

## MACHAIRS ROBACH AND NEWTON

OS Grid Reference: NF860750–NF890777

### Introduction

The beach–dune–machair systems of Hornish and Lingay Strands include Machairs Robach and Newton, Clachan Sands, and part of Vallaquie Strand (see Figure 9.1 for general location). The area provides excellent examples of most of the machair landform and vegetation types found in the Uists. Machairs Robach and Newton provide the best sites in the Western Isles for flat and low-lying machair landforms that have been influenced by water-table effects and modified by centuries of traditional grazing and cultivation practices. They also provide the finest examples in the Western Isles of old and high machair plateau forms that have either been dissected down to the water table by deflation to produce a distinctive scarp and table land appearance or undercut by wave activity to produce a truncated sequence. Recent depositional activity has enlarged the intertidal strands, and together with saltmarsh development adds to the complexity and scientific interest of the site.

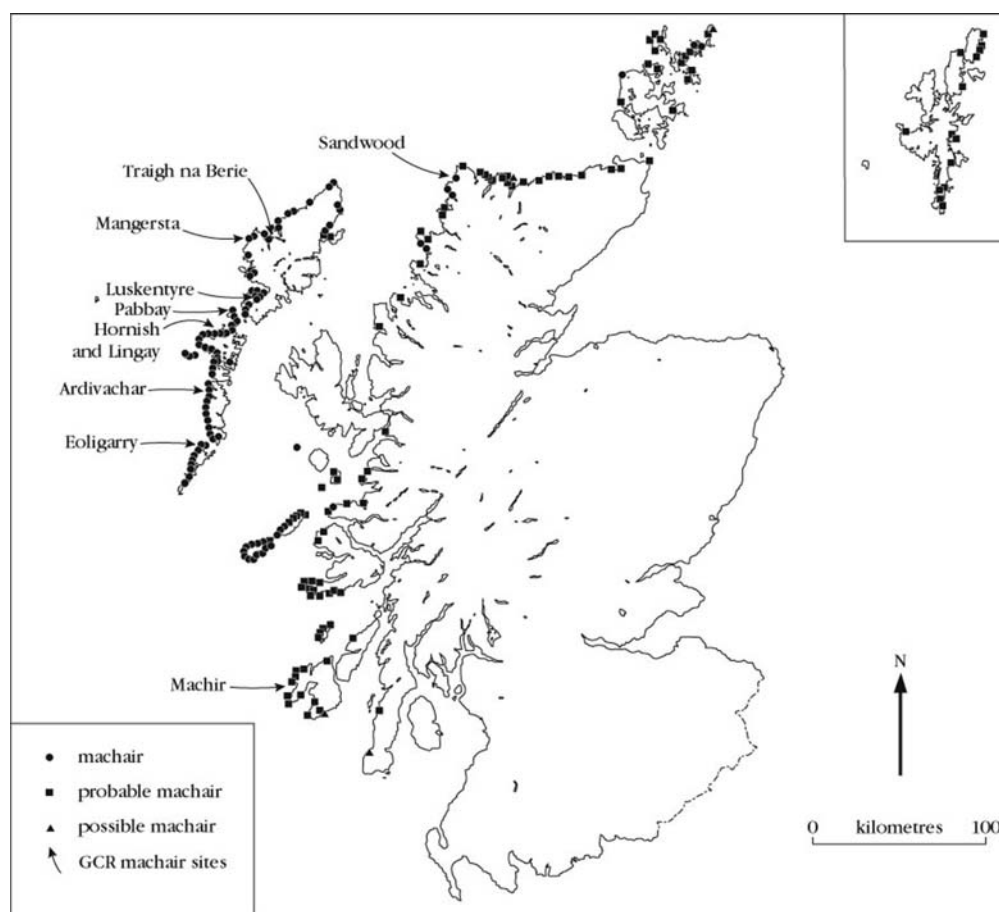


Figure 9.1: Distribution of machair in Scotland. Other than Sandwood, Torrisdale and Balta (see Chapter 7), all the sites included in the GCR fulfil both the geomorphological and vegetational definition of machair. Small vegetational differences in the above sites have resulted in the label 'probable machair'. Ongoing work that interprets the geomorphology and botany of machair aims to provide a definitive machair diagnostic test in the future and so the above classification will be subject to slight modification (Angus, 2003, pers. comm.). (After Hansom and Angus, 2001.)

