CHAPTER 12: THE CHARRED PLANT REMAINS FROM BALESHARE AND HORNISH POINT

G Jones (1987)

Samples from 353 different contexts were examined, 176 from Baleshare and 177 from Hornish Point. All but eleven of these (seven from Baleshare and four from Hornish Point) produced some identifiable charred remains (See Tables 20 & 21).

12.1 AIMS

This study of the charred plant remains from Baleshare and Hornish Point attempted to answer the following questions:

i) What species are represented, particularly:

a Were cultivated species other than barley present? Was it considered possible and worthwhile to cultivate wheat?

b Which wild species are represented and did these grow locally or were they brought in from further afield?

ii) Does the midden represent accumulations of domestic refuse, true farmyard middens, or are both types of accumulations represented?

iii) Is it possible to distinguish plant material representing food debris from that coming in as fuel and, if so, is it possible to use the wild species introduced by these two routes to indicate the location of cultivated fields and fuel sources?

iv) Are there any differences in the plant remains found at the two sites and, in particular, are differences between sites also apparent when similar deposit types are compared, ie are inter-site differences simply a reflection of the different types of deposit encountered in the excavations?

v) Is it possible to distinguish between different types of deposit (eg from features, middens, cultivation layers and windblown sands) on the basis of the quantity and type of charred plant remains, ie can charred plant remains be used as an indicator of human interference?

12.2 SPECIES REPRESENTED

12.2.1 Crops

By far the most common crop represented was barley which, where determination was possible, was of the hulled variety. No obviously naked grains were found. Twisted grains (and a few identifiable rachis internodes) indicate the presence of the six-row species, *Hordeum vulgare*. The twisted, lateral grains of six-row barley outnumber the straight, medial grains by two to one while all the grains of two-row barley are medial and, therefore, straight. Straight grains tend to predominate over twisted ones which might suggest the presence also of the two-row species, *H. distichum*. However, most of the grains were indeterminate on the basis of shape and so the apparent predominance of straight grains may simply reflect the difficulty of distinguishing twisting due to natural causes from deformation during charring.

Wheat was represented by very few examples and may have been nothing more than a minor contaminant of barley. All the grains and glume bases which could be further identified were of *Triticum diccoccum* (emmer wheat).

12.2.2 Wild species

The most commonly encountered wild taxa were *Carex* spp. (sedges), *Danthonia decumbens* (heath grass), *Polygonum aviculare agg* (knotgrass) and *Brassicao Sinapis* (brassicas/charclock). Morphologically, most of the Carex nutlets resembled species in the sections Panicea Carey (*C. panicea*, *C. flacca*) or Extensae Fr. (in particular, *C. hostiana*, *C. oederi* and *C. demissa*) though some species from other sections, eg *C. rostrata* and *C. pallescens*, could not be excluded. The shapes of a few nutlets at Hornish Point were more typical of *C. binervis* or *C. distans* (both in section Extensae Fr.) or even *C. lasiocarpa* or *C. pilulifera*.

Fruits of Calluna/Erica (heather ling or heath) were also quite common in some samples. Other frequent taxa included Polygonum cf. persicaria (persicaria), Rumex sp. (dock), *Stellaria media* (chickweed), Graminaea (grasses) and Cyperaceae/Polygonaceae (sedges/knotgrasses). *Chenopodium album* (fat hen), *atriplex* sp. (orache), *Bilderdykia convolvulus* (bindweed), *Medicago* sp. (medick), *Sherardia arvensis* (field madder) and *Plantago lanceolata* (ribwort) were occasionally present. Vegetative fragments of non-cereal plants, including large numbers of probable rhizomes, were also frequent.

