Mangersta, Lewis, Western Isles

[NB 008 308]

Introduction

Mangersta Sands occupy a small embayment situated on the exposed west coast of Lewis, near Uig (see (Figure 9.1) for general location). A 200 m-wide beach fronts a long, narrow machair that occupies a depression running inland. Mangersta is an excellent example of a beach–dune–machair complex in which much of the dune has been eroded and the machair surface has been deflated down to the water table. Little of the stripped surface has been recolonized by vegetation and it seems likely that Mangersta represents an advanced stage in the cycle of growth and decay of beach–dune–machair complexes in exposed areas.

Description

The beach at Mangersta extends to 200 m in length and at low water is 200 m wide. It is contained within rock headlands cut into Lewisian gneiss and sits within a valley that is probably part of a pre-glacial drainage system (Ritchie and Mather, 1970b) (Figure 9.16). The low-gradient intertidal beach is composed of well-sorted, medium-grained sands (median diameter 0.39 mm), 38% of which is shell. The upper beach is characterized by a steeper—gradient arcuate storm ridge composed of subrounded gravel, through which water seeps from the surfaces behind. The gravel ridge is 100 m long and 20 m wide. A continuous cordon of frontal dunes behind the beach is lacking at Mangersta and only in the southern part are poorly developed and discontinuous young dunes found. Extending for at least 500 m inland of the gravel storm ridge at Mangersta, is a flat and bare sand surface that is deflated to the water table. The seaward part of the surface is littered with driftwood and a series of small braided streams cross the low-gradient (1°) slope (Figure 9.17). The flat-floored deflation surface abuts landwards against the steep rocky slopes surrounding the depression, the abrupt change of gradient being masked by small marram-clad sand dunes. In spite of new dune development and re-vegetation around the perimeter of the depression and to a limited extent around storm debris just above mean high-water spings, much of the central sand area was unvegetated in 1970 (Ritchie and Mather, 1970b) and remained so in 2001 when the photograph (Figure 9.17) was taken. Most of the flanking dune orientations reflect deposition by winds from the south-west. A thin veneer of machair occurs on all of the surrounding hill-slopes above the central depression. The lower parts of the machair are terrraced in places indicating that they have undergone erosion in the past, although much of the contact is obscured beneath the younger flanking dunes. The thin layer of hill machair is undergoing active erosion by runoff, and in places the underlying glacial till cover is visible in stream cuttings (Figure 9.17).

Interpretation

In common with much of the Western Isles, coastal development at Mangersta 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. Although dates vary between locations in Scotland, it is generally thought that sea-level rise slowed after 6500 years BP (Hansom and Angus, 2001). A large influx of coastal sediments is thought to have occurred in response to the slowing of sea-level rise and beaches developed with sufficient excess sand available on the upper profile to be blown into the extensive dune and machair systems that remain active today (Ritchie, 1971; Hansom and Comber, 1996). However, ongoing sea-level rise, coupled with reductions in the offshore sand supply, subsequently resulted in chronic erosion of many Hebridean beaches and the frontal undercutting of the sand dune and machair systems that they support. The events at Mangersta appear to have followed this general trend,' albeit exacerbated by local effects. The wider Mangersta coastline is characterized by cliffs cut into resistant rocks and so the potential sources of beach sediment are restricted to adjacent glaciogenic deposits. Since both the onshore and offshore extent of the Mangersta valley is limited (deep water exists close inshore at Mangersta), the amount of glaciogenic sediment available from both sources was probably also very restricted. It seems likely that given an initially limited supply of sediment, any beach development would eventually suffer sediment supply problems as the supply became

