GLEANN MOR, HIRTA

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OS Grid Reference: NF086997

Highlights

The sediments which infill a topographic basin in Gleann M¢r contain a valuable pollen record, supported by radiocarbon dating, of the Lateglacial and Holocene vegetational and environmental changes on St Kilda. This record is particularly significant in view of the location of the site on the extreme Atlantic periphery of the British Isles, where human modifications have been minimal.

Introduction

The site (NF 086997) is a small peat bog located at an altitude of approximately 90 m O.D. on the lower slopes of Gleann M¢r, in the north-west part of the island of Hirta. The islands of St Kilda have long been a focus of ecological interest because of their remote position on the Atlantic fringes of the British Isles. The archipelago, consisting of the islands of Hirta, Dun, Soay and Boreray, lies near the edge of the continental shelf 180 km west of the Scottish mainland and 64 km WNW of the westernmost headland of the Outer Hebrides. Although a considerable amount of research has been carried out on the present vegetation (Turrill, 1927; Petch, 1933, Poore and Robertson, 1948; McVean, 1961; Gwynne *et al*., 1974), until recently only limited palynological investigations (McVean, 1961) had been made and hence the vegetational history of the island group was virtually unknown. Following the discovery of an interstadial polleniferous sand (Sutherland *et al*., 1984), the publication (Walker, 1984a) of a detailed pollen diagram from Hirta covering much of the Holocene has given important insights into the vegetational development of the islands.

Description

A little over 2 m of sediment, comprising principally sand, organic muds and peat, have accumulated in the peat bog (Figure 12.10). The lowermost sediments in the profile, comprising beds of grit and fine gravel, and brown organic mud are of probable Loch Lomond Stadial age; the remainder are Holocene deposits. Five pollen assemblage zones have been identified and four radiocarbon dates (SRR–2361 to SRR–2364) have been obtained from the sediments (Figure 12.10).

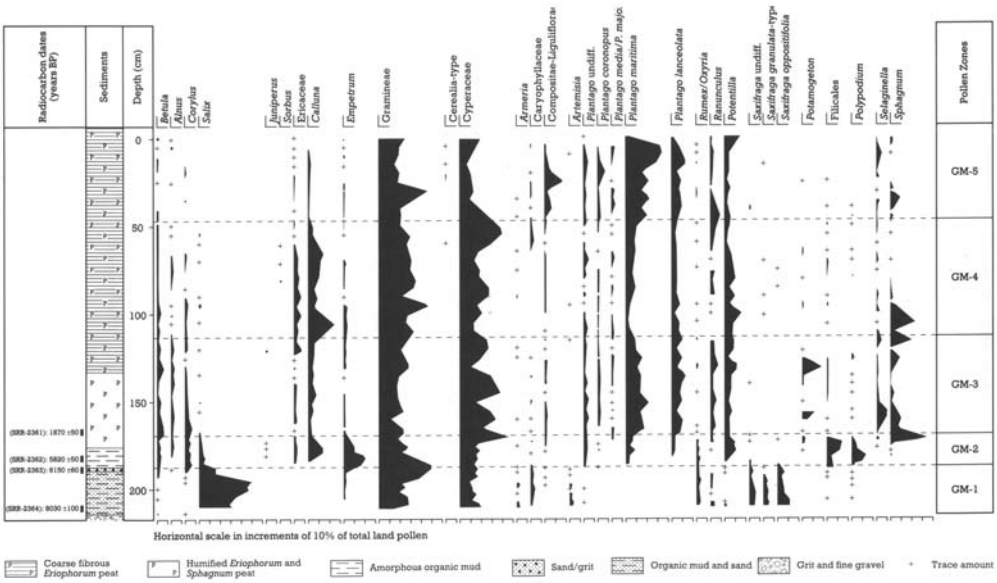

Figure 12.10: Gleann Mòr, Hirta: relative pollen diagram showing selected taxa as percentages of total land pollen (from Walker, 1984a).

Interpretation

The earliest pollen zone (GM–1) is dominated by *Salix*, and is characterized by pollen from taxa indicative of bare and disturbed ground such as *Saxifraga oppositifolia*, *Oxyria digyna*, *Artemisia* and species of Caryophyllaceae. An open tundra landscape is indicated and hence the *Salix* pollen indicates the presence of either the least willow (*Salix herbacea),* or such northern or arctic willows as *Salix polaris*, *Salix reticulata* or *Salix glauca*. The basal minerogenic sediments that contain this pollen assemblage are indicative of periglacial conditions, and a Loch Lomond Stadial age (11,000–10,000 BP) is suggested. The radiocarbon date of 8030 + 100 BP (SRR–2364) obtained from the base of the profile is considered to be in error by around 2000 years as a consequence of groundwater contamination.

