Gribun

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Highlights

Pollen preserved in the sediments that infill a topographic basin at Gribun provide an unusually long and detailed record of Holocene vegetational history and environmental change. The sediments accumulated after the retreat of a Loch Lomond Readvance glacier, one of the lowest to have existed in Scotland during the Loch Lomond Stadial.

Introduction

The site [NM 450 326], located at Gribun in western Mull, comprises a deep, infilled basin behind an arcuate end moraine (Bailey *et al,* 1924; Dawson *et al.,* 1987a). The sediments in the basin have yielded a high-resolution pollen record which spans most of the Holocene and displays a level of detail seldom achieved in Scottish Holocene pollen profiles (Walker and Lowe, 1987). Hence Gribun is possibly the most important site for reconstructing the Holocene vegetational history in the Hebridean islands and adjacent areas of the west coast of Scotland.

Description

The coastal cliffs at Gribun are characterized by a series of extensive landslips resulting from failure of the Upper Cretaceous sedimentary rocks that underlie the Tertiary basalts in this area. One of the largest of the debris accumulations occurs to the south of Balmeanach Farm [NM 448 329], where an impressive multiple-ridged, arcuate rampart composed of large boulders within a fine-grained matrix has developed at the foot of the Creag a'Ghaill escarpment. Deep, infilled basins are enclosed within the rampart complex. Although the arcuate ridge was originally described by the Geological Survey as '…a landslip of the completely disintegrated type, and accordingly might be claimed with some propriety as a moraine' (Bailey *et al.,* 1924, p. 414), a combination of geomorphological and sedimentary evidence confirms the view that the feature is an end moraine that formed as a consequence of glacier activity during the Loch Lomond Stadial (Walker *et al.,* 1985; Dawson *et al.,* 1987a). As such, it reflects the existence of one of the lowest glaciers in Scotland during the last cold phase, with an equilibrium line altitude of about 100 m. Of wider significance, however, is the biostratigraphical record contained within the sediments of the deep basin enclosed by the outer rampart.

Over 13 m of limnic and terrestrial sediment have accumulated in the largest basin within the morainic complex. The lowermost sediments (approximately 1.8 m) are minerogenic and consist of a generally upward-fining sequence of pebbles, grits, sands, silts and clays. Particularly distinctive is a series of over 90 silt/clay laminations which overlies the coarser basal beds. These sediments accumulated in a proglacial lake that developed behind the outer moraine following glacier recession. The lower gravels and sands are considered to reflect glaciofluvial deposition, whereas the laminated deposits are interpreted as glaciolacustrine varves. Overlying the basal minerogenic sediments are some 4 m of fine-grained gyttja (organic mud) and clay–gyttja, these limnic deposits being succeeded, in turn, by over 7 m of amorphous organic muds and peats (Figure 11.14). The pollen evidence (below) suggests that these sediments accumulated very rapidly, with rates of 0.2 m-0.3 m 100 years' being recorded for the middle Holocene; and even during the early Holocene, organic sediment was accumulating at about 0.04 m 100 years'. These are significantly higher rates of deposition than are usually encountered in Holocene pollen sites in Scotland.

Interpretation

The minerogenic sediments at the base of the Gribun profile contained too little pollen for counting, but nine local pollen assemblage zones were identified in the overlying organic deposits (Figure 11.14). This sequence of pollen assemblage zones is broadly similar to that recorded at other Holocene sites on Mull (Walker and Lowe, 1985; Lowe and Walker,

1986b), although the early and late Holocene is more fully represented in the sediments from Gribun. On the wider scale, the sequence is comparable with Holocene pollen records from other parts of Scotland, including the north-west Highlands (see Cam Loch and Loch Sionascaig) (Pennington *et al.,* 1972), the Western Isles (Bennett *et al.,* 1990), Skye (see Loch Ashik) (Williams, 1977; Birks and Williams, 1983), Ardnamurchan (Moore, 1977), Argyll (see Loch Cill an Aonghais) (Rymer, 1974; Tipping, 1984) and the Rannoch Moor area of the Grampian Highlands (see Kingshouse) (Walker and Lowe, 1977, 1979, 1981). In terms of vegetational development, three distinct stages can be recognized.