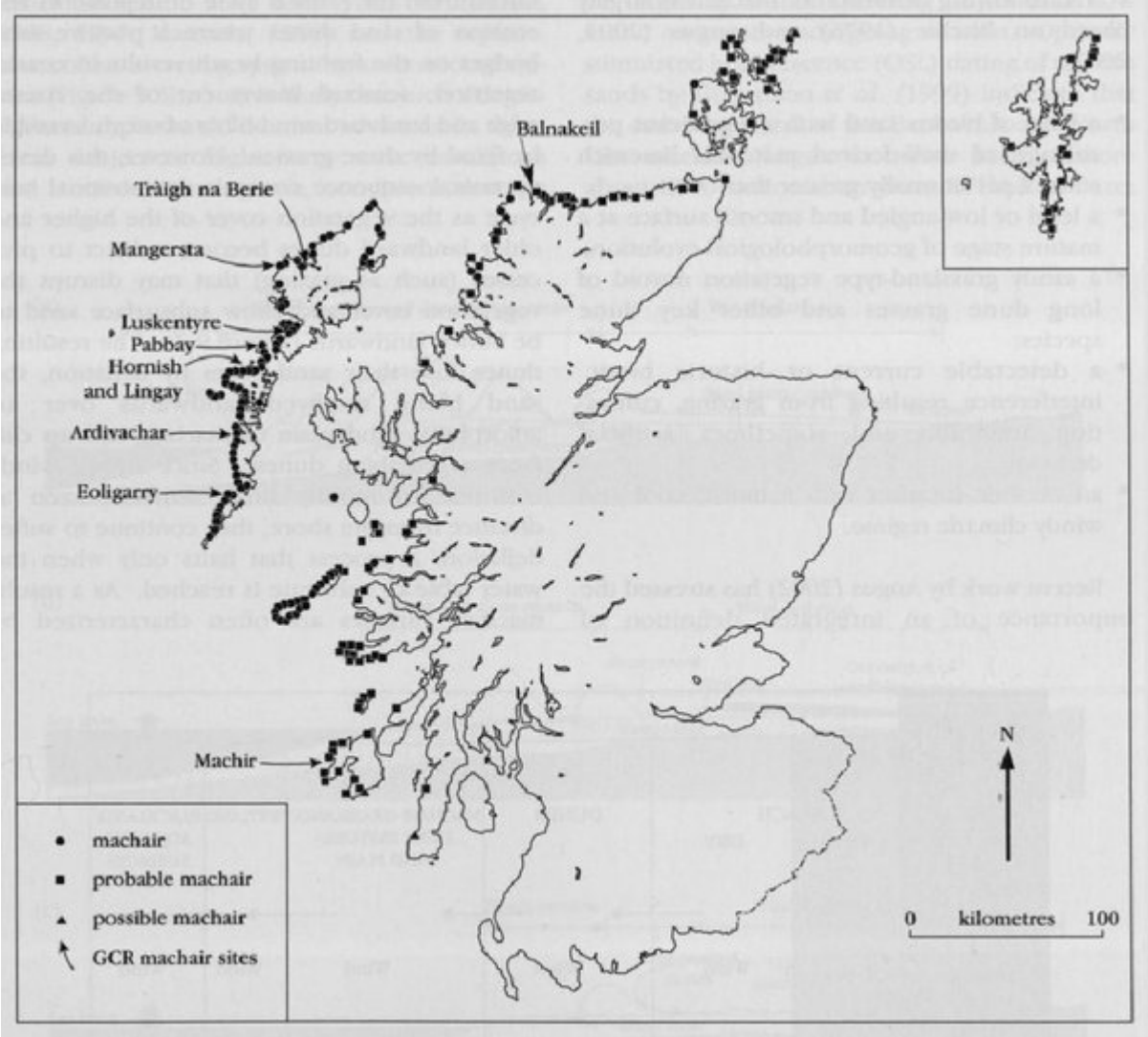
exhausted. In the exposed wave and wind environment of Mangersta this situation may have been achieved earlier in the cycle of machair development and erosion than has occurred elsewhere.

The extent of hill machair at Mangersta, and the occurrence of erosional terraces at lower levels of the hill machair suggests that the central area once supported a machair surface probably sited landwards of a dune cordon behind the beach. The deflation of the central depression behind the beach is likely to be attributable to a reduction in the rate of sediment supply from an already restricted offshore contributing area. Reduction of beach sand leads to starvation and eventual removal by wind erosion of the landward dune area. The flat machair surfaces behind these dunes then underwent deflation down to either an underlying gravel basement or to the water table. Since the machair at Mangersta is crossed by streams and is often wet, it appears to have deflated down to the water table. Severely deflated machair occurs at several other sites in both the Western Isles and in the north-west Highlands, but nowhere is the amount of stripping so complete as at Mangersta (Ritchie and Mather, 1970b). The emplacement of the arcuate storm ridge on the upper beach at Mangersta may be a relatively recent development, since the ridge obscures any eroded frontal edge of the central machair depression. The gravels remain relatively unrounded and so have been relatively unaffected by wave abrasion. However, it may be that the gravels are part of a poorly-developed storm beach thrown up before the build-up of sand and subsequently exhumed from beneath the dune cover. Field visits in 2001 indicated that small amounts of gravel had been artificially added to the ridge in an attempt to reduce the likelihood of washover.