Many of these species could have grown in the machair, eg *Carex flacca, C. paniceda, C. hostiana, C. lepidocarpa, C. rostrata* and *C. pallescens* (Currie 1979). Other plants which prefer acidic conditions, eg Calluna/Erica, *Danthonia decumbens, Carex binervis* and *C. pilulifera*, (Ratcliffe 1977) would have grown on acidic heath, grasslands or moors. Most of the species mentioned above, except Calluna/Erica but including *Danthonia decumbens* (Hillman 1981) could also occur as weeds of cultivation and some of them (such as the Polygonum spp, and *Stellaria media*) are very common weeds. All of the taxa encountered could have grown locally in the Uists (Clapham *et al* 1962)

A few small fragments of fleshy fruits were found which may have been edible but could not be identified more specifically. Similarly, *Brassica* spp., if present, could have been cultivated for food but the alternative, *Sinapis arvensis*, is a common field weed.

12.3 DISCUSSION

12.3.1 Nature of the middens

With the exception of catastrophic destruction of buildings by fire, plant material at these sites is most likely to have been charred on household fires or in domestic ovens. On balance, the charred plant remains probably represent domestic refuse resulting from accidental losses of food

	Barley	Int*	Wheat	Cereal	Str**	Root	Weeds
Features							
12	22	0	0	3	0	0	1
11	253	1	1	36	0	8	13
7	11	0	0	3	0	0	0
14	34	0	0	9	0	2	0
9	18	0	0	1	0	0	1
8	20	0	0	1	0	1	0
4	2	0	0	0	0	0	0
29	39	0	1	1	0	1	3
Total	*399*	*1*	*2*	*54*	*0*	*12*	*18*
Midden							
15	2824	0	2	191	2	15	48
16	239	0	0	18	0	8	12
5	88	0	0	6	2	8	23
2	320	3	1	3	0	26	19
17	87	0	0	0	0	3	9
19	491	0	1	25	0	3	25
24	229	1	0	7	9	23	19
Total	*4278*	*4*	*4*	*250*	*13*	*86*	*155*
Cultivation layers							
1	5	0	0	0	0	0	0
22	33	0	0	4	0	2	2
26	121	0	0	20	0	6	1
18	10	0	0	0	0	1	6
20	8	0	0	1	0	0	2
25	125	0	0	0	0	1	1
Total	*302*	*0*	*0*	*25*	*0*	*10*	*12*
Windblown sand							
3	28	0	0	4	0	5	6
10	7	0	0	0	0	0	0
21	4	1	0	0	0	0	0
23	7	0	0	0	0	0	0
6	12	0	0	0	0	1	0
27	27	0	0	2	0	3	7
Total	*85*	*1*	*0*	*6*	*0*	*9*	*13*
SUMMARY							
Features	**399**	**1**	**2**	**54**	**0**	**12**	**18**
Midden	**4278**	**4**	**4**	**250**	**13**	**86**	**155**
Cultivation layers	**302**	**0**	**0**	**25**	**0**	**10**	**12**
Windblown sand	**85**	**1**	**0**	**6**	**0**	**9**	**13**
Total	**5064**	**6**	**6**	**335**	**13**	**117**	**198**

*Table 20. Baleshare. Carbonised plant remains. * = barley rachis internodes. **grass occl nodes*

plants and/or material used as fuel. The ability to distinguish true farmyard middens (deliberately accumulated as fertilizer to be spread onto cultivated fields) from ordinary domestic refuse (casually deposited in the vicinity of settlement sites) depends on the extent to which such domestic refuse was added to farmyard middens. This cannot be solely determined on the basis of the plant remains present.

On the islands of Orkney and Shetland surface turves from grassland, heath and moor, as well as underlying peat, were collected for fuel and the resulting ash thrown onto middens (Fenton 1978). Animal dung, sometimes mixed with turves, seaweed or straw from the byre, was also used. If this was common practice in the Western Isles in the Iron Age, it is likely that the two types of midden would be indistinguishable on the basis of charred plant remains. It may nevertheless be possible to distinguish between plant material derived from food debris and that derived from fuel. This could, by an analysis of the species represented, suggest the likely location of cultivated fields and the areas exploited for fuel (see Smith 1999 for results from Dun Vulan).

