LOCH AN T-SUIDHE

M.J.C. Walker

OS Grid Reference: NM370215

Highlights

The sediments that infill the floor of this loch contain a valuable pollen record, supported by radiocarbon dating, of vegetational history and environmental change on Mull during the Lateglacial.

Introduction

Loch an t-Suidhe (NM 370215) is a small lochan at an altitude of 30 m OD, approximately 1 km west-south-west of Bunessan on the Ross of Mull. Although a large number of pollen sites have now been investigated on the Scottish mainland (Walker, 1984b), until recently relatively little information was available about the Lateglacial on the islands of the Inner and Outer Hebrides. The publication (Lowe and Walker, 1986a) of two radiocarbon-dated pollen diagrams from sites on the Isle of Mull was therefore of significance in the context of the Scottish Lateglacial. Of the two sites investigated, Loch an t-Suidhe offered the better stratigraphic resolution and a coherent series of six radiocarbon dates was obtained from the profile (Walker and Lowe, 1982). The wealth of palaeoenvironmental evidence contained within the sediments of this basin make it one of the most important Lateglacial pollen sites so far described from western Scotland.

Description

The sedimentary sequence (Figure 11.15) near the southern shore of the lochan clearly resembles the tripartite lithostratigraphic Lateglacial succession commonly found in infilled Lateglacial lake sites in Britain (Sissons *et al.*, 1973). A lower minerogenic unit (approximately 8.8 m to base) is overlain by organic sediments (8.2–8.8 m) and these, in turn, are succeeded by a further minerogenic suite (7.9–8.2 m). The whole sequence is overlain by Holocene lake muds and peats. Details of the pollen stratigraphy of the Holocene sediments are contained in Lowe and Walker (1986b).

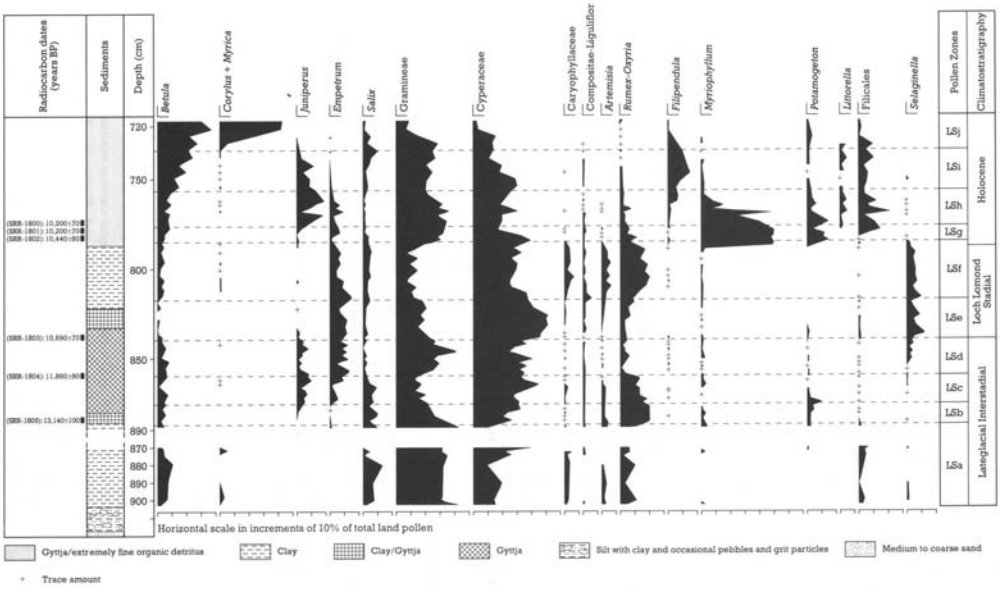

Figure 11.15: Loch an t-Suidhe: relative pollen diagram showing selected taxa as percentages of total land pollen (from Lowe and Walker, 1986a).

The pollen diagram from the Lateglacial and early Holocene deposits was divided into a series

of local pollen assemblage zones based on fluctuations in the curves for the principal taxa (Figure 11.15). These show (from the base) a sequence of increasing pollen content and diversity accompanied by rising curves for woody plant pollen (zones LSa to LSd; the Lateglacial Interstadial), followed by a phase of reduced woody plant pollen and an increase in pollen from taxa indicative of bare or disturbed soils (zones LSe and LSf; the Loch Lomond Stadial). This, in turn, is followed by a series of pollen assemblage zones dominated by successive maxima in *Empetrum*, *Juniperus*, *Betula* and *Corylus* (zones LSg to LSj; the early Holocene).

Interpretation

In terms of regional landscape changes, the pollen record from Loch an t-Suidhe reflects initial vegetational colonization of freshly exposed substrates during the early Lateglacial Interstadial following the wastage of the Late Devensian ice-sheet. Subsequently, there developed a juniper scrub and *Empetrum* heath vegetation cover. This was succeeded by a marked vegetational "revertance' phase (during pollen zones LSe and LSf) in response to the harsh climatic conditions of the Loch Lomond Stadial, when a tundra landscape developed. Finally, woody plants re-expanded as climate improved at the close of the Lateglacial and there occurred a vegetational succession from open heathland to Betula–Corylus woodland during the early Holocene.