1. An early Holocene succession in which open-habitat herbaceous vegetation was succeeded by heathland and ultimately by a landscape of trees and shrubs. This is reflected in the Gribun profile by a basal pollen assemblage zone (G–1) dominated by pollen of herbaceous plants including Gramineae, Cyper-aceae, *Rumex* and *Artemisia,* along with spores of the clubmosses *Lycopodium selago* and *L. annotinum.* This initial pollen assemblage zone is succeeded by zones dominated by *Empetrum* with some *Salix, Juniperus* and *Betula* (G–2); *Juniperus, Salix* and *Betula* (*G–3*); *Betula* and *Salix* with a rising *Corylus* curve (G–4); and *Corylus* with *Betula* and *Salix* (G–5). No radiocarbon dates have been obtained from the Gribun profile, but there are profiles dated to the early Holocene available from other sites on Mull (Walker and Lowe, 1982). On the not unreasonable assumption that the early Holocene local pollen assemblage zones from the various profiles broadly correlate, then the earliest organic sediments at Gribun may be inferred to have accumulated prior to 10,200 BP, the *Empetrum* maximum may be dated to close to 10,000 BP, the phase of *Juniperus* expansion occurred around 9600 BP, the birch episode can be dated to near 9300 BP, and the *Corylus* rise began around 8800 BP.

2. A phase of middle Holocene woodland expansion and diversification following the establishment of *Corylus,* with *Quercus, Ulmus, Pinus* and *Alnus* forming the dominant elements. The first consistent pollen records for oak and elm are recorded in pollen zone G–5, but these taxa are better represented (along with *Pinus*)in pollen zone G-6. *Alnus* also appears during that zone and dominates the spectra along with *Corylusl Myrica* in pollen zone G–7. Radiocarbon dates from sites in western Scotland suggest that the *Alnus* expansion occurred around 6500 BP (Birks, 1972b; Pennington *et al.,* 1972; Williams, 1977). The generally low frequencies of arboreal taxa in the Gribun profile are found not only at other sites on Mull, but also in records from elsewhere in the Hebrides (Flenley and Pearson, 1967; Vasari and Vasari, 1968; Birks, 1973; Williams, 1977; Birks and Madsen, 1979; Birks and Williams, 1983), suggesting that only a scattering of oak, elm and pine woods developed on the islands of western Scotland even at the 'climatic optimum' of the Holocene. This reflects, above all, the effects of exposure to strong westerly winds, although generally thin soils which became rapidly leached during the course of the Holocene may also have significantly reduced tree vigour (Pennington *et al.,* 1972; Birks, 1975).

