Borve

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Highlights

The coastal sediments in the inter-tidal and sub-tidal areas at Borve comprise a sequence of interbedded sands and organic materials which accumulated in a former freshwater lake. Analysis and radiocarbon dating of these sediments has provided important evidence for interpreting sea-level changes and coastline evolution during the Holocene in the Western Isles.

Introduction

The site [NF 769 499] is located on the south coast of North Uist facing the entrance to the South Ford, which separates Benbecula from South Uist. The interest lies in organic deposits preserved in the inter- and sub-tidal zones. Organic deposits, usually described as peat, have been recorded at intertidal locations in the Uists since the 18th century (Macleod, 1794; McRae, 1845; Martin, 1884; Beveridge, 1911; Jehu and Craig, 1927; Elton, 1938). Although the materials at these sites resemble peat, they consist of a variety of compressed organic layers, normally with a high sand content. Some layers contain wood fragments and others reed stems: some layers have a high silt content and a few contain terrestrial gastropods. Investigations in recent years (Ritchie, 1966, 1979, 1985) have demonstrated the importance of these organic horizons in understanding both sea-level change and the accompanying development of the dune and machair landscapes of the western coasts of the Outer Hebrides. The most extensive and best documented site is that at Borve on the southwest coast of Benbecula (Ritchie, 1985).

Description

The deposits occur in a shallow rock basin, now covered by a thin sand beach, between low, irregular rock platforms. At high tide level there is a small shingle storm beach which lies at the base of a sand cliff 1–4 m high. There are no dunes and the coastline is backed by a mature, flat machair plain which stretches inland for up to 2 km. The deposits have been investigated in a series of pits and boreholes and comprise, principally, a succession of interbedded sand and organic layers (Figure 12.9). Some organic layers include wood fragments and reed stems. Pollen analysis and study of macrofossils indicate that the entire site was at one time a freshwater lake which progressively infilled to form a marshy grassland. Later, massive quantities of sand were carried across these deposits to form the existing machair landforms. The complexity of the stratigraphy, however, indicates many changes in local conditions. Throughout the period of accumulation of the organic deposits there was considerable sand-blowing, the episodic nature of which is reflected in some individual sand layers up to 0.2 m in thickness; other beds are mainly organic material with only a few discrete sand particles in the matrix.

Three radiocarbon dates indicate the approximate period of deposition of the organic deposits and phases of sand influx. A fragment of wood from 0.6 m below present mean tide level was dated to 5700 ± 170 BP (1–1543) (Figure 12.9, pit J), and peat-like material, obtained from offshore and 3.7 m below the same datum, gave an age of 5160 ± 45 BP (SRR–1222). These two dates imply that the freshwater lake existed between a time prior to 5700 BP until after 5200 BP. In the machair sands backing the beach, a peaty layer at 2 m above present high water mark has been radiocarbon dated to 3370 ± 60 BP (GU–1096); this layer represents a machair slack similar to those found in most low-lying machair plains today.

Interpretation

The freshwater lake in which the organic remains accumulated is interpreted as being similar to the lochs and marshlands that usually form the landward margins of modern machairs, the water level of which rarely exceeds 2 m

above mean sea level (Ritchie, 1985). It seems likely that there has been a sea-level rise of at least 5 m as well as an accompanying landward movement of the shoreline in the last 5200 years. Radiocarbon dates on similar subtidal and intertidal peats of 8330 ± 65 BP (SRR–1223) from Pabbay (Ritchie, 1985) and 8802 ± 70 BP (SRR–396) from Holm in Lewis (von Weymarn, 1974) suggest sea levels at least 3–5 m lower between about 8800 BP and 5200 BP (Ritchie, 1985). The lacustrine origin of these dated organic materials makes it difficult to provide exact values for both the amount and rate of sea-level rise, but all such deposits provide unambiguous evidence of coastline recession.

