
Pabbay, Harris, Western Isles

[NF 900 870]

Introduction

The island of Pabbay lies in the Sound of Harris some 8 km north of North Uist (see (Figure 9.1) for general location). About 30% of the island area is covered by blown sand, most of which is located in the south-east, and the site is probably the best example of climbing dune habitat in the Western Isles. The machair on Pabbay is of national importance because it provides good examples of all the types of machair and dune surfaces found in the Outer Hebrides in addition to areas of unusual large conical dunes. Unusually, the machair areas face south-east rather than to the west as is the case in most of the Hebridean machair. There is no record of rabbits having reached the island, and since rabbits are thought to have had a major effect on dune and machair geomorphology, Pabbay provides a good comparative site. Several areas of intertidal and subtidal peats occur on Pabbay that may help elucidate the sequence of aeolian and sea-level events that led to machair development both on Pabbay and elsewhere in the Outer Hebrides.

Description

Pabbay is a distinctive, conical island, which has been uninhabited since the 1930s. The coastline is also distinctive being characterized by north and east coasts that are rocky, cuffed and indented with geos and inlets and south and west coasts that are low-lying and predominantly sandy (Figure 9.13). The coastal edge of the south and west coast comprises three crescentic sand embayments that have developed between low rocky skerries and platform remnants. Landwards of these embayments a beach–dune–machair complex has accumulated that has extended north to cover about 30% of the area of the island. Ritchie (1980) described the island as consisting of three main landform surfaces. The northern half of the island is characterized by ice-moulded bare rock and boulder surfaces, stripped of the original peat cover. The central-west plateau is covered by boggy moorland in the west and north and by windblown shell-sand elsewhere. The south is dominated by shallow basins filled with various types of machair and dune landforms.

The beaches along the south-west coast are mainly gravel storm ridges connecting low fragments of rock shore platform that are locally covered by a thin veneer of blown sand (MacTaggart, 1998c). Small pockets of intertidal organic deposits are occasionally visible near the offshore skerry of Quinish. Quinish is connected to Pabbay by a gravel tombolo that steepens at its landward end to obscure the machair edge. The gradient and height of the gravel ridge decline towards Haltosh Point where it is replaced by a predominantly sand beach. To the east, between Haltosh Point and the rocky cliffs of the north-east coast, lie two promontories that define three crescentic sandy embayments each composed mainly of shell-rich white sand. The first of these promontories, An Corran, is a triangular sandy foreland backed by low machair. The beach to the west is often partly covered by bars of small rounded gravels but the 1.5 km-long and 200 m-wide beach to the east is characterized by thick accumulations of sand that is subject to wind-blow (MacTaggart, 1998c). From comparison of aerial photographs the coastal edge of this promontory has retreated over the period from 1965 to present to form a steep scarp face that undercuts the seaward edge of the dune ridge, while progradation of several tens of metres has characterized the area to the east (MacTaggart, 1998c). The second promontory east of Haltosh Point (Figure 9.13) is a low rocky outcrop veneered by blown sand, beyond which is another sandy beach both shorter and narrower than the one to the west. A narrow gravel bank occurs along the coastal edge at the eastern end of this beach. Intertidal and subtidal peat deposits have been reported at the eastern end of the beach by Ritchie (1980).

Much of the coastal edge to the west of Haltosh Point is obscured by gravel beach deposits banked up against a steep and undercut machair face. Machair stratification is visible in places and displays alternating sequences of organic and sandy horizons. The coastal edge to the east of Haltosh Point is characterized mainly by localized areas of accreting and erosion-affected dune scarps that average 2–3 m high but a 15 m-high section undergoing erosion occurs in the face of a well-vegetated large dune ridge that runs inland and declines in height to the west of the first promontory. The ridge is punctuated by three shallow blowthroughs. Seawards of this large ridge lies a series of low accretional dunes that are

vegetated to different degrees by primary colonizing species and mar-ram *Ammophila arenaria*. At least two sequences of dune ridges are present, each running at a different angle from the present coast, the seaward sequence cross-cutting the landward sequence. The alignment of the large dune ridge defines a wider and more deeply indented bay centred on the outlet of Lingay Burn. Subsequent accretion has resulted in low dunes developing seawards of the large dune. The easternmost bay is characterized by a low machair edge undercut into several low hillocks, sections within which show thick accumulations of sand capped by an organic horizon that corresponds to the surface of the low machair plain behind. The organic layer is itself capped by windblown sands that have now been sectioned by coastal erosion. Ritchie (1980) reports several exposures of dune-foot organic horizons in the machair edge.