The boundary between pollen assemblage zones GM–1 and GM–2 has been dated to 6150 + 60 BP (SRR–2363) which, if correct, indicates a gap in the sediment record of the Gleann M¢r profile spanning over 4000 years during the early and middle Holocene. The pollen spectra in GM–2 reflect a floristically diverse grassland with *Plantago maritima*, *Plantago lanceolata*, *Potentilla*, *Rumex*, Compositae (Liguliflorae), and Polypodium, interspersed with heathland communities dominated by *Empetrum*, *Calluna vulgaris* and, probably, *Erica cinerea*. Pollen of *Betula*, *Alnus* and *Corylus* is also present. While it is possible that small numbers of birch, hazel and alder managed to gain a foothold on Hirta, the fact that frequencies for these genera never exceed 6–7% of total land pollen means that the possibility of long-distance transfer from the Scottish mainland cannot be discounted (see Birks and Madsen, 1979). Certainly, there is no unequivocal evidence to support the view (McVean, 1961) that St Kilda once possessed a cover of birch-hazel scrub.

The renewed accumulation of sediment at Gleann M¢r a little before 6000 BP is almost certainly a reflection of a regional climatic shift to more oceanic conditions in north-west Europe following the Holocene rise in sea level. The first traces of *Alnus* which are recorded in the Gleann M¢r profile around 5800 BP may be a further indication of a general trend towards increasing climatic wetness (Godwin, 1975).

Pollen zone GM–3, the base of which has been dated to 1870 + 50 BP (SRR–2361), reflects a change from a mixed heath and grassland landscape to a Plantago-dominated sward, the principal elements of which were *Plantago maritima* and *P. lanceolata*, along with P. media/major and *P. coronopus*. Many of these species are found in the halophyte swards that have developed on St Kilda at the present day in areas where the sea spray effect is considerable (Gwynne *et al*., 1974). The decline in heathland and expansion of the *Plantago* grassland may therefore be indicative of an increase in storm frequency and intensity around St Kilda, with salt spray being blown across large areas of Hirta. Wetter conditions are also

indicated by the occurrence of *Potamogeton* and *Littorella* which suggest pools of standing water, by the appearance of *Selaginella* reflecting the expansion of moist and damp habitats, and by the higher counts for *Sphagnum* and Cyperaceae. These records probably reflect the marked deterioration in climate that occurred throughout north-west Europe around 2500 BP (Lamb, 1977, 1982a).

The pollen spectra in zone GM–4, by contrast, appear to indicate a change to drier and less stormy conditions. The decline in *Plantago maritima* frequencies and the increased values for *Empetrum* imply an expansion of heathland at the expense of *Plantago* sward. Some areas of marshy and boggy ground remained but, in general, the extensive maritime communities that had previously been a feature of the Hirta landscape were significantly reduced. No radiocarbon dates were obtained from this level of the profile, and hence dating is speculative, but pollen zone GM–4 may span the first millennium A.D., a period of generally more equable climate in the North Atlantic region (Lamb, 1977, 1982a, 1982b).

The uppermost pollen assemblage zone (GM–5) is comparable in a number of respects to GM–3, with the expansion of Plantago-dominated plant communities at the expense of heathland. Again, an episode of wetter and more stormy conditions is implied, most probably corresponding with the Little Ice Age, the climatic deterioration that was experienced throughout north-west Europe and the North Atlantic region during the second millennium A.D.

Anthropogenic effects on the vegetation of Hirta are difficult to establish. The appearance of *Plantago lanceolata* pollen shortly after 5800 BP is a feature that has frequently been associated with human activity (for example, Johansen, 1978), but in the context of St Kilda, the pollen record for this species is more probably a reflection of the growth of ribwort plantain in natural maritime grassland communities. Similarly, although it is possible that some of the fluctuations in the *Calluna* pollen curves may be due to prehistoric grazing activity, there is little independent archaeological evidence, and hence the pollen record is more likely to reflect climatic rather than anthropogenic influences. Only in the uppermost 0.2 m of the profile where low frequencies of cereal-type pollen are encountered is there clear evidence of human activity.

The pollen site in Gleann M¢r on the island of Hirta is of considerable significance. It provides valuable data on the vegetational history of St Kilda during the Loch Lomond Stadial, and it contains detailed pollen evidence of vegetational changes in this remote area of the British Isles throughout the middle and late Holocene. Of particular importance, however, is the fact that, by contrast with other areas of the British Isles and north-west Europe, human influence on the vegetation of the islands appears to have been minimal and hence the pollen sequence provides a rare proxy record of climatic changes in the North Atlantic province spanning the past 6000 years. Relatively few records of this nature are available because the effects of climatic change are frequently masked in late Holocene pollen records by anthropogenic influences (Birks, 1986).

Conclusions

Gleann M¢r is important for its record of vegetation history and environmental change on St Kilda during the Devensian Lateglacial and Holocene (approximately the last 11,000 years). The site provides valuable palaeoecological data from a remote and inaccessible part of Britain, and the pollen evidence from Gleann M¢r is of particular significance for the insights it allows into the patterns of climatic change during the later part of the Holocene.

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