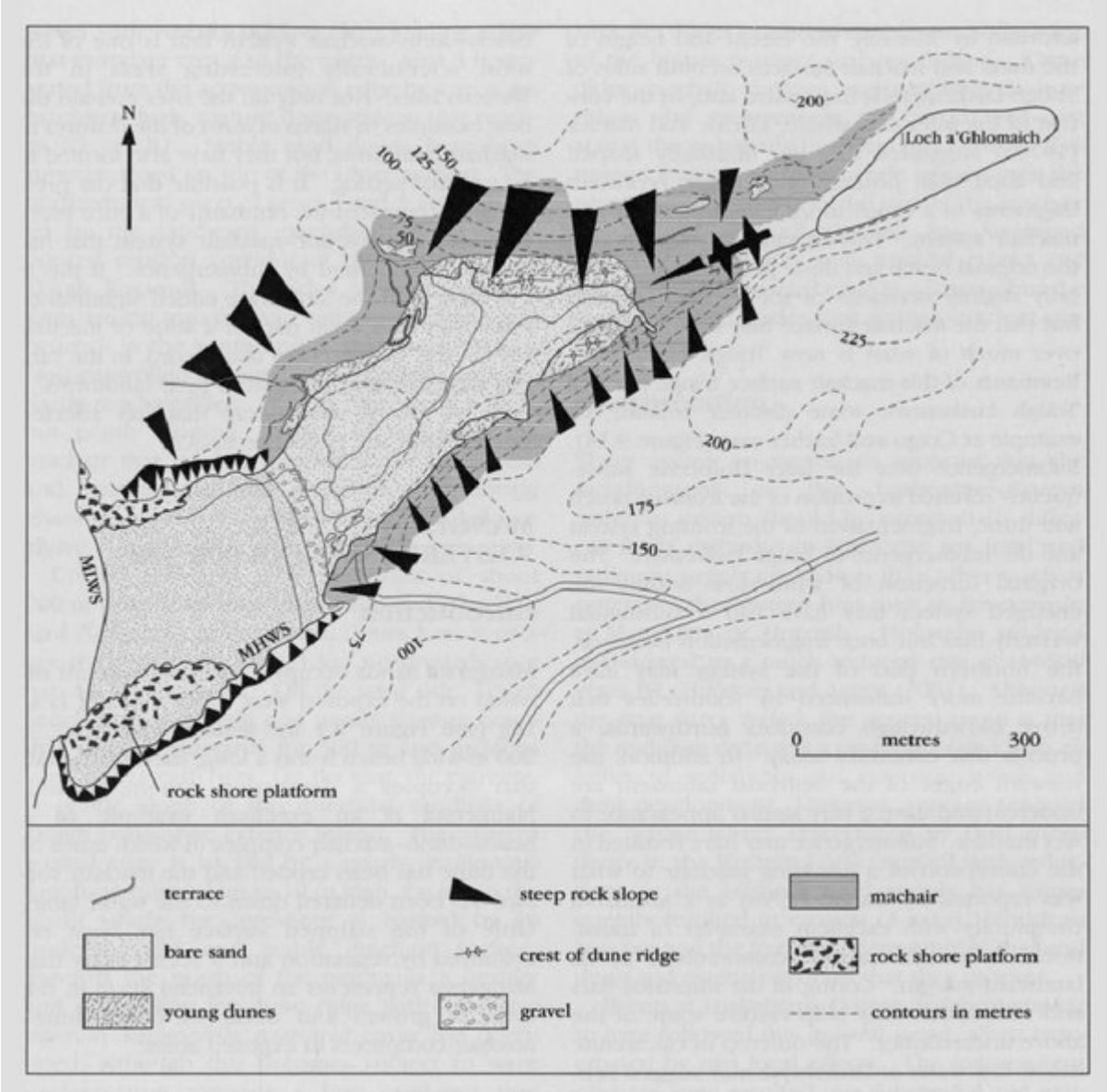
Conclusions

The causes of the severe deflation at Mangersta are not known with certainty, nor are the start and end dates of stripping episodes. For example, the effect of land-use practices or of rabbit-induced erosion cannot be discounted. Whatever the reason, Mangersta is the best example of stripped machair in Scotland, and so probably in the world. It seems likely that the fundamental and underlying cause for deflation and stripping may be related to the progressive exhaustion of a locally limited sediment supply.

Mangersta may thus represent an advanced stage in the cycle of growth and decay that, to varying extents depending on the local conditions, may characterize all beach–dune–machair complexes.



(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 9.16) The geomorphology of the small embayment of Mangersta, Lewis. A narrow beach separates an area of low-lying sand from the sea. Mangersta is an example of a machair complex that has been eroded and deflated down to the water table. (After Ritchie and Mather, 1970b.)

(Figure 9.17) The central deflated surface of Mangersta viewed from the north-east. Climbing machair veneers the flanking slopes and occasional washover of the fronting beach occurs during storms. (Photo: J.D. Hansom.)