Behind the beach and dunes lies an extensive machair surface that displays three machair types: level or undulating machair, wet machair and hill-slope machair. Two large areas of wet machair occur landwards of the dunes backing the two eastern beaches. The largest of the wet machair areas was mapped by Ritchie (1980), and still remains, as a seasonal loch displaying distinctive vegetation zonation patterns dominated by bryophytes. The area of wet machair matches fairly closely with the extent of a marine inlet shown on the Admiralty Chart of 1857. To the south-west of the central wet machair lies low hummocky machair but to the north-east on the rising hillside lies a spectacular series of near-symmetrical conical sand dunes up to 8 m high and rising to 30 m OD. The dunes support machair vegetation with only small patches of marram *Ammophila arenaria*, although the intervening low-angled surfaces between the dunes contain damper habitats (Dargie, 1998). A small area of calcarenite occurs at the north end of the machair on Pabbay.

Interpretation

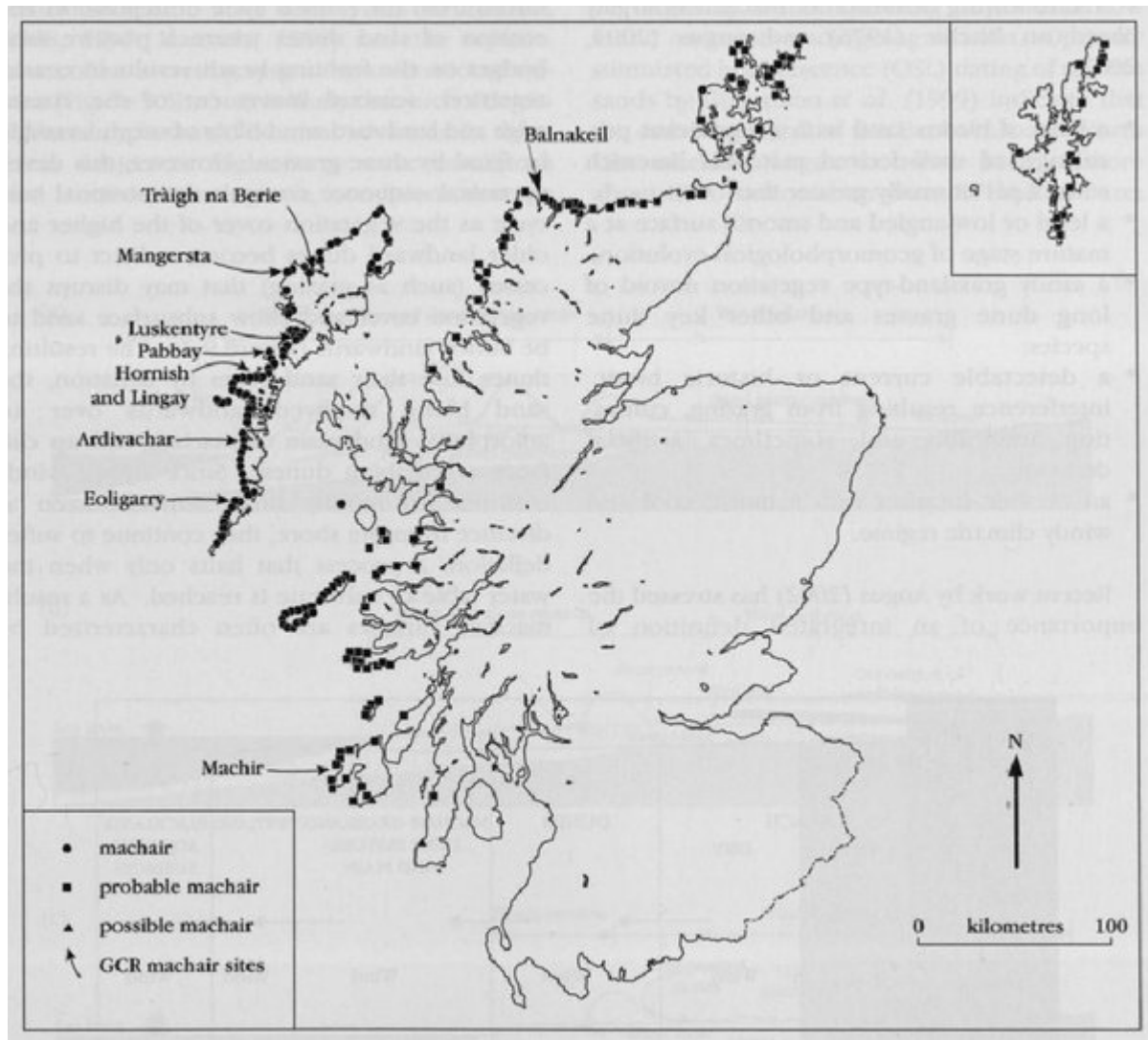
In common with much of Harris and the Uists, coastal development on Pabbay has been dominated by sea-level change and the availability of sediment. Throughout most of the Holocene Epoch sea-level rise has resulted in transgression of the seaboard of the Western Isles. However, since much of the coastline is characterized by undulating rocky surfaces at various altitudes and often with a variably thick veneer of glaciogenic deposits, the timing of inundation and subsequent beach