

UPTON AND GWITHIAN TOWANS

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OS Grid Reference: SW575406

Introduction

Much of the shoreline of St Ives Bay is formed by dunes, known as the 'Hayle, Upton and Gwithian Towans', banked against and covering bedrock to heights of over 60 m (see Figure 7.1 for general location). Blown sand also covers parts of the western side of Godrevy Point at the northern end of St Ives Bay. Documentary evidence indicates that the dunes spread inland covering small houses from the 12th century onwards (Steers, 1946a). Dunes in the southern part of the site are gradually replaced northwards by rock cliffs, caves, stacks and arches overlain by blown sand and dunes. These features have been exposed as the covering dunes have been eroded and the shoreline has retreated. Remnants of former dunes are still preserved on the stacks, but are gradually being removed by subaerial processes. There has been only limited research on this site (Steers, 1946a; Balchin, 1954; Hosking and Ong, 1963); nevertheless the site is important as an example of a relict cliff coastline. It also allows examination of the interface between the dunes and the sub-dune surface.

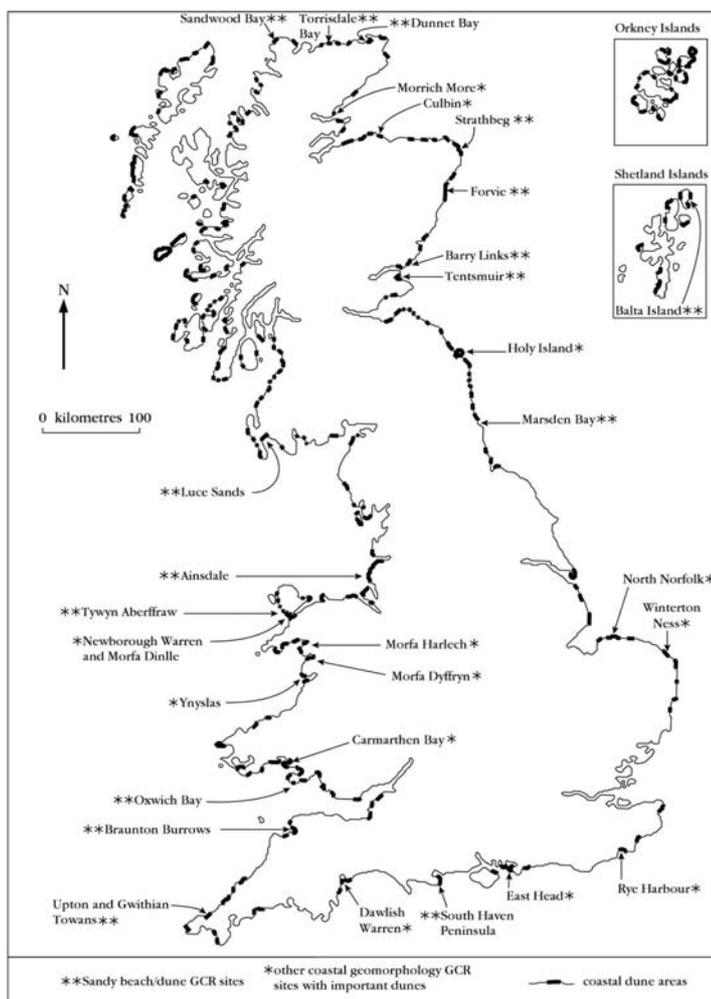


Figure 7.1: Great Britain sandy beaches and coastal dunes, also indicating the location of GCR machair-dune sites (see chapter 9) and other coastal geomorphology GCR sites that contain dunes in the assemblage.

Description

The site lies at the northern end of St Ives Bay. It is formed at its southern end (SW 572 043) by active climbing dunes which reach over 25 m in height and at its northern end (SW 580 416) by a series of cliffs, stacks, caves and rocky platforms known as 'Strap Rocks'. Between these two contrasting forms, the dunes undergoing erosion are gradually replaced at the shoreline by a small rock cliff upon which they rest. This cliff reaches about 20 m in height south of Peter's Point before declining towards 15 m around Strap Rocks. Between Peter's Point and the northern boundary of the site (SW 530 417), the cliff is broken by small coves, stacks and caves associated with lines of weakness in the Lower Devonian rocks. The stacks appear to have developed as marine action has attacked joints and other weaknesses (Figures 7.7 and 7.8).



