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# Beanrig Moss

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## Highlights

The pollen and plant macrofossils preserved in the sediments which infill the topographic depression at Beanrig Moss provide a detailed record of vegetational history and environmental change in south-east Scotland during the Lateglacial. The plant macrofossils, in particular, have yielded a great wealth of palaeoecological information.

## Introduction

Beanrig Moss [NT 517 293] is part of the Whitlaw Mosses, a series of peat bogs located 5 km east of Selkirk and 6 km south-west of Melrose. It is about 200 m long and occurs at an altitude of about 240 m OD. The sediments of Beanrig Moss are of considerable palaeoecological value in that their rich fossil content provides evidence for a continental flora in eastern Scotland during Late Devensian times, several members of which are now rare or extinct in the British Isles. The site and its deposits have been described by Daniels (1972) and Webb and Moore (1982).

## Description

The drift-covered Silurian shales of the Melrose area of the Borders have given rise to alternating ridges and hollows depending upon their susceptibility to glacial erosion (Ragg, 1960). Within the hollows is developed a series of valley fens, the Whitlaw Mosses, of which the most thoroughly studied is Beanrig Moss (Daniels, 1972; Webb and Moore, 1982). Calcareous groundwater during the Late Devensian led to the development of marl and clay deposits in these fens, which form the main feature of sedimentary interest. Similar sediments have been described at Whitrig Bog (Mitchell, 1948; Connolly, 1957) some 10 km to the north-east, and at Blackpool and Murder Mosses within the Whitlaw complex.

The deposits at Beanrig Moss comprise grey and pink, banded clays containing angular shale fragments. The succession at the deepest part of the site is as follows:

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| 5. Detritus (organic) muds and swamp peats interrupted at a depth of about 1 m below the surface by a clear depositional hiatus, followed by fresh, unconsolidated swamp peat | 1.55 m |
| 4. Grey clay with angular rock fragments and with abundant bryophyte remains  | 0.50 m |
| 3. Coarse detritus muds   | 0.38 m |
| 2. Marls, muds and clays  | 0.60 m |
| 1. Grey and pink, banded clays containing angular shale fragments   | 0.97 m |

The Late Devensian sediments of bed 2 have their greatest depth (about 3 m) in the centre of the basin. The hiatus in bed 5 can be traced across the entire basin and has evidently resulted from the harvesting of peat from the basin in the past. The current vegetation at the site is thus the consequence of secondary reinvasion of abandoned peat cuttings.

The sediments at Beanrig Moss contain an abundance of plant microfossils and macrofossils which provide material for a detailed reconstruction of the vegetation of the Lateglacial Inter-stadial and Loch Lomond Stadial (Figure 17.9). Evidence from the fossil plant materials within the sediments indicates that they represent the full Lateglacial sequence. The abundance of marl at the site, however, has so far precluded the use of radiocarbon dating techniques.

## Interpretation

The basal clays (bed 1) do not contain a sufficient density of pollen for analysis, but plant macrofossils and other microfossils have been extracted (upper part of bed 2) and identified (Webb and Moore, 1982). These included ostracods, *Daphnia*, Chironomidae, and *Nitella* and *Tolypella* oospores. Terrestrial plants included *Artemisia* (a capitulum of *A. sect. dracunculus*), *Salix* and *Papaver sect. scapiflora*, reflecting open, cold tundra conditions.

Warmer conditions are indicated in the succeeding sediments (bed 3) by an increasing abundance of *Potamogeton* fruit stones, particularly within the marls, but terrestrial plant macrofossils, including *Dryas octopetala*, *Vaccinium vitisidaea* and many mosses (for example, *Rhytidium rugosum*) show that dwarf-shrub vegetation persisted. Pollen density increases within these sediments and has provided evidence of local fens and willow thickets, together with both tree and dwarf birch (pollen assemblage zone BRM-a). Open ground was clearly still present in the early part of the interstadial, however, as is demonstrated both by flowering plants (such as *Saxifraga oppositifolia*, *Artemisia cf. norvegica*, *Minuartia rubella*), and mosses (for example, *Tortella fragilis*). Basic short-turf communities were also present forming a 'continental grass heath' (for example, *Medicago falcata*, *Astragalus danicus*).

A second pollen assemblage zone is distinguishable within the interstadial (BRM-b) (upper part of bed 3), differing from the lower zone (BRM-a) mainly in its greater abundance of *Juniperus* and *Filipendula*, and lower proportions of tree birch and willow. *Helianthemum* is extremely abundant in this zone, showing the persistence, perhaps extension, of basic grassland, and the continental grassland species *Gypsophila fastigiata/repens* and *Hedysarum cf. hedysaroides* also occur, together with *Astragalus alpinus* and *Artemisia cf. norvegica*. These changes of vegetation indicate a climatic cooling, and the grassland species show very distinct continental affinities, supporting an argument for a continental climate at the time.

The Loch Lomond Stadial is marked lithologically by clays (bed 4), and corresponds with a distinct pollen assemblage zone (BRM-c), the most marked features of which are high proportions of *Artemisia*, Oxyria-type and *Thalictrum* pollen. The decrease in warmth-demanding taxa, such as *Juniperus* and tree birches, confirms the onset of colder conditions. Of the *Artemisia* pollen, the most abundant type was *A. cf. norvegica*, indicating a 'fell-field' habitat, and also containing such taxa as *Papaver sect. scapiflora* and *Polytrichum alpinum*. Both snow patch (indicated by *Salix herbacea* and *Polytrichum norvegicum*) and wind-exposed areas (indicated by *Minuartia rubella*) were evidently present at this time.