and sand-dune deposition varies from site to site. Submergence of at least 2.8 m since 7700 radiocarbon years BP is indicated from the radiocarbon dating of freshwater peat from Pabbay (Ritchie, 1985), although dates elsewhere in the Uists suggest that the amount of submergence since 5100 radiocarbon years BP was of the order of 5 m. Certainly, the coastline of Pabbay was likely to have been characterized by variably drained low rocky basins at different altitudes and distances from the coast that began to fill with terrestrial peat at different times and may have been subject to the first wind-blow events at different times. Sea-level rise began to slow about 6500 years BP (see the introduction to the present chapter) but in the Outer Hebrides large amounts of sand from offshore sources had probably begun to arrive on shorelines prior to this date, resulting in wide beaches and the potential for substantial wind-blow and dune and machair development. It is thus likely that the lower levels of the first machair surfaces were formed early in the mid Holocene times, although the recycling of machair surfaces ensured that 'first wind-blow' events occurred over a wide range of dates. The abrupt change from a peat surface to a sandy upper section occurred at about 4400 radiocarbon years BP at Quinish on Pabbay (Ritchie, 1980). The former terrestrial peat deposits are now located 80 m seawards of MLWS, so it may be that much of the former low machair surface has been subsequently eroded and recycled landwards to form the higher machair, a process that continues today.