Figure 7.7: Upton and Gwithian Towans GCR site. Both on the mainland and on the stack the sequence a–d is as follows: (a) dune grasses on blown sand; (b) thin sandy soil on weathered clay and angular intermittent gravel-sized clasts; (c) weathered bedrock; (d) bedrock. (Photo: V.J. May)

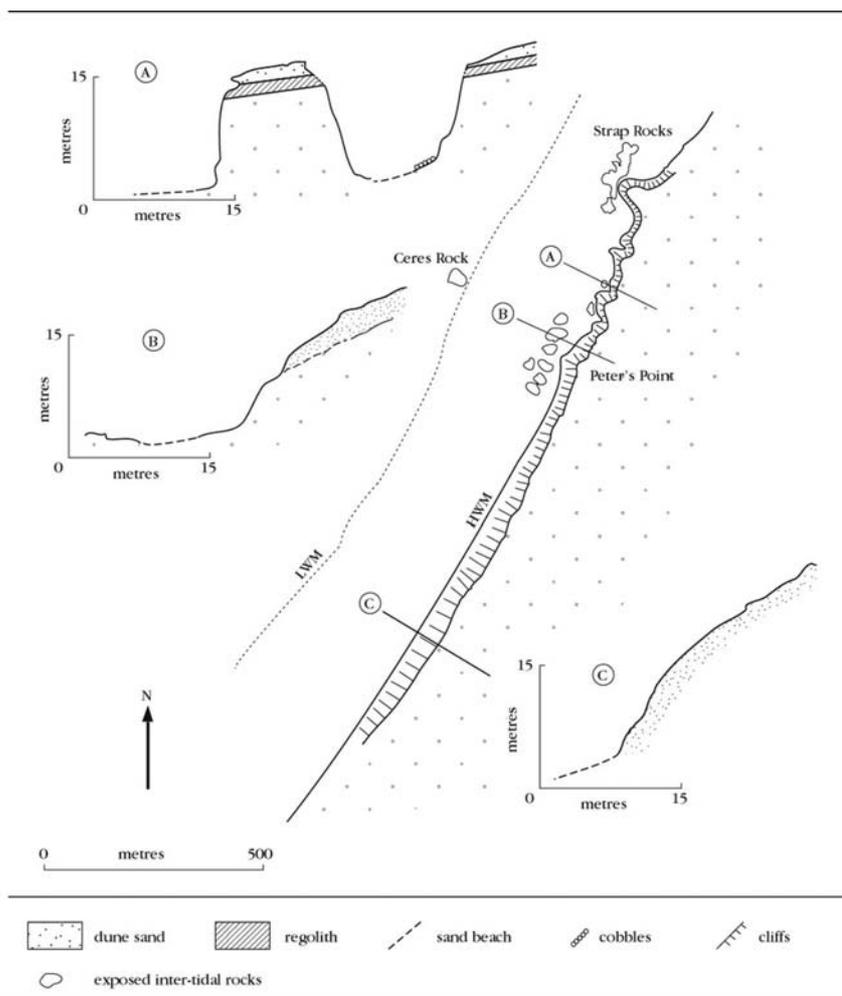


Figure 7.8: Relationships between dunes and cliffs at Peter's Point. Profiles through section A, B and C are shown.

Steers (1946a) described the area as a 'mass of high and well-developed dunes', and makes no reference to the erosional forms that now characterize the northern part of the site. Indeed, the dunes have suffered considerable erosion not only since the 1940s but also over a much longer period, for there appear to have been dunes well to seaward of the present shoreline in the early 19th century. Even allowing for the inadequacies of topographical maps as evidence for coastal change (Carr, 1962) both the Ordnance Survey and the Geological Survey maps point to considerable retreat of the shoreline.