Identifications	Barley	Int*	Wheat	Cereal	Str**	Root	Weeds
Features							
3	5	0	0	0	0	2	0
7	44	0	0	8	1	13	21
15	116	5	0	13	0	18	33
18	144	2	0	6	0	27	24
20	16	0	0	0	0	3	6
22	121	0	0	6	0	4	13
27	72	0	0	7	0	5	2
29	12	0	0	0	0	6	3
Total	*530*	*7*	*0*	*40*	*1*	*78*	*102*
Midden							
8	256	1	2	9	2	18	41
9	256	0	0	13	0	19	13
11	214	0	1	8	0	21	40
12	206	0	0	9	1	18	23
13	69	0	0	2	0	5	4
17	237	0	1	9	0	15	35
19	1414	0	9	105	10	238	221
21	57	0	0	1	0	2	13
Total	*2709*	*1*	*13*	*156*	*13*	*336*	*390*
Cultivation layers							
1	273	1	0	6	0	14	13
2	155	0	1	9	2	4	22
5	1531	2	6	59	1	122	110
6	1380	4	9	83	14	269	414
10	40	0	0	1	0	0	5
26	180	0	0	19	0	23	29
Total	*3559*	*7*	*16*	*177*	*17*	*432*	*593*
Windblown sand							
4	116	0	0	6	0	17	20
Total	*116*	*0*	*0*	*6*	*0*	*17*	*20*
SUMMARY							
Features	**530**	**7**	**0**	**40**	**1**	**78**	**102**
Midden	**2709**	**1**	**13**	**156**	**13**	**336**	**390**
Cultivation layers	**3559**	**7**	**16**	**177**	**17**	**432**	**593**
Windblown sand	**116**	**0**	**0**	**6**	**0**	**17**	**20**
Total	*6914*	*15*	*29*	*379*	*31*	*863*	*1105*

*Table 21. Hornish Point. Carbonised plant remains. * = barley rachis internodes. **grass occl nodes*

12.3.2 Derivation of plant material

Food plants (eg cereals) may be accidentally charred during preparation and residues from grain cleaning may be discarded onto household fires. The parts of the cereal plant most likely to survive are the grains and denser chaff fragments, together with any associated weed seeds, since these tend to filter down through the fire into the ashes where they remain in a charred state (Hillman 1981). With barley as the predominant cereal, food preparation accidents should be dominated by grains, possibly contaminated by weed seeds and small quantities of chaff (rachis internodes), while grain cleaning residues would result in quantities of weed seeds with relatively few cereal remains (Hillman 1981, 1984; Jones 1984; 1987). Earlier stages of crop processing would be identified by larger quantities of cereal chaff and straw (culm nodes) and vegetative fragments of weed plants. Cereal culm bases and rhizomes from wild species could also be present in these early processing residues, if the barley was harvested by uprooting. Turf or peat used as fuel, on the other hand, would be composed of plants from the habitat where it was formed. It is doubtful whether much identifiable plant material would survive peat burning as, being rather dense, there would be little opportunity for the heavier fragments to fall into the ashes and be preserved (J Hillman pers comm). The looser turf, however, might provide such an opportunity and vegetative fragments of wild plants (including rhizomes) as well as seeds and fruits could be introduced in this way. Similar species may be introduced with both turf and dung used as fuel

