

## CHAPTER 13: POLLEN ANALYSES OF ORGANIC HORIZONS FROM THE BALELONE MIDDEN

A Mannion (1986)

### 13.1 INTRODUCTION

The extensive midden deposits excavated at Balelone Farm contained a wealth of archaeological remains embedded in a matrix consisting variously of sand, clay and organic horizons. It was considered that the latter horizons in particular might yield information on the nature of the material that produced them and thus augment the results of the archaeological excavation by providing additional information on resource use and subsistence strategies.

A number of possibilities were suggested relating to the derivation of these organic horizons *viz* that they originated as animal bedding, animal faeces, thatch, peat and/or domestic refuse. Consequently, it was decided that pollen analysis, a palaeoecological technique widely used in the examination of the relationship between people and environment, should be undertaken to determine whether or not such data could elucidate more precisely the nature of the organic material.

Pollen analysis was undertaken on organic horizons contained within monolith boxes and bag samples collected by CEU. This report details the results of these analyses and examines the data in relation to the possible origins of the Balelone midden organic horizons.

#### a) Monolith 1

Level (cm)	Description
0–10	Greenish shell sand matrix with large shell remains
10–16	Red clayey matrix. Some fragments of charcoal and shell remains
16–22	Light brown clayey matrix with shell and charcoal? remains
22–26	Transition between 16–22 cm above and 26–42 cm below
26–42	Light coloured shell sand with some siliceous sand. Small (2–3 mm) organic horizon at 38 cm below which sand is iron-stained for 1–2 mm
42–50	Brown horizon with some shell sand, shell fragments and charcoal? fragments

#### b) Monolith 2

Level (cm)	Description
0–7	Red clayey matrix with some shell sand containing shells of limpets and winkles and charcoal? remains
7–12	Dark humic layer of hard compacted deposits. Initially dark red-brown in colour but turning black after exposure
12–14.5	Dark brown humic deposits with high water content
14.5–20.5	Coarse deposits of small shell fragments with weathered chalk, tinged green
20.5–23	Hard black organic horizon
23–30.5	As 20.5–23 cm but slightly less compacted
31.5–43	Shell sand with slight green tinge. Iron layer at 40 cm
43–50	Shell sand

#### c) Bagged samples

Sample	Description
209	Brown material matter of small friable particles including shell fragments and charcoal?
875	Brown mineral matter similar to 0209
204	As above, with charcoal and iron pyrites
132	Red-brown mineral matter with organics, charcoal and iron pyrites
710	As 0132 but with organic matter
714	Very dark brown cohesive mineral matter and a high proportion of organics and a few shell fragments

### 13.2 RESULTS

The stratigraphy of the two monoliths is given in Table 23. Six additional bagged samples were also analysed from Balelone, the sediment characteristics of which are also given in Table 23.

It proved necessary to examine at least two slides from each sample to obtain a reasonable total pollen count. In general, however, the total counts were low, usually between 200 and 300, due to the presence of relatively large numbers of poorly preserved palynomorphs that made identification impossible. The subsamples from 16 cm and 19 cm of Monolith 1 contained too few palynomorphs (<40) to give reliable counts. The results from the remaining subsamples are given in Figures 81 and 82. In both these diagrams the results are expressed as percentages of total pollen although in the following discussion reference is also made to pollen concentrations.

### 13.3 DISCUSSION

Overall, the results show that the pollen spectra are dominated by Gramineae, Cyperaceae and *Calluna vulgaris*. All of these taxa are abundantly present in peatland and moorland communities which are widespread in North Uist today and, as Mannion and Moseley have shown (*passim*) by pollen analysis of lake sediments and peat in the immediate vicinity of the Balelone midden, were present in the island from about 7000 years BP, long before the midden came into exis-

Table 23. Balelone. a) stratigraphy of Monolith 1. b) stratigraphy of Monolith 2. c) description of bagged samples