Erosion of the rocky coast is slow when compared with the inferred rate of retreat of the dune shoreline. No dating of the interface between the dunes and the surface beneath them has been attempted. Many west coast dunes lie upon a rocky base and often owe their height to their rocky foundations; similar sub-dune rocky cliffs have been observed in Brittany, though without the intricate forms of Strap Rocks.

The dune sands are carbonate-rich (Table 7.3). The beach sands contain both tin and other heavy metals which have presumably been carried to the beach down the streams both to north and south (Hosking and Ong, 1963). The potential fluvial sediment supply to the beach has not been quantified, but may have been significant in the past. De la Beche (1830) indicates that up to 100 000 tonnes a^{-1} was removed from the Camel estuary in the 1820s, and extraction from this area may have removed comparable volumes.

Interpretation

This site is unusual in that it contains both active dunes and intricate erosional forms, the latter exhumed from beneath a retreating sandy shoreline. The relatively rapid changes in this site's

cliffed coastline today contrast with the much slower changes farther north at Tintagel. It is the exhumed cliffline that makes this site particularly important for coastal geomorphology. There are several other locations where there is clear evidence of exhumation (Hallsands and Redend Point (South Haven Peninsula) in England, and Tarbat Ness and the Bullers of Buchan in Scotland – see GCR site reports). The dune–rock interface is poorly preserved at Redend Point, whereas in this site it is well exposed. At the Bullers of Buchan (Walton, 1959), stacks and geos are cloaked and infilled by till, indicating that they are at least older than the last glaciation.

Taken as a whole the site demonstrates a sequence from sandy dune shoreline through progressively dominant erosional rock forms to stacks with residual dune deposits atop them. As such, it is a good example of the cyclic nature of the processes affecting the British coastline. Erosional processes were replaced by depositional marine or periglacial processes, the resultant forms then being eroded and the earlier erosional forms exhumed. Even on a shorter timescale of less than 100 years, much of this coastline is marked by oscillation between erosion and deposition.

The age of the exhumed cliffs is not known. It is possible that they merely pre-date the dune growth and migration recorded along much of the Cornish coast during medieval times. Steers (1946a) notes for example the spread of the dunes in Perran Bay that engulfed St Piran's Chapel. Balchin (1954) suggests that St Piran's Chapel was buried before the 12th century. Leland (1535–1543) described St Ives in the 16th century as 'sore oppressed or over covered with sandes...'. Steers (1946a) also refers to 'the east side of St Ives Bay where the dunes have buried St Gothian's Chapel and by 1907 had banked themselves around the walls of Millook churchyard'.

In the absence of a firm date, the contemporary origin of the cliffs must be considered. Assuming that the erosion of the dunes was sufficiently rapid during the late 1940s to bring the sea to the foot of the sub-dune rocky topography, all of the features now in existence at Strap Rocks could have formed since the 1950s. However, although erosion is undoubtedly taking place there is no evidence that the cliffs are eroding at a sufficiently rapid rate to produce the forms during this time. The presence of a layer of regolith and small angular clasts (possibly head) beneath the dunes that is continued on to the top of the stacks suggests that this was laid down before they were isolated. This suggests a substantial period of cold conditions followed by warmer conditions after the cliffs were formed, and so the cliffs could be pre-glacial and have been re-occupied in the Holocene Epoch. Subsequent erosion has removed the surface between the stack and the mainland. On balance it is likely that the forms substantially pre-date the dunes, have been exhumed and are being reworked at present.

Conclusions

The Upton and Gwithian Towans GCR site contains an unusual set of forms that warrant further investigation. Cliff-forms and erosional features are being exhumed at this site from beneath a formerly more extensive dune system. They are unusual within Great Britain because there are few sites where erosional forms are being exposed by the removal of dunes at present. As dunes to the south have been eroded they have exposed former cliffs, caves and stacks.

Reference list

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