	Both sites				HornishPoint			
	Contexts		Blocks		Contexts		Blocks	
	1	2	1	2	1	2	1	2
No. cereal grains/litre	0.8	–	–	0.6	–	0.9	–	0.9
No.vegetative frags./litre	0.8	–	–	0.9	–	0.7	–	0.9
								–
% *Calluna/Erica*	–	–	0.5	0.5	–	–	–	–
% *Polygonum aviculare agg.*	–	–	–	–	–	–	0.7	–
% *Polygonum cf. persicaria*	–	–	0.9	–	0.7	–	–	–
% *Rumex sp.*	–	–	–	–	–	–	0.8	–
% *Stellaria media*	–	–	–	–	–	–	–	–
% *Brassica/ Sinapis*	–	–	–	-0.5	–	–	–	–
% *Danthonia decumbens*	–	–	–	–	0.8	–	0.5	–
% indet.Gramineae	–	-0.8	–	–		–	–	–
% *Carex spp.*	–	0.7	–	–	-0.6	–	-0.8	–
% Cyperaceae/Polygonaceae	–	–	0.8	–	–	–	–	–

Table 22. Baleshare & Hornish Point. Principal Components analysis of the carbonised plant remains. 1 and 2 = first two varimax-rotated Principal Components in each analysis. Loadings of less than 0.5 are not shown

since animals could have grazed the same grassland that would be used for turf cutting.

Since Calluna/Erica cannot grow as a weed of cultivation, the presence of these fruits at Baleshare and Hornish Point indicates that this plant at least was not introduced with cereals and raises the possibility of its introduction with fuel. Moreover, the cereal assemblage is heavily dominated by barley grains with very few rachis internodes, culm nodes or culm bases suggesting that the early stages of barley processing are not represented. It is likely then that the vegetative fragments of wild plants were introduced with fuel or some commodity other than cereal products. (It should however be noted that although rachis and culm fragments may survive charring less well than cereal grain (Boardman 1987) there is no reason why they should be underrepresented in comparison with the, often fragile, vegetative parts of non-cereal plants.)

In order to investigate the origin of other wild plant taxa, Pearson correlation coefficients and principal components were computed (using SPSSx procedures = SPSS Inc. 1983). The aim of these analyses was to see whether any taxa were consistently associated with one another and whether it was possible to identify a group of taxa representing food (perhaps associated with cereal remains) and another group representing fuel (perhaps associated with vegetative remains of wild plants).

Statistics were computed for individual contexts as well as consolidated blocks and sites were treated both together and individually. Only contexts (or blocks) with 30 or more identifiable plant items were used. The variables used were the densities of cereal remains and non-cereal vegetative fragments (number of items per litre) and the proportions of the different wild taxa. Percentages were based on the total number of seeds and fruits of common wild taxa and calculated only when the number of species was ten or more. Statistics involving wild taxa were not calculated for Baleshare as the number of contexts/blocks was too small and only the principal components analyses and correlation coefficients significant at the 0.05 level were interpreted.

There was a consistent and significant correlation between the density of cereal items and the density of vegetative wild plant fragments at Hornish Point, the site which provides the majority of the charred remains. This correlation was also reflected in the principal components analyses where the densities of cereal grain and vegetative fragments consistently load high on the same rotated principal component (Table 22). This could indicate that the vegetative fragments were brought in with the cereal harvest but it is equally likely that their association is due to the fact that they result from the same household fires, the vegetative fragments being introduced with the fuel and the cereal remains as food debris. Given the apparent lack of early cereal processing waste, however, the latter alternative is more likely and may simply indicate that some contexts are richer in charred remains than others.

If cereal remains represent food debris and vegetative non-cereal fragments fuel, then their consistent association will tend to blur any grouping of wild taxa due to their introduction with either food or fuel. This is borne out by a lack of consistently significant correlations or associations amongst the wild taxa. There is a significant correlation between the density of vegetative fragments and Calluna/Erica fruits among contexts from Hornish Point, but this correlation breaks down when consolidated blocks are considered. Similarly a significant correlation between Calluna/Erica fruits and Carex nutlets is apparent for whole blocks at Hornish Point but not for separate contexts. These correlations should, therefore, be treated with caution.