### Description

Hornish and Lingay Strands face north-west on the north coast of North Uist. On their landward side, the beaches are backed by extensive machair surfaces that rise to the east and

south and grade into hill land beyond (Figure 9.12). The northernmost part of the strand is hinged against a low rocky knoll at Suenish and the southern limit is the low island of Oronsay, itself fringed with fragments of rocky shore platform. The intervening sands stretch for 4.5 km in a gently curving bay broken only by a small rocky ridge of gneiss at Hornish where the beach narrows to only 100 m. At both extremities the beach widens to over 1 km in the north at the intertidal sand tombolo that extends to the island of Lingay and in the south at Corran Vallaquie. The beach gradient is shallow and low sand-bars are common in the fine sand. The shell content of sand at nearby Ahmore and Trumisgarry is 52% and 44% respectively. In the north of the site the coastal edge is mainly characterized by re-depositional young foredunes masking a retreating older machair edge and a narrow band of young dunes colonized by vigorous growths of marram *Ammophila arenaria* everywhere skirts the backshore. At Lingay Strand, the protecting influence of Lingay Island is reflected in fresh deposition along the dune ridge and annual plants are common in the embryo dunes along the strandline. Along the entire length of this section northwards from Corran Goulaby, the foredune ridge is backed by a higher dune ridge, parts of which have sealed the seaward entrances of blowthroughs. South of Corran Goulaby and the exit of the Goulaby Burn, the coastal edge is undercut with low (1–2 m high) but active sand faces cut into the mature machair plain behind. South of the rocky outcrop at Hornish a relatively healthy 8 m-high foredune ridge extends to Corran Vallaquie and although fronted by seasonal accumulations of sand, the partly obscured underlying faces are undercut. At Corran Vallaquie a healthy foredune ridge is backed by several older dune ridges, suggesting progradation towards the island of Oronsay. Both Hornish and Lingay Strands are sheltered from westerly waves by the Sollas peninsula (Figure 9.12).