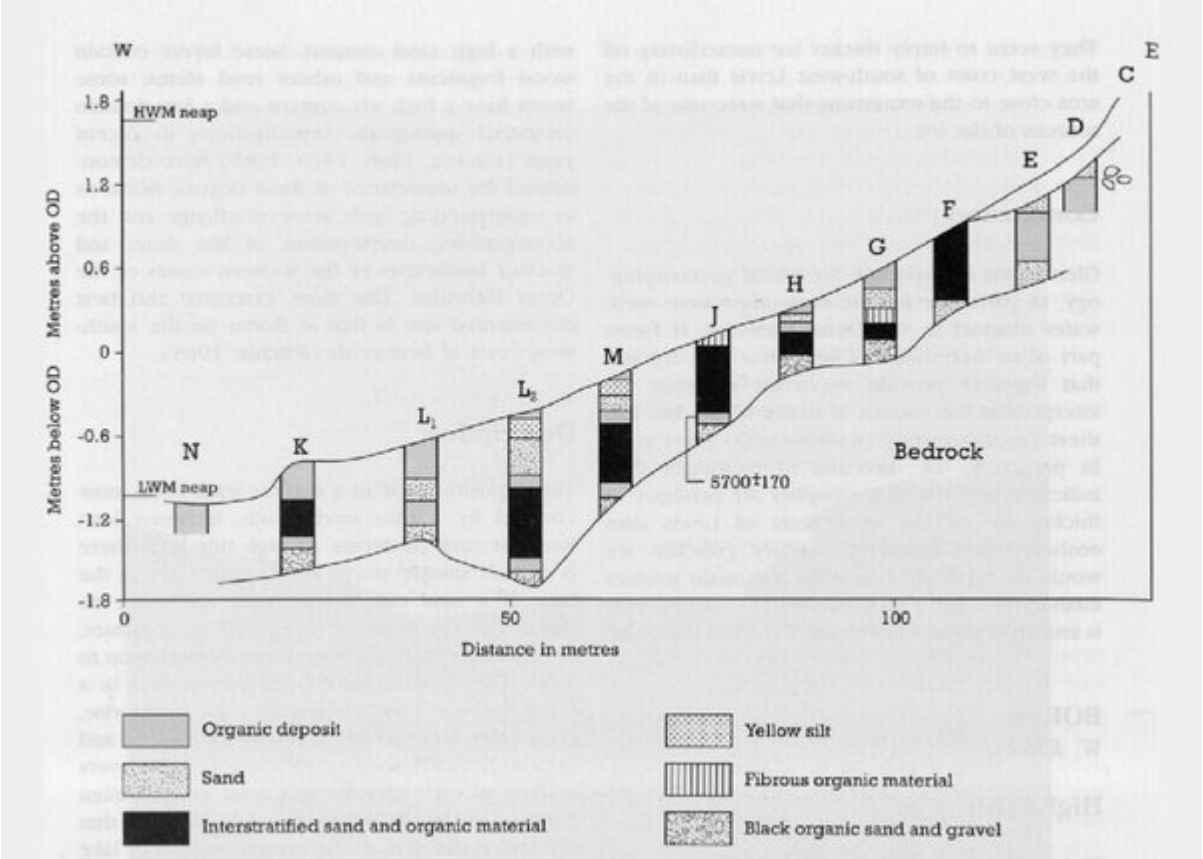
The radiocarbon date of 3370 ± 60 BP from the machair sands indicates a locally stable land surface at that time, with phases of sand accumulation both before and after. Elsewhere, radiocarbon dates associated with machair coastlines suggest significant sand accumulation after 4366 ± 40 BP (SRR–1225) on Pabbay (Ritchie, 1985), 4550 ± 70 BP (SRR–2988) on Grimsay (Whittington and Ritchie, 1988) and 7810 ± 140 BP (GU–1762) at Claddach More (Balelone) (G. Whittington and W. Ritchie, unpublished data). Thus more evidence is accumulating from a variety of sites to demonstrate a long period of sand drifting both from primary and secondary sources. Unpublished evidence from a variety of Bronze and Iron Age archaeological sites, located in machair areas, also indicates that there were many episodes of sand drifting which alternate with periods of stability. The extent to which these changes were anthropogenic is open to discussion. Similarly, the question of whether these periods of massive sand movements were synchronous in South Uist, North Uist and the Sound of Harris remains unanswered.

Inter- and sub-tidal organic remains occur at thirteen sites in the Uists (Ritchie, 1985). However, those at Borve are the most extensive and best documented deposits of their type in the Outer Hebrides. They are important for the evidence they provide both for sea-level change in the middle to late Holocene and for the accompanying development of the dune and machair landscapes that occupy 10% of the land area of the Uists. Unlike the coastline of mainland Scotland (see Western Forth Valley, Silver Moss and Philorth Valley) and the Inner Herbrides, sea-level change around the outer isles during the latter part of the Holocene resulted in coastal submergence and landward migration of the shoreline. Borve is one of the few sites in Scotland at which this type of sea-level movement has been dated. The evidence from there and related sites provides a fundamental, if as yet incomplete, stratigraphic and chronological framework that underpins the interpretation of the development and evolution of the beach and machair systems in the Outer Hebrides (see Ritchie, 1966, 1979, 1986; Whittington and Ritchie, 1988, unpublished data).

Conclusion

Borve is important for a sequence of deposits that provides a detailed and dated record of sea-level changes and coastline development in the Outer Hebrides during Holocene times. In particular, the deposits show that the coastline has moved landwards as relative sea level rose by at least 5 m during the last 5200 years. Phases of sand erosion and accumulation occurred both before and after about 3400 years ago. This evidence is important not only for understanding the development of the dune and machair landscapes of the Western Isles, but it also allows valuable comparisons with results from sites elsewhere in Scotland where the pattern has been one of coastal emergence rather than submergence. Borve is therefore a valuable reference site for sea-level studies in Scotland.

References



(Figure 12.9) Profile across the intertidal deposits at Borve, showing the sediment sequence and its variations (from Ritchie, 1985).