Given the difficulty of distinguishing species brought in with cereals from those introduced with fuel, it is not possible to determine whether cultivation was concentrated on the machair (as it has been recently – Grant 1979) or spread more widely onto acid soils. Nor is it possible to identify areas which may have been used for turf cutting.

12.3.3 Differences between sites

Various aspects of the plant assemblages from Baleshare and Hornish Point were compared using Student's t (applying the procedure in SPSSx–SPSS Inc 1983). As before, tests were conducted for separate contexts and for whole blocks and only differences significant at the 0.5 level were interpreted.

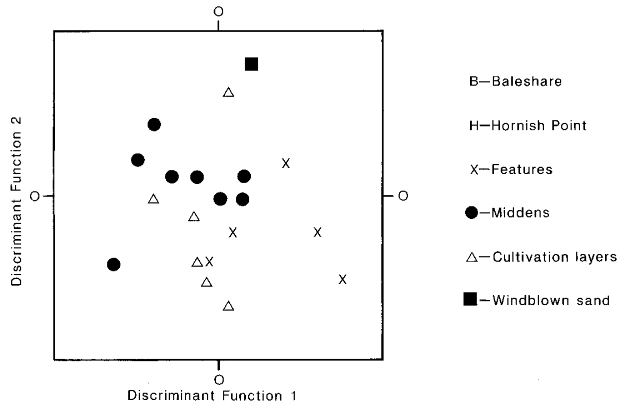
The density of both cereal and non-cereal remains (calculated for all contexts and blocks) was consistently and significantly greater at Hornish Point than at Baleshare.

Conversely, fewer animal bones were recovered from Hornish Point than from Baleshare (Halstead *infra*) even though the quantity of deposit excavated at the two sites was comparable. There were also high ratios of cereal chaff, non-cereal fruits/seeds and non-cereal vegetative fragments to cereal grain (calculated only for contexts or blocks with 30 or more cereal grains) at Hornish Point though the first was significant only when separate contexts were considered.

To determine whether these differences simply reflect the proportions of different deposit types excavated at the two sites, the tests were repeated comparing similar deposit types (ie features, middens, cultivation layers or windblown sands) from each site. In fact, the differences between the sites were still apparent though, due to the smaller numbers of contexts blocks in each category, they were not always significant.

A possible reason for the differences between sites is the rate of deposition which was faster at Hornish Point (below). This would account for the lower density of animal bones at Hornish Point and could also have resulted in better preservation of charred plant material through rapid burial, giving greater densities of material and better representation of the more fragile remains such as chaff and non-cereal items. However, the most likely reason is chronological, due to changes in crop processing during the first millennium BC, which have been noted at other sites on South Uist (Helen Smith pers comm).

There was no significant difference in the ratio of wheat to barley grains or the ratio of straight to twisted barley grains at the two sites but the percentages of some of the wild taxa were significantly different. *Danthonia decumbens* (and sometimes *Polygonum cf. persicaria*) was more common at Baleshare and *Carex* spp. (and sometimes *Polygonum aviculare agg*, Calluna/Erica and Brassica/Sinapsis) at Hornish Point. The archaeological significance of this will be easier to assess when information is available from a larger number of sites in a variety of different environments.



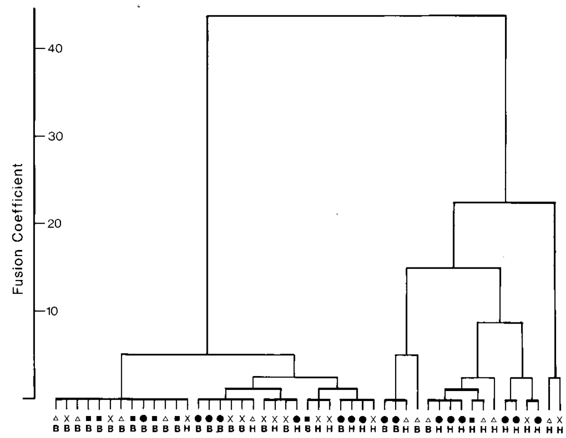


Figure 80. a) Discriminant analysis of Hornish Point Block types using characteristics of the charred plant assemblage b) Cluster analysis of Baleshare and Hornish Point Blocks using densities of charred plant remains