Historical records support the above reconstruction and indicate that the south-east part of Pabbay was formerly a large plain consisting of a sandy soil mixed with earth so fertile that Pabbay was known as the 'Granary of Harris' (Angus, 1997). However, in a sand storm in 1697 about 300 acres of arable land were overwhelmed by sand as well as land lost on the south-west side of the island 'where many people still alive have reaped crops of grain' (Walker (1764), cited in Angus, 1997). It is tempting to attribute the development of the climbing machair and conical dunes in the east of the island to the wind-blow events of 1697 particularly since the walls of ruined buildings have not yet been completely buried by blown sand. Elton (1938) attributes this to stabilization of the higher surfaces into a closed turf resulting from a shift from predominantly arable farming before the end of the 18th century to pastoral farming thereafter. In spite of this possible stability at altitude, substantial changes at lower levels occurred as a result of sea-level rise. An early map of Pabbay in 1805 shows the coastline much as it is today yet the Admiralty Chart of 1857 shows a large tidal inlet behind the dunes. The first OS maps in 1881 show this loch sealed from the sea, presumably resulting from sand deposition (Angus, 1997). Since then, substantial accretion of dune and sand has resulted in the consolidation of the two forelands,

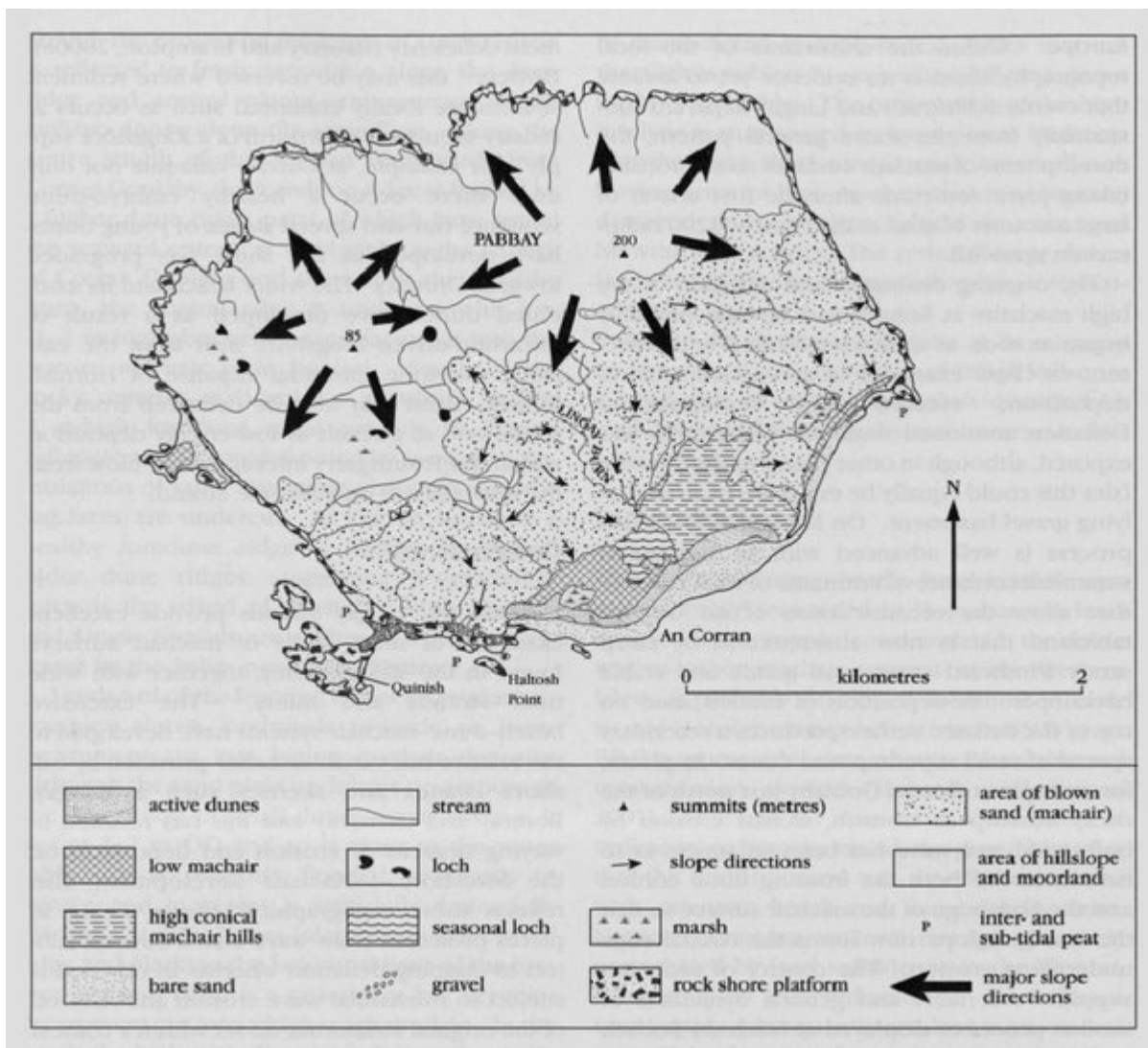
with the high dune ridge probably marking the former position of the mean high-water springs in 1881. However, recent erosion of the west coast and accretion to the east (Angus, 2001) suggests that cycles of erosion and deposition, depending on storm approach direction, continue to influence the sand feed to the beaches and dunes of Pabbay.

Conclusions

Pabbay displays excellent examples of a range of beach–dune–machair landforms and is probably the best example of climbing dune habitat in the Western Isles (Dargie, 1998) with high conical dunes that are unique in terms of their scale and symmetry. The machair assemblage is also unusual in that it faces south-east whereas most other machair faces west. The island is also important for comparative study since there is no record of rabbits on Pabbay. The presence of several intertidal peat deposits together with an historical record of change allows the development of beach and machair to be placed in a temporal context.



(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.)



(Figure 9.13) The geomorphology of Pabbay, Sound of Harris, showing the extensive area of climbing machair and the low-lying area east of Haltosh Point that has been infilled by beach and dune accretion since 1857, when it was a marine inlet. (After Ritchie, 1980.)