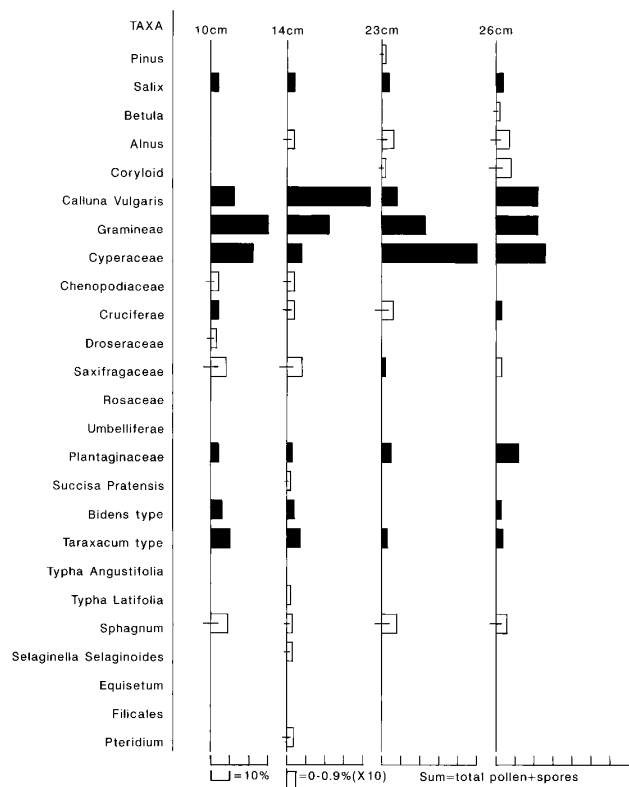


Figure 81. Balelone Farm; percentage pollen histograms for the monolith samples

tence. Thus, there is every likelihood that the midden organic horizons originated, at least in part, as peat which was collected as fuel and/or animal bedding. Moreover, it is also possible that the Gramineae, Cyperaceae and *Calluna vulgaris* pollen originated from material that was collected for thatch. Dickson and Dickson (1984), for example, suggest that the preponderance of *Calluna vulgaris* pollen at the Iron Age site of Crosskirk Broch, Caithness, may indicate the use of ling heather as a thatching material. It is also possible that a wider range of vegetation types may have been similarly used, especially grasses and sedges, which could provide very adequate roofing materials. If such practices were common then it is also likely that pteridophytes, such as *Polypodium* and *Pteridium*, and bryophytes, such as *Sphagnum*, were collected and this would account for the significant presence of their spores in the midden organic horizons. There is certainly no pollen analytical evidence from the Balelone midden organic horizons that positively disprove that they originated as peat, animal bedding or thatch.

Moreover, since Mannion and Moseley (*infra*) have shown that the moorland and peatland vegetation communities of North Uist were well established by the time the midden began to accumulate it is also highly likely that such communities were grazed by domesticated animals. This, therefore, lends some support to the hypothesis that the midden organic horizons originated from animal faeces. There have been very few studies on the relationships between the pollen content of animal faeces and the representation in the modern pollen rain of extant vegetation communities with which to compare the midden pollen data. Moe (1983) has undertaken such a study in Norway and he concludes that there may not be a simple or direct relationship between the

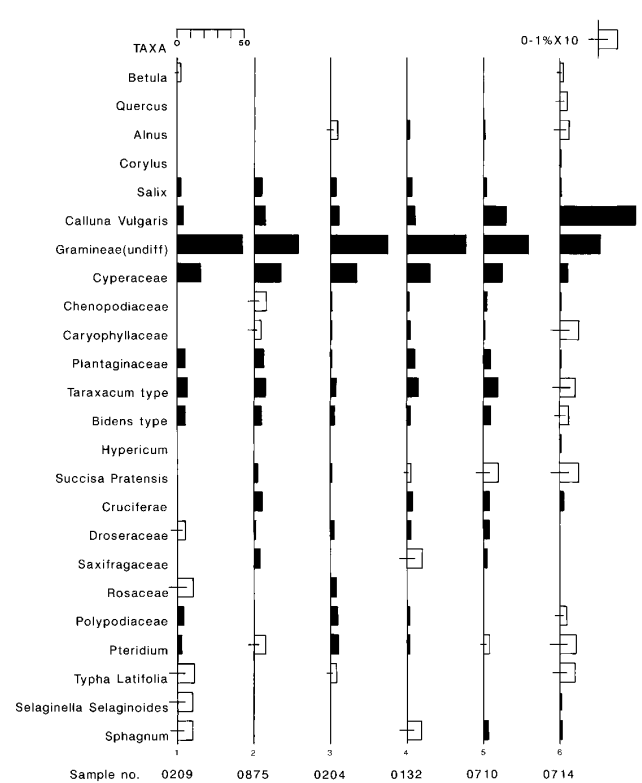


Figure 82. Balelone Farm; percentage pollen histograms for the bagged samples

pollen spectra from the faeces of grazing animals, such as sheep, and the local pollen rain. The pollen analytical data from the Balelone midden organic horizons do not preclude the possibility that the latter were derived from animal faeces but further work is presented below, based on pollen analyses of modern animal faeces, to show that the midden organic horizons cannot be attributed solely to animal faeces.

