will undoubtedly be developed as new sites and assemblages come to light.

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