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.