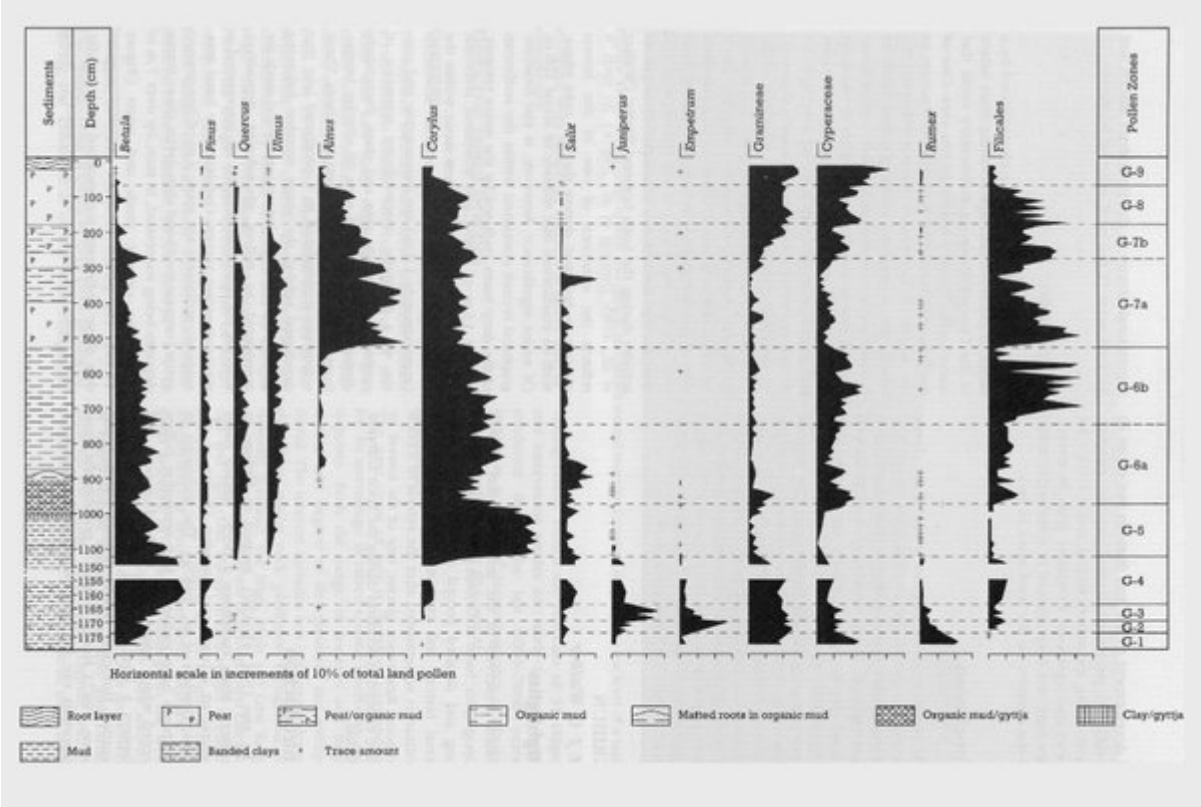
3. A period of woodland contraction and the replacement of woodland stands and tall-shrub-dominated communities by heathland and grassland. This phase is represented in the Gribun profile in pollen zones G–8 and G–9, throughout which there is a progressive increase in pollen of Gramineae, Cyperaceae and other herbaceous taxa including *Potentilla, Rumex* and *Plantago,* and a marked reduction in woody plant pollen, a phenomenon which becomes particularly apparent in pollen zone G–9. Although these landscape changes largely reflect natural processes, namely progressive soil deterioration through accelerated leaching and increasingly stormy conditions along the western littoral, anthro-pogenic activity may be partly responsible for some of the inferred vegetational changes. There is abundant evidence on Mull to suggest a long history of human occupation (Morrison, 1980; Royal Commission, 1980), and hence the pollen changes that are apparent throughout zones G–8 and G–9 of the Gribun profile may reflect not only the decline of woodland stands through natural processes, but also the acceleration of that trend as a consequence of anthropogenic activity from the Neolithic period onwards.

Gribun is therefore a pollen site of major importance in the context of the Holocene in Scotland, for few profiles combine a length of stratigraphic record with such a high level of detail. The broad similarity between the local pollen assemblage zones in the Gribun diagram, and those from elsewhere on Mull and other sites in western Scotland suggests that the Gribun pollen assemblage zones have wider application and that they can constitute a basis for regional correlation of Holocene deposits. On the broader scale, the high degree of stratigraphic resolution in the Gribun profile and the relative scarcity of detailed pollen records from the islands of the Hebrides and nearby areas of the Scottish mainland, indicate that Gribun is possibly the most important site for the central stretch of the west coast of Scotland.

Conclusion

The sediments preserved in the infilled basin at Gribun provide an exceptionally detailed record of vegetational change during the Holocene (the last 10,000 years). Analysis of pollen contained in the sediments shows the development of open-habitat vegetation, heathland and trees during the early Holocene, a phase of woodland expansion during middle Holocene times and the subsequent contraction of the woodland and its replacement by heath and grassland. The pollen record from Gribun is particularly important because of its length and detail. Consequently Gribun is a key reference site for studies of vegetational history in the islands and the adjacent mainland of the central part of the west coast of Scotland.

References



(Figure 11.14) Gribun: relative pollen diagram showing selected taxa as percentages of total land pollen (from Walker and Lowe, 1987).