Although this sequence is very similar to that recorded at Mishnish in northern Mull (Lowe and Walker, 1986a) and is comparable in broad outline with many other Lateglacial pollen successions from northern Britain (Pennington *et al.*, 1972; Gray and Lowe, 1977b; Pennington, 1977a, 1977b; Walker and Lowe, 1990), a number of features combine to make the Lateglacial and early Holocene record from Loch an t-Suidhe particularly distinctive. First, the data on deteriorated pollen provide independent evidence of episodes of increased geomorphological activity around the basin (for example, accelerated minerogenic inwash during the Loch Lomond Stadial). In addition, variations in levels of deterioration between individual pollen taxa made possible the differentiation between primary and secondary components in the pollen spectra, an aspect of pollen analysis that is becoming increasingly important in understanding the plant communities that developed during the Loch Lomond Stadial (Walker and Lowe, 1990). Second, following the work of Mackereth (1965, 1966) and Pennington *et al.* (1972), fluctuations in the curves for organic carbon and for the chemical elements Na, K, Mg and Ca, provide further evidence of the extent of mineral inwash into the basin and hence constitute an additional indirect record for landscape change around the site. Third, the fall in *Juniperus* pollen during the mid-interstadial and its replacement by *Empetrum*, in association with other evidence for disturbance in the vegetation cover, appears to reflect climatic deterioration some 1000 years before the onset of the Loch Lomond Stadial. This inference is in broad agreement with coleopteran records, which show evidence of a cooling trend, and particularly a fall in winter temperatures, from *c.* 12,500 BP onwards (Atkinson *et al.*, 1987). Fourth, systematic analysis of the record of *Artemisia* pollen reveals a change from oceanic conditions to a more continental climatic regime during the course of the Loch Lomond Stadial, which appears to be related to the southward migration of the oceanic and atmospheric polar fronts (Duplessy *et al.*, 1981; Ruddiman and McIntyre, 1981b; Bard *et al.*, 1987).

Finally, Loch an t-Suidhe is notable because of the internally consistent series of radiocarbon dates that was obtained from the profile. As with all age determinations on bulk samples of organic lake muds, however, contamination by older or younger carbon residues (Sutherland, 1980; Walker and Harkness, 1990) cannot be entirely excluded, and hence the dates must be treated with a degree of caution. The basal organic sediments were dated at 13,140 + 100 BP (SRR-1805), an age determination which is in broad agreement with dates on comparable biostratigraphic horizons at sites on the Scottish mainland (Bishop, 1963; Kirk and Godwin, 1963; Sissons and Walker, 1974; Pennington, 1975b; Lowe and Walker, 1977; Vasari, 1977). It is also in agreement with the date inferred for the replacement of polar by warmer waters around the shores of western Britain (Duplessy *et al.*, 1981; Ruddiman and McIntyre, 1981b; Peacock and Harkness, 1990). If correct, the date from the basal sediments would support the view that climatic amelioration at the beginning of the Lateglacial Interstadial occurred around 13,000 BP (Coope, 1975; Atkinson *et al.*, 1987). The *Juniperus* decline in the interstadial was dated at 11,860 + 80 BP (SRR-1804), an age determination that accords with the inference

that climatic deterioration in western Britain began around 12,000 BP (Watts, 1977, 1985; Craig, 1978; Walker and Lowe, 1990). The onset of the Loch Lomond Stadial (as indicated by the sediment and pollen records) was dated at 10,690 + 70 BP (SRR-1803), which is very close to the age determination (10,730 + 60 BP; SRR-1807) on the comparable horizon at Mishnish in northern Mull (Walker and Lowe, 1982). Three dates of 10,440 + 80 BP (SRR-1802), 10,200 + 70 BP (SRR-1801) and 10,200 + 70 BP (SRR-1800) were obtained from the early Holocene sediments which pre-date the expansion of *Juniperus*. These dates are in broad agreement with a number of dates from basal Holocene sediments from other Scottish sites (Walker and Lowe, 1979, 1980, 1985) and, if correct, they reinforce the suggestion (Lowe and Walker, 1976; Walker and Lowe, 1981) that climatic amelioration at the close of the Loch Lomond Stadial occurred well before 10,000 BP. It should be noted, however, that the recently discovered plateau of constant radiocarbon age around 10,000 BP, and which appears to reflect fluctuations in atmospheric radiocarbon production (Ammann and Lotter, 1989; Zbinden *et al*., 1989), poses a major difficulty in the establishment of "reliable' age estimates at the Lateglacial–Holocene boundary (see also Kingshouse).

Loch an t-Suidhe contains a wealth of data on the Lateglacial and early Holocene environmental history of the Isle of Mull. It forms a key element in a network of published sites from the mainland (Pennington *et al*., 1972; Pennington, 1975b, 1977a; Rymer, 1977; Tipping, 1984) and from the Isle of Skye (Birks, 1973; Walker and Lowe, 1990) which now enable a regional picture to be established of environmental change along the western Scottish seaboard following the wastage of the last ice-sheet. However, Loch an t-Suidhe may also be important in a wider context. Although it is now generally recognized that a dominant influence on the British climate and environment has been oceanographic changes in the north-east Atlantic province (see, for example, Lowe and Walker, 1984), it has not always proved possible to establish clear links between the marine and terrestrial records, particularly over the relatively restricted timespan of the Lateglacial. The location of Loch an t-Suidhe on the maritime fringes of north-west Britain, coupled with the detailed stratigraphic evidence contained within the profile and the internally consistent radiocarbon chronology, make it a potentially valuable site for correlation between the marine and terrestrial records. In this respect, therefore, Loch an t-Suidhe may prove to be a site of both national and international significance.

Conclusions

Loch an t-Suidhe is a key site for interpreting Lateglacial environmental history in western Scotland during the Lateglacial, between about 13,000 and 10,000 years ago. The pollen record shows the pattern of vegetation colonization and development in the period after melting of the last ice-sheet (about 13,000 years ago). There is clear evidence for a subsequent return to tundra conditions during the Loch Lomond Stadial (approximately 11,000 and 10,000 years ago), followed by the development of open heathland and birch woodland during the early Holocene. Loch an t-Suidhe is particularly significant for the wealth of information it provides about this important time period, allowing detailed reconstruction of the palaeoenvironmental conditions.

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