12.3.4 The use of charred plant remains as an indicator of human activity

The same aspects of the plant assemblage, excluding the proportions of different wild taxa as the number of contexts/blocks was too small, were compared for different types of deposit, *viz* features, middens, cultivation layers and windblown sands, by analysis of variance (from SPSSx–SRSS Inc 1983). For both sites, the density of both cereal and non-cereal remains was found to be greater in middens and cultivation layers than in features and windblown sands. These results were particularly significant for cereal remains especially when both sites were considered together. The same pattern was observed when each site was considered separately though the results were not always significant, especially for Baleshare, and the differences for non-cereal remains were not significant for blocks.

The only other significant difference was in the proportion of cereal chaff to grain at Hornish Point, where there was more chaff in the features. Given the extremely small number of chaff fragments in total, however, this difference is probably not of archaeological significance.

At first, the apparent lack of charred plant material in features (comparable only with windblown sand) is surprising. However, little charred material would be expected in masonry while ditches, pits and floors may have been subject to periodic cleaning out. Whatever the reason, it highlights the need to be cautious when using charred remains (or other rubbish eg animal bones) as an indicator of human interference since too much 'interference' may produce a very clean result. The similarity between middens and cultivation layers is interesting however, and may indicate that midden deposits were being used to fertilise the fields. This raises the possibility of using the density (and type) of charred plant material, if not as an indicator of human interference, then at least as an indicator of refuse use.

In order to explore the potential of charred plant material as an indicator of human refuse use, discriminant analyses (using the SPSSx procedure – SPSS Inc. 1983) were performed. The densities of cereal grains and non-cereal vegetative fragments, the ratios of cereal chaff, non-cereal fruits/seeds, and non-cereal vegetative fragments to cereal grain as well as the ratio of wheat to barley were used as discriminating variables and the four major deposit types as the groups to be discriminated. The discriminant analysis reduces the discriminating variables to three composite functions which maximise the statistical separation of the four predefined groups. A useful measure of the discriminating value of the functions is given by their ability to reclassify contexts or blocks correctly.

The ability of the variables to discriminate between contexts from deposit types was poor. Even when analysis was restricted to contexts with 30 or more cereal grains, only 69% of contexts from Baleshare and 43% from Hornish Point could be correctly reclassified into their original groups on the basis of the discriminant functions extracted. The reclassification of consolidated blocks was better – 85% of blocks from Baleshare and 75% from Hornish Point were correctly reclassified when blocks of 30 or more cereal grains only were used (Figure 80a). This suggests that any index based on aspects of the charred plant assemblage should be applied to whole blocks (where the quantities of charred material are sufficiently large) rather than to individual contexts.

The results of the study were promising but it is still necessary to test the ability of these variables to assign blocks to particular deposit types without prior knowledge of the types represented. For this reason, the same variable were used in cluster analyses (using Ward's method of hierarchical clustering from the CLUSTAN package – Wishart 1978). Unfortunately, no clear clusters emerged, regardless of the numbers of blocks (or contexts) used or whether the sites were treated together or separately. Moreover, such clusters as were present bore little relationship to the deposit types as originally defined.

The cluster analyses of blocks were repeated using only the densities of charred grain and non-cereal fragments which the analyses of variance had shown were most significantly different between deposits. This produced rather more interpretable results, the most obvious separation being between sites (Figure 80b). The separation of deposit types was less clear resulting in two major clusters, one composed largely of midden and cultivation deposits from Hornish Point and the other comprising most of the features and windblown sand deposits but also including large numbers of midden and cultivation deposits. This 'mis-classification' of many of the midden and cultivation deposits was also apparent when the sites were considered separately.