As Figures 81 and 82 show, the Balelone midden organic horizons contain quite a wide variety of pollen taxa. It is extremely unlikely that such a wide pollen spectrum would have been derived from a single source and any more positive conclusions must consider the exploitation of the varied machair, peatland and moorland vegetation communities as well as the possible inadvertent inclusion of 'weed' plants and the deliberate cultivation of crop plants. Cruciferae pollen, for example, are particularly abundant in the 13 cm level of Monolith 1. Cultivated brassicas are members of the Cruciferae family and it is quite possible that such taxa were being cultivated and their remains left to rot, in much the same way that compost heaps are presently used. It is also highly likely that many of the Gramineae pollen types identified were Cerealia, although the poor preservation of palynomorph types in general precluded their separation from the Gramineae. If cereals were being cultivated, as is indicated in the pollen analytical data from the Balelone Farm peat profile (Figure 81), it is not difficult to envisage a situation where chaff etc. was discarded, along with the remains of other cultivated plants and 'weeds' of cultivation which had been inadvertently collected as part of the harvest. This explanation would account, at least in part, for the relatively wide variety of taxa recorded in the midden or-

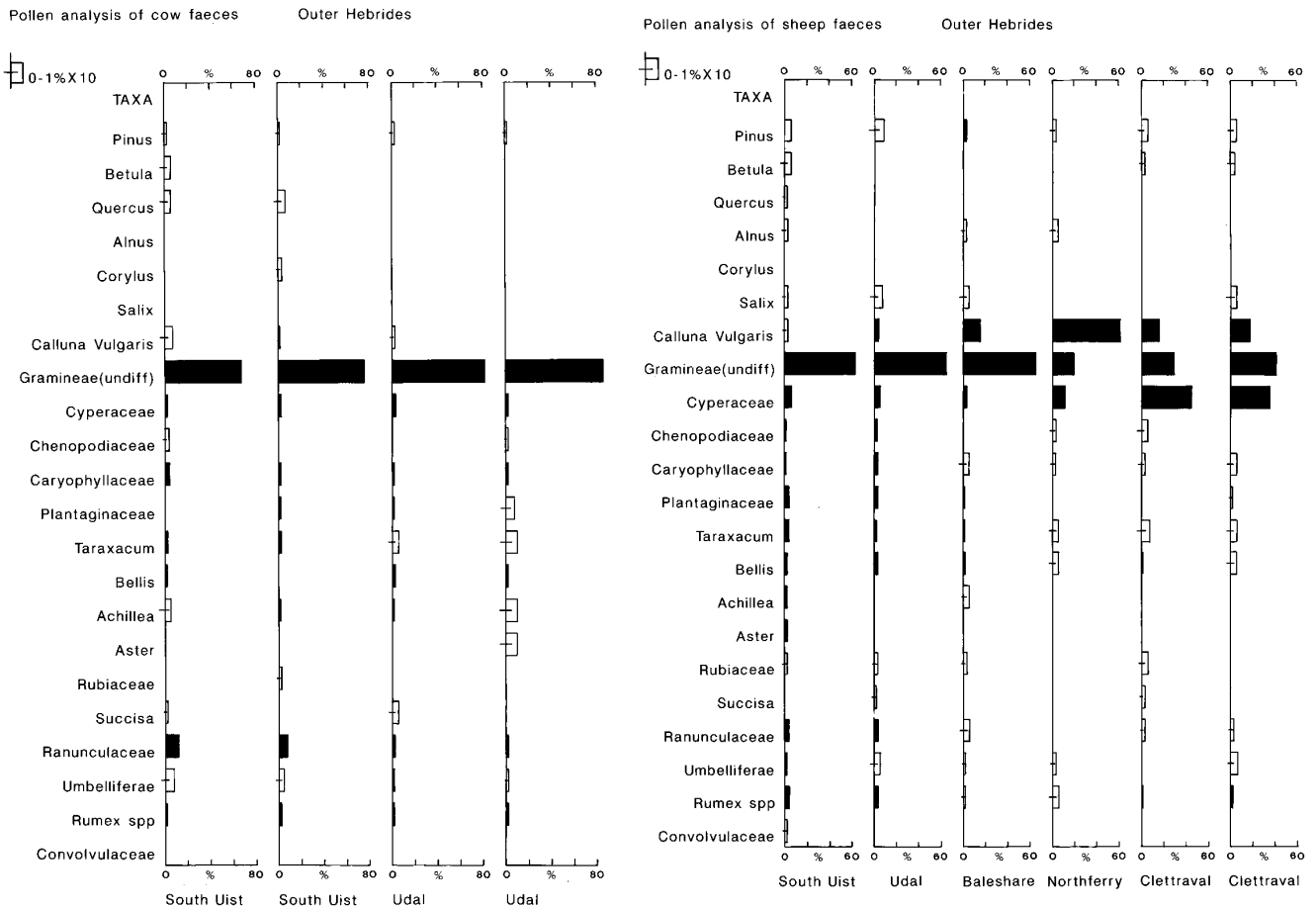


Figure 83. Percentage pollen histograms for animal faeces a) cow faeces b) sheep faeces

ganic horizons and in particular, the significant percentages of Plantaginaceae, Compositae and Cruciferae pollen, all of which may have originated from the machair plain as it was cultivated for cereal production or, alternatively, cropped for hay.