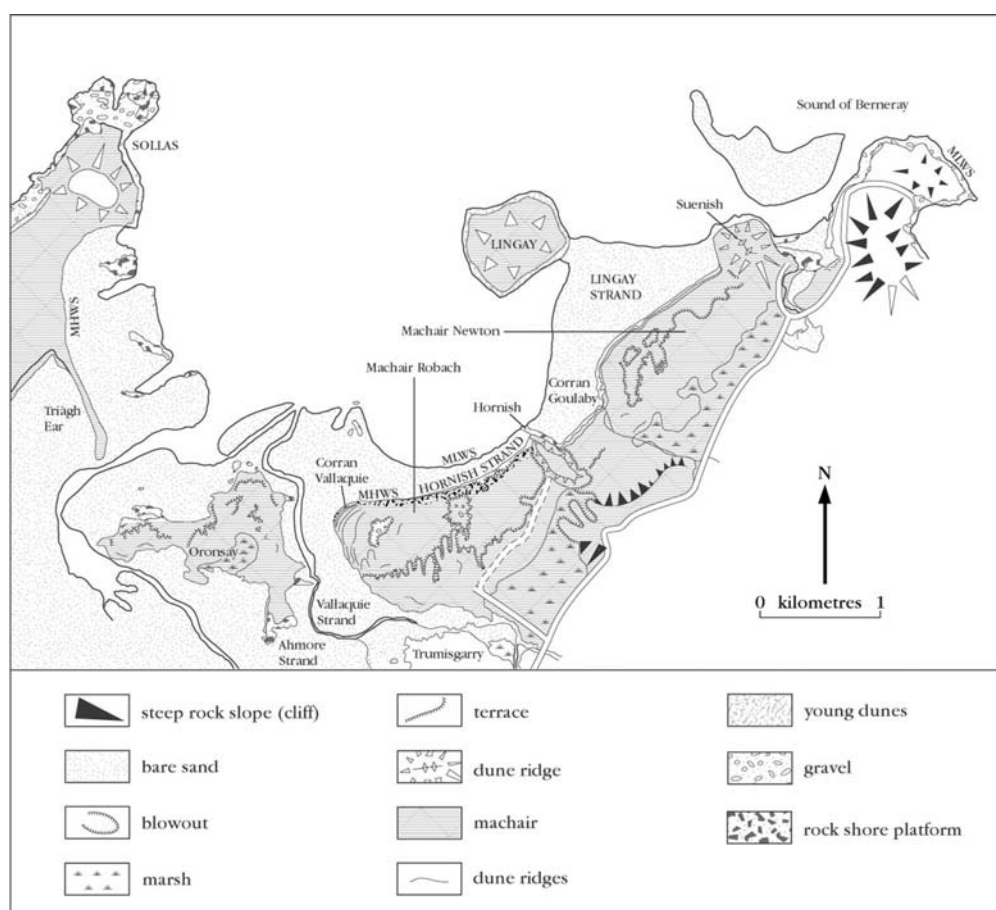


Figure 9.12: The geomorphology of Hornish and Lingay Strands including Machairs Robach and Newton. Well-developed beaches, dunes and machair have benefited from the relative protection from westerly waves offered by the headland at Sollas and the island of Lingay (see Figure 9.4). (After Ritchie, 1971.)

Landward of the fronting dunes a low machair complex slopes landwards towards an inner escarpment cut into higher machair deposits. Although the sand plain undulates on account of the deposition of small dunes on its surface, it lies at 1–2 m OD and so is close to the water

table. It is regularly flooded, especially in winter, and in places is artificially drained by ditches. At 100–700 m inland from the coastal edge and marking the landward limit of the low, wet, machair plain is a prominent but irregular escarpment cut into a high machair plain. In the north the high plain lies some 3–8 m above the level of the lower surface and slopes landwards for 1.25 km to a poorly drained zone of marsh with small lochans where it meets the rising hill land beyond. Although the high machair plain is currently cultivated, it remains subject to windblown sand deposition that slowly infills the marsh zone behind. Just north of Hornish, the inner escarpment approaches the coastal edge and what remains of the low machair plain is actively being undercut by wave erosion. South of Hornish, Machair Robach extends up to 2.5 km inland and, although the landform sequence mirrors that of Machair Newton, the degree of deflation, especially of the higher machair surface, is more impressive and the zone that is locally eroded down to the water table widens towards the south-west. Flanking the deflated areas are eroded sandy faces cut into the surrounding machair surface and areas of marram-clad re-depositional dunes that are themselves subject to secondary deflation down to the water table. The escarpment of the high machair is punctuated in most places by linear blowthroughs that extend south or south-east leaving arms of high machair that may become detached and are then subject to enhanced blowthrough activity. The series of large dunes landward of Corran Vallaquie may have originated in this way.

Within the sheltered tidal inlet at Trumisgarry and protected by the expanse of Tràigh Vallaquie a small area of sandy saltmarsh is dissected by well-developed tidal creeks and numerous salt-pans occur.

## Interpretation

The Hornish–Lingay beach–dune–machair system probably responded to Holocene sea level and sediment supply constraints in the same way as other machair systems in the Western Isles. It probably developed sometime in early to mid-Holocene times before about 6500 years BP, the approximate date when sea-level rise and transgression slowed (Hansom and Angus, 2001). Although the start dates of the influx of sediments to beaches varied, the general trend is that the mid-Holocene was a period associated with extensive beach and dune development. However, ongoing sea-level rise (progressively exacerbated by land subsidence in the Western Isles) coupled with reductions in the offshore sand supply subsequently resulted in erosion of many Hebridean beaches and the frontal undercutting of the sand dune and machair systems that they support. Gilbertson *et al.* (1999) identified several periods of sand drift in the Uists dating from 9000–8300, 7500–7000, 6900–6400 and 5800–4200 radiocarbon years BP. In North Uist, Ritchie and Whittington (1994) show that organic deposits now exposed in the intertidal zone at Cladach Mór were first subject to sand incursion at 7600 radiocarbon years BP, one of the earliest records of offshore-sourced carbonate sand incursion in the Uists (Gilbertson *et al.*, 1999). At Camas Mór on the island of Vallay, 10 km west of Hornish Strand (Figure 9.4), the first sand incursion occurred at 6925 years BP. However, Ritchie *et al.* (2001) identify the major period of sand incursion at many sites in North Uist to be after 5200 radiocarbon years BP, this date agreeing with the well-known period of strong sand drift on the coasts of north-west Europe. Within the constraints of the local topography, there is no evidence yet to assume that events at Hornish and Lingay departed substantially from the above general pattern, the development of machair surfaces most probably taking place sometime after the first arrival of large amounts of sand at the coast at 5200 radiocarbon years BP.