Subsequent detritus muds (bed 5), up to the level of the peat cutting, correspond with pollen assemblage zones BRM-d and BRM-e, in which the warmth-demanding taxa of the Holocene increase in abundance. Gramineae and *Rumex acetosa* dominate BRM-d, followed by tree birch and *Juniperus* in BRM-e.

The most important features of the Beanrig Moss sediments are first, the floristic richness of the Lateglacial fossil material and second, the phytogeographical and climatic implications of the plant fossil assemblages.

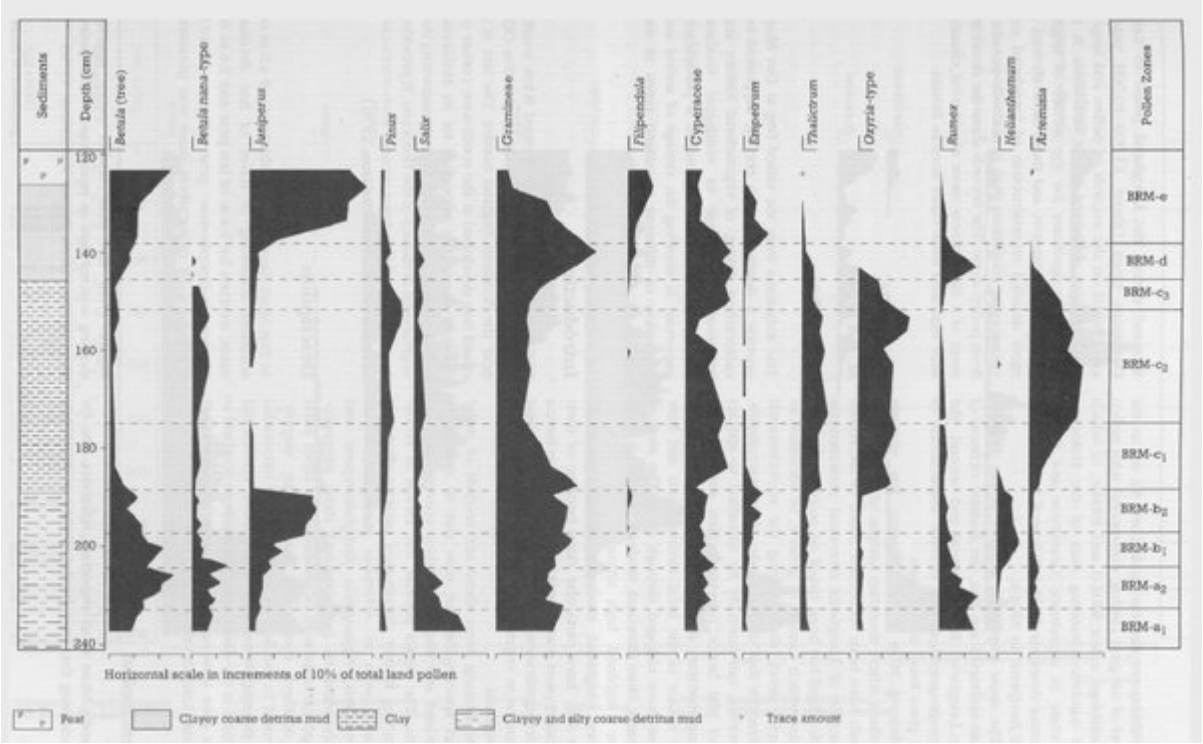
Beanrig Moss is one of very few sites in Scotland where abundant Lateglacial plant macrofossils have been recovered. Much of the reconstruction of Lateglacial terrestrial environments in Scotland has been based on analysis of pollen grains which cannot, in general, be identified to species level, thus limiting the environmental inferences that can be made. Plant macrofossils, however, can normally be identified to species level and hence provide pollen analysis with complementary and more precise evidence as to the nature of the local environments and how these have changed through time. The sites of Beanrig Moss (lowland, moderate altitude), Morrone (highland, high altitude) and Abernethy Forest (highland, moderate altitude) therefore not only have particular value because of their detailed plant macrofossil records, but also have a wider significance in reconstruction of the regional variation in vegetational communities during the Lateglacial.

At Beanrig Moss there are records of many plant species that are now rare or extinct in Scotland and disjunct in their current distributions. The fossils provide the means of reconstructing former distribution patterns, many of which (such as *Artemisia norvegica*, *A. cf. campestris*, *Gypsophila fastigiata/repens* and *Hedysarum cf. hedysaroides*) show phytogeographical links with Scandinavia and other parts of northern continental Europe. The 'steppic' element in the flora of the Lateglacial Interstadial at Beanrig Moss suggests a more continental climate in the eastern part of southern Scotland at that time than has been proposed for any other British Late Devensian site.

## Conclusion

Beanrig Moss is an important reference site for elucidating the vegetational history of south-east Scotland during the Lateglacial phase in Late Devensian times (about 13,000–10,000 years ago), based on the records of pollen and larger plant remains contained in the sediments. It is particularly significant for the wealth of larger plant remains present, and these have allowed a more detailed reconstruction of Lateglacial environmental conditions than is normally possible from pollen alone. The records show the development of a distinctively more continental climate than indicated from other sites in Britain.

References



(Figure 17.9) Beanrig Moss: relative pollen diagram showing selected taxa as percentages of total land pollen (from Webb and Moore, 1982).