

GARTHS VOE

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Highlights

Pollen and wood remains from peat exposed in the stream section at Garths Voe provide a record of vegetational change in Shetland during the Holocene. It is important in dating a period when trees in Shetland were more widespread than today. The peat also contains a thin layer of sand which appears to represent a major coastal flood about 6000 years ago.

Introduction

The site is a roadside section [HU 409741] at the head of Garths Voe, an eastern arm of Sullom Voe. It was revealed at the mouth of a small burn draining the Hill of Garth by road building for the Sullom Voe oil terminal. At present it is one of only two sites in Shetland where radiocarbon dates have been obtained on wood within Holocene peat deposits, with associated pollen analysis of the peat giving a record of regional vegetation history. Hence it indicates the past status of trees and shrubs in this northernmost part of the British Isles, which is currently treeless. The pollen stratigraphy of the site is described by Birnie (1981).

Description

The sequence, traced along both sides of the burn for approximately 8 m, is as follows (Birnie, 1981):

Blanket peat	2.0 m
Sand, unconsolidated	0.1 m
Peat, less-humified, containing twigs and small wood fragments, and including branches of 0.05 m diameter in the upper part of the bed	0.52 m
Discrete, fibrous organic layer of detrital vegetation remains	0.03 m
Peat, well-humified, with a few plant remains	0.2 m
Till	>0.1 m

Small fragments of wood are present in the lowest 0.5 m of the blanket peat (bed 6), but above this it is composed only of sedge, *Sphagnum* and ericaceous remains. *Salix* wood in bed 4, from below the sand layer, was dated to 7870 + 50 BP (SRR-1794), and *Betula* wood from above the sand, in bed 6, to 5130 + 50 BP (SRR-1793).

Interpretation

Pollen analysis (Figure 3.6) indicates the presence of open-ground herbs in the lowest organic layer (bed 2), being replaced by Cyperaceae, and then covered with inwashed detritus of *Sphagnum*, Cyperaceae and Ericaceae comprising the fibrous layer. Autochthonous deposition then recommenced, with Cyperaceae and some *Sphagnum* locally and Ericaceae nearby. The site then became a willow fen, with grassland, ferns and tall herbs associated. This is represented by the lower woody peat (bed 4), with *Salix* constituting over 40% of the pollen total. Prior to the deposition of the sand, birch also appeared at the site, with *Betula* pollen values reaching 33% of the total. The pollen and microfossils together show that there was open woodland or scrub at the site at around 7900 BP. Following deposition of the sand, peat accumulation recommenced, with *Betula* pollen reaching its maximum representation of 50% and *Salix* virtually absent. The birch was initially associated with ferns, but then heaths appeared at the site, and at some time after 5130 BP (bed 6) shrubs or trees disappeared and

heath- and sedge-dominated blanket peat communities predominated, as at present. Birnie (1981) interpreted the sand layer (bed 5) as reflecting either erosion of minerogenic soils in the stream catchment or encroachment of beach sediments landwards from Garths Voe. However, recent investigations (D.E. Smith, unpublished data) suggest that the sand is part of a widespread deposit in Shetland, and may possibly represent a major marine flood with a run-up of several metres. Smith *et al.* (1991a) obtained radiocarbon dates on peat at the upper and lower contacts of the sand layer at Garths Voe and the adjacent Voe of Scatsta (Table 3.1).

