Benacre Ness, Suffolk

[TM 532 824]–[TM 535 831]

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Introduction

Benacre Ness (see (Figure 6.2) for general location) is a good example of a ness formed in shingle and associated with rapid coastal retreat of part of the beach and of nearby cliffs. Williams (1956) outlined the history of the ness (which had been referred to by Ward (1922) under the name 'Covehithe Ness'), showing how it had progressively moved from south of Covehithe to its present-day position (see (Figure 6.39)); almost 6 km in 200 years. The site comprises three landform units: namely cliffs cut mainly in fluvioglacial sand with a fringing beach of sand and shingle, a beach ridge fronting Benacre Broad and The Denes, and Benacre Ness itself formed of sand and shingle ridges. Although the evidence from longshore sediment transport is that material moves towards the south, the ness form itself has moved northwards. As well as being a classic landform, therefore, Benacre Ness is of considerable importance for studies of coastal form-process dynamics (Steers, 1946b; Russell, 1956; Williams, 1956, 1960; Hardy, 1966; Cambers, 1975; McCave, 1978b; Carr, 1981; Onyett and Simmons, 1983).

Description

The southern part of this site is formed by the cliffs at Covehithe, which are undergoing very rapid erosion. Cambers (1973) estimated the historical (100-year) rate of retreat at up to 4.25 m a^{-1} and it has exceeded 6 m a^{-1} since 1929. The estimated loss of beach volume during a single 24-hour period at Covehithe was 300 000 m^3 (Williams, 1956). The rapidity of cliff-top retreat is shown vividly by the truncation of the lane leading from Covehithe itself and the loss of autumn-sown crops by the next spring. The cliffs decline northwards to Benacre Broad. Here the beach is a single fringing ridge that blocks the mainly infilled Benacre Broad (between [TM 532 824] and [TM 535 831]. This ridge has similar rates of retreat to the cliffs to the south, but the rate of change declines along The Denes until Benacre Ness where accretion at rates up to +2.46 m a^{-1} has occurred since 1880. The northern part of the ness is marked by erosion, but at significantly lower rates (up to 0.36 m a^{-1}) than the southern part. Steers (1981) has drawn attention to the very high rates of retreat that have occurred during storm surges. Between 19 March 1977 and 11 March 1978, at three separate points, 9 m, 8 m and 14 m were lost. During 1979 and 1980, the same points lost 2.7 m, 4.6 m and 8.8 m. Even larger values of 12 m and 27 m were recorded by Williams (1956) during the storm surge of early 1953. A surge in 1990 caused overnight recession of 35 m (K. Clayton, pers. comm.).

Interpretation

Much of the early description of the ness and its changes was based upon cartographic evidence (Ward, 1922; Steers, 1946b; Williams, 1956).

Both Williams (1956) and Steers (1964a) found inconsistencies in the cartographic rccord, and Steers inclined towards the view that the ness has only existed in a form similar to present since about 1826. Steers (1946a) suggested that the feature had originated as a spit across the Kessingland River but offered no evidence for this or for the direction of the spit's growth. Williams (1956) suggested that a northward transport of sediment would occur immediately following surges. The large quantities of material eroded from the cliffs would be transported 'under the action of an abnormal north-going pull as the level of the sea falls'. Sediment would accumulate seawards of the ness and would then be gradually pushed up the beach by wave action. Steers accepted that this might be the case today, but could not see how this process could occur at earlier stages of ness formation when the ness was protecting the cliffs. The beach throughout the site is composed mainly of flint shingle but there are varying amounts of sand, except at the ness, which is formed almost entirely of shingle. Whereas the beach fronting Benacre Broad and The Denes is tending to move landwards, the ness itself has moved progressively northwards. Onyett and Simmons (1983) described Benacre as moving rapidly to the north, but were unable to provide evidence as to the net change in its volume.