Figure 9.4: A typical machair landscape of partly-drowned rock basins connected on the seaward side by wide sandy beaches and on the landward side by dune cordons backed by expanses of windblown machair sand. Looking north-east from North Uist over Vallay Strand in the foreground to Hornish and Lingay in the distance. (Photo: P. and A. Macdonald/SNH.)

The ongoing dissection and deflation of the high machairs at Robach and Newton probably began as soon as they were formed and represent excellent examples of a constant cycle of deposition, erosion and re-deposition. Deflation continued until the water table was exposed, although in other places in the Western Isles this could equally be exposure of an underlying gravel basement. On Machair Robach this process is well advanced with an impressive summit accordance of remnants of high machair that allow the reconstruction of an original tableland that is now characterized by steep sandy windward scarps and gentle and stable backslopes. Re-deposition of eroded sand on top of the deflated surface produces a secondary spread of small superimposed dunes. In places, for example at Corran Goulaby just north of the rocky outcrop at Hornish, frontal erosion by both wind and wave has been so severe as to have removed both the fronting dune cordon and the high edge of the machair surface so that the low backslope now forms the coastal edge undergoing erosion. The control of sediment supply, water table and general dynamism of aeolian processes displayed at Machairs Robach and Newton, conforms well to the model of machair development suggested by Ritchie (1979a,b) and supported recently by Gilbertson *et al.* (1999), and Machair Robach is probably one of the best examples of machair erosion and development in the Western Isles. Viewed in the context of a generally submerging coastline, recycling of beach and sand dune sediments might be expected as wave erosion progressively enhances coastal instability and produces sand surfaces susceptible to wind-blow. So too might be the progressive flooding of low-lying basins to form intertidal strands, such as at Trumisgarry and Tràigh Ear, and the associated flooding of terrestrial deposits, some of which now appear as intertidal peats.

Although the coastal edge is often obscured by newly deposited windblown sand, the general underlying status of the beaches of the Uists appears to be characterized by erosion and sediment deficiency (Ramsay and Brampton, 2000e). However, this may be reversed where sediment sources are locally enhanced such as occurs at estuary mouths or downdrift of a longshore supply. For example, at Corran Vallaquie not only does there occur a healthy embryo-dune sequence but also several ridges of young dunes have developed as the shore has prograded towards Oronsay. The wider beach and its associated dunes have developed as a result of refraction-driven longshore drift from the east along the wide intertidal expanse of Hornish Strand. Sand may also be delivered from the south-west as a result of low-energy deposition within the Trumisgarry inlet and wind-blow from the upper beach on Vallaquie Strand.

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## Conclusions

Hornish and Lingay Strands provide excellent examples of most kinds of machair surfaces found in the Western Isles, together with wide tidal strands and inlets. The extensive beach–dune–machair systems have developed in the relative but variable shelter provided by offshore islands and skerries such as Lingay, Boreray and Berneray and this has resulted in varying degrees of erosion and deposition on the foreshore. Machair development also reflects these topographical effects, being in places protected from wave attack but still subject to ongoing deflation whereas in others it is subject to substantial wave erosion and removal of the original landforms, all set within a context of submergence. Machairs Robach and Newton are one of the sites of the highest geomorphological interest in the Highlands and Islands. Since 66% of the world resource of machair is found in the western seaboard of Scotland, there can be little doubt about the international scientific importance of Hornish and Lingay Strands and Machairs Robach and Newton.

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