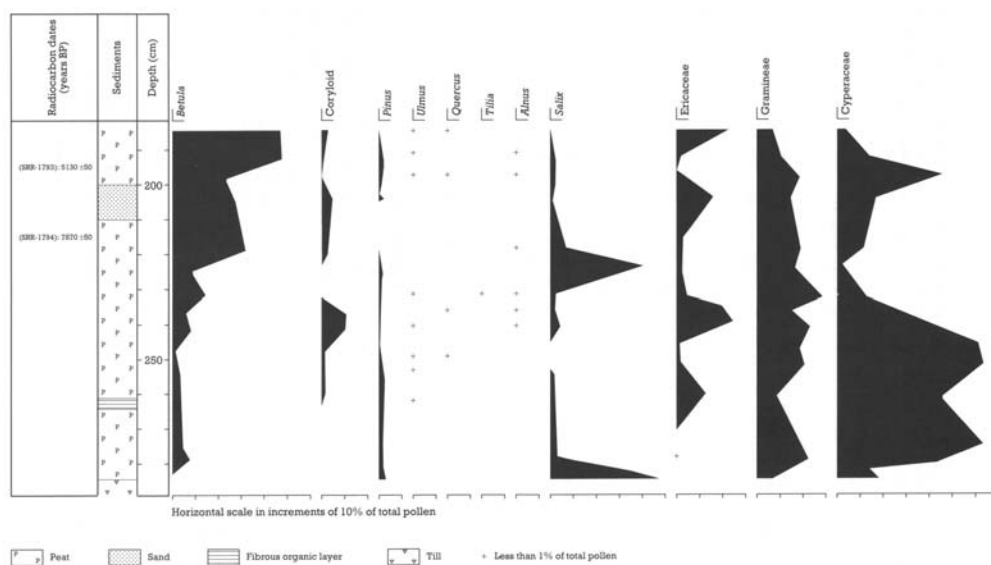


Figure 3.6: Garths Voe: relative pollen diagram showing selected taxa as percentages of total pollen (from Birnie, 1981).

Two possible explanations for the origin of the sand layer are that it is a tsunami deposit rather like that recorded from *c.* 7000 BP in eastern Scotland (see Maryton), since a third Storegga slide is known at *c.* 6000 BP (Jansen *et al.*, 1987), or that it is the deposit of a storm surge of unusual magnitude.

There are written records of wood in Shetland peat from at least the early 19th century, for example Brewster (1829) and Bryden (1845), and Lewis (1907, 1911) published accounts of wood and other plant macrofossils as part of a study of peat in the whole of Scotland. Lewis wrote that the "Forest Bed" (principally of birch, hazel and willow) was remarkably widespread in Shetland' and concluded "these trees do not represent copses growing in sheltered valleys away from the coast but ... are just as well developed in the most exposed situations" (1911, p. 808). Hawksworth (1970) described the distribution of wood remains in peat on Foula, and concluded that on this small island they were restricted to the lower and more sheltered areas. Johansen (1975, 1978), examining the pollen record of a lake infill site on the Mainland, found that tree and shrub pollen did not exceed 50% of the sum of the land pollen at any one time, and so he disputed Lewis's term "Forest" for what he interpreted as birch and hazel scrub. Birnie (1984) has examined wood and pollen records from a number of sites in Shetland and concluded that there was a distinct phase of widespread willow, birch or hazel development, with the radiocarbon dates from Garths Voe providing the only means of dating that phase at present – between 8000 and 5000 BP. The Garths Voe site is therefore an example of the vegetation record described by Lewis as representing forest, and by Johansen as scrub. It records the most advanced level of Holocene vegetation development in Shetland and as such will be significant in any interpretation of the climatic optimum, the timing and causes of environmental deterioration, and such issues as species dispersal and colonization rates.

There could, potentially, be very many sites in Shetland which demonstrate a similar Holocene stratigraphic record to that at Garths Voe (*cf.* Bennett *et al.*, 1992). Garths Voe is at present, however, the only site in which Holocene vegetation development has been examined by means of pollen and macrofossil analyses, with radiocarbon dates obtained from the wood. It

appears to represent vegetation sequences described by Lewis in the early part of this century, and with the presence of macrofossils there is potential for more detailed examination of the age and relative importance of trees and shrubs contributing to the deposit. This would lead to a better understanding of the nature of former woodland cover in the Scottish Islands – an issue presently unresolved in the Western Isles and Orkney, let alone Shetland.

Conclusions

The deposits at Garths Voe provide a representative record of the vegetational history of Shetland during the Holocene (the last 10,000 years), based on pollen analysis and radiocarbon dating. A phase of open-habitat vegetation was followed by the development of willow, birch or hazel between about 8000 and 5000 years ago, but was subsequently replaced by blanket peat with heath and sedge communities. As a reference site for Shetland, Garths Voe and its record are also important for further investigation of the timing of the Holocene climatic optimum and the causes and wider patterns of the subsequent deterioration. In addition, the deposits at Garths Voe include a sand layer formed just after 6000 years ago, which may represent a tsunami (tidal wave) or storm-surge event in the North Sea.

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