13.4 POLLEN ANALYSES OF SHEEP AND CATTLE FAECES FROM THE OUTER HEBRIDES

To test the hypothesis that the organic horizons may have derived from animal faeces, modern faeces of sheep and cattle were collected for pollen analysis, the results of which are presented below.

13.4.1 Field and laboratory methods

Samples of sheep and cattle faeces were collected from a number of sites on North and South Uist, ranging from the machair plain at Udal and Baleshare, to moorland sites at Northferry and Cletraval. Ten samples, four from cattle and six from sheep were subjected to the procedures for laboratory preparation of pollen slides (see Chapter 4). Although it was not intended to present the data as pollen concentrations, since in the case of animal faeces this is meaningless, *Lycopodium* spore tablets (Stockmarr 1971; 1972) were added to each preparation to ensure replicability and to de-

termine whether the samples were sufficiently polliniferous to yield reliable counts.

13.4.2 Results

All ten samples yielded sufficient pollen for counting, most of which was in identifiable conditions. The results are given in Figure 83 where each taxon or genus is expressed as a percentage, based on a minimum count of 300 pollen grains. Figure 83 has been drawn at the same scale as those for the Balelone midden organic horizons to facilitate direct comparison.

13.4.3 Discussion

In common with the midden organic horizons the faeces samples contain a wide variety of pollen types (Figure 83). Of particular note is the absence of bryophyte (moss) and pteridophyte (fern) spores from the faeces. In none of the midden samples are these abundant but the results show that they are consistently present, especially Polypodiaceae and Pteridium. On this basis an origin for the midden organic horizons from animal faeces has to be discounted. This is not surprising as it is very probable that animal faeces were highly prized as manure, particularly for cultivation of the machair in which organic matter is not abundant. The pollen analyses of the animal faeces also provide grounds for some

further observations. Samples of both sheep and cattle faeces from South Uist and Udal indicate that the animals were grazing on a similar vegetation, probably the machair, since the pollen spectra are dominated by Gramineae and a range of herbaceous taxa. The sheep faeces from Northferry and Cletraval, however, contain abundant Cyperaceae and *Calluna vulgaris* pollen indicating that these animals grazed moorland and peatland vegetation communities. Moreover, the general range of pollen from herbaceous taxa must represent only those plants which were in flower at the time the animals were browsing. It is highly likely that if faeces samples were collected at different times during the year pollen of different herbaceous plants would be present. A study of this variation would necessitate the tracking of individual animals and the collection of their faeces at regular intervals as Moe (1983) has done in western Norway. It would also be interesting to compare the pollen spectra from the faeces with the pollen rain of the area to evaluate how representative the former is of the latter and how both relate to the present-day vegetation communities. The presence of arboreal pollen in the faeces is also somewhat anomalous as it is unlikely that the animals were grazing on trees such as *Pinus*. The most plausible explanations for the presence of arboreal pollen, albeit in small numbers, are that it was blown onto the faeces or that it adhered to the vegetation which was subsequently grazed.

It, therefore, seems most unlikely the Balelone midden organic horizons are derived from animal faeces. This conclusion rests on the complete absence of spores, both bryophyte and pteridophyte, from the faeces samples.

### 13.5 CONCLUSION

In conclusion, the specific origin of the midden organic horizons remains an enigma and the pollen analytical data prompt more questions than answers. Of the possible origins for the midden organic horizons given in the introduction only an origin from animal faeces can be discounted. Moreover, the presence of a relatively wide variety of pollen taxa can only be adequately explained by considering the exploitation of the most abundant habitats in North Uist, ie the machair grassland, peatland and moorland communities and possibly the cultivation of specific crops such as cereals. A combination of practices involving the exploitation of all the dominant habitats for thatching and/or animal bedding and/or fuel as well as the cultivation of specific crops would account for the pollen spectra of the Balelone midden organic horizons. It would not be unreasonable to suppose that the producers of the midden were indeed using such a wide variety of natural resources but there is no viable palaeoecological test which suggests itself as the panacea to this enigma.