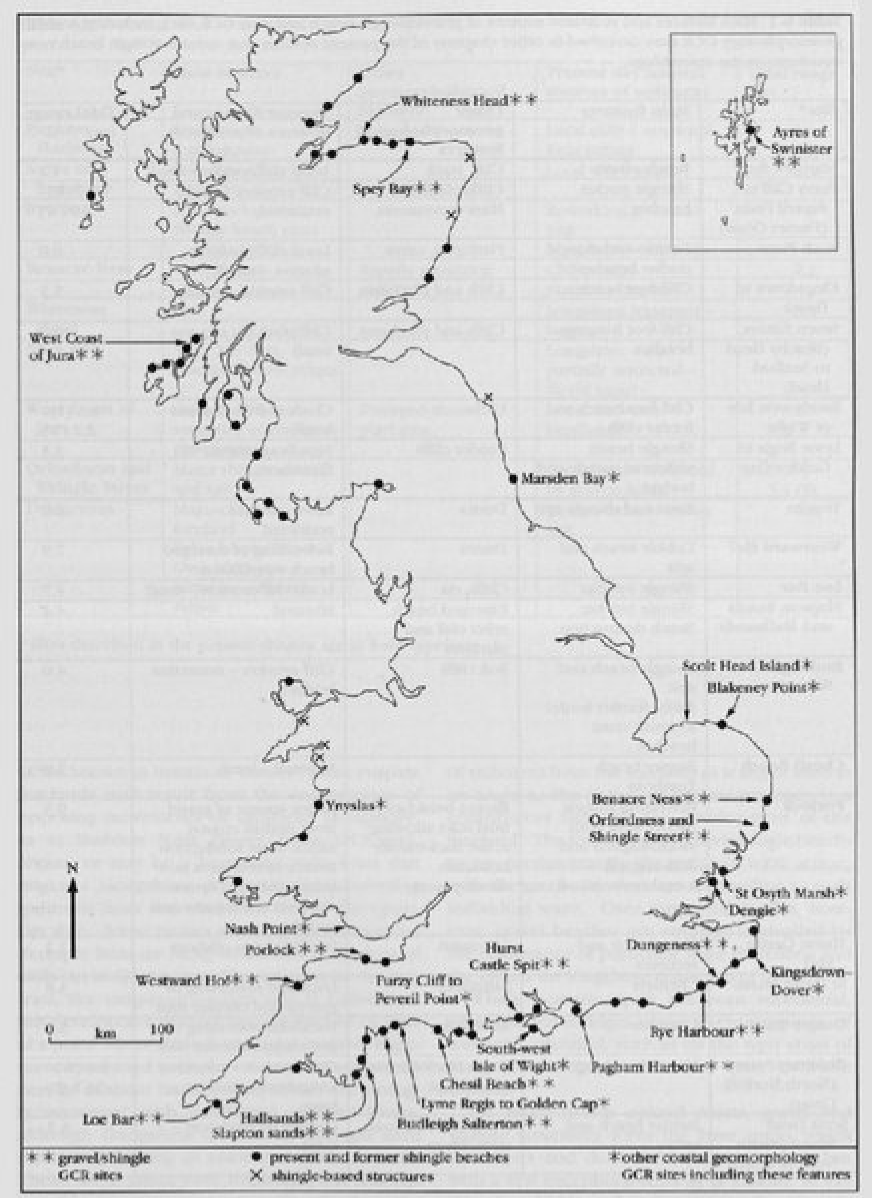
In his discussion of Ward's paper, Russell (1956) suggested a simple mechanism for the apparent conflict between southward movement of sediment and northwards movement of the ness. The alignment of the northern face of the ness would mean that drift was zero, whereas the alignment of the southern face would increase longshore transport. Material would be accreted at the northern face, but the southern face would be eroded (Figure 6.39). As a result the ness would move northwards. The same mechanism was proposed by Cambers (1975) at Winterton Ness. Williams (1960) accepted Russell's suggestion, adding that the rate of movement of the ness is probably slowing as the amount of material available for transport reduces. However, Russell's concept does not explain how the ness forms in the first instance. At some point along the coast, wave direction must have been affected by refraction and the alignment of the coastline in such a way that the beach aligned itself to face the dominant waves. g as Steers (1946a) suggested, there was a spit along this coast, the slight change in alignment of the coastline south of Benacre could have been sufficient to have caused the beach to change its alignment slightly to face the waves. Once this had occurred, the mechanism proposed by Russell would ensure the maintenance of the ness and its movement northwards.

However, Hardy (1966) demonstrated that the ness had migrated southwards since the beginning of the 20th century, in association with a complex pattern of erosion and deposition in neighbouring areas. A northward-trend ing offshore bank had developed since 1945 that was aligned away from the coast in the immediate vicinity of the ness. It was likely that a flood channel had developed between the ness and this bank that would allow sediment to come ashore in the area of the ness. An ebb channel carried most material offshore on the eastern side of the north-south-trending bank. Changes in the foreshore appeared to have occurred before the formation of the bank. Robinson (1966) argued that a flood channel carrying material southwards would feed sediment on to the northern flank of the ness, whereas the ebb channel carried material northwards on to its southern flank. Changes in offshore relief show that between 1824 and 1956, the ebb channel was established off the 19th century position of the ness. A gradual northerly shift of the ebb channel was followed by northward migration of the ness. McCave (1978b) identified the nesses as a possible location at which fine-grained material was removed from the longshore sediment drift, with coarsening in the direction of sediment movement. Carr (1981), however, regarded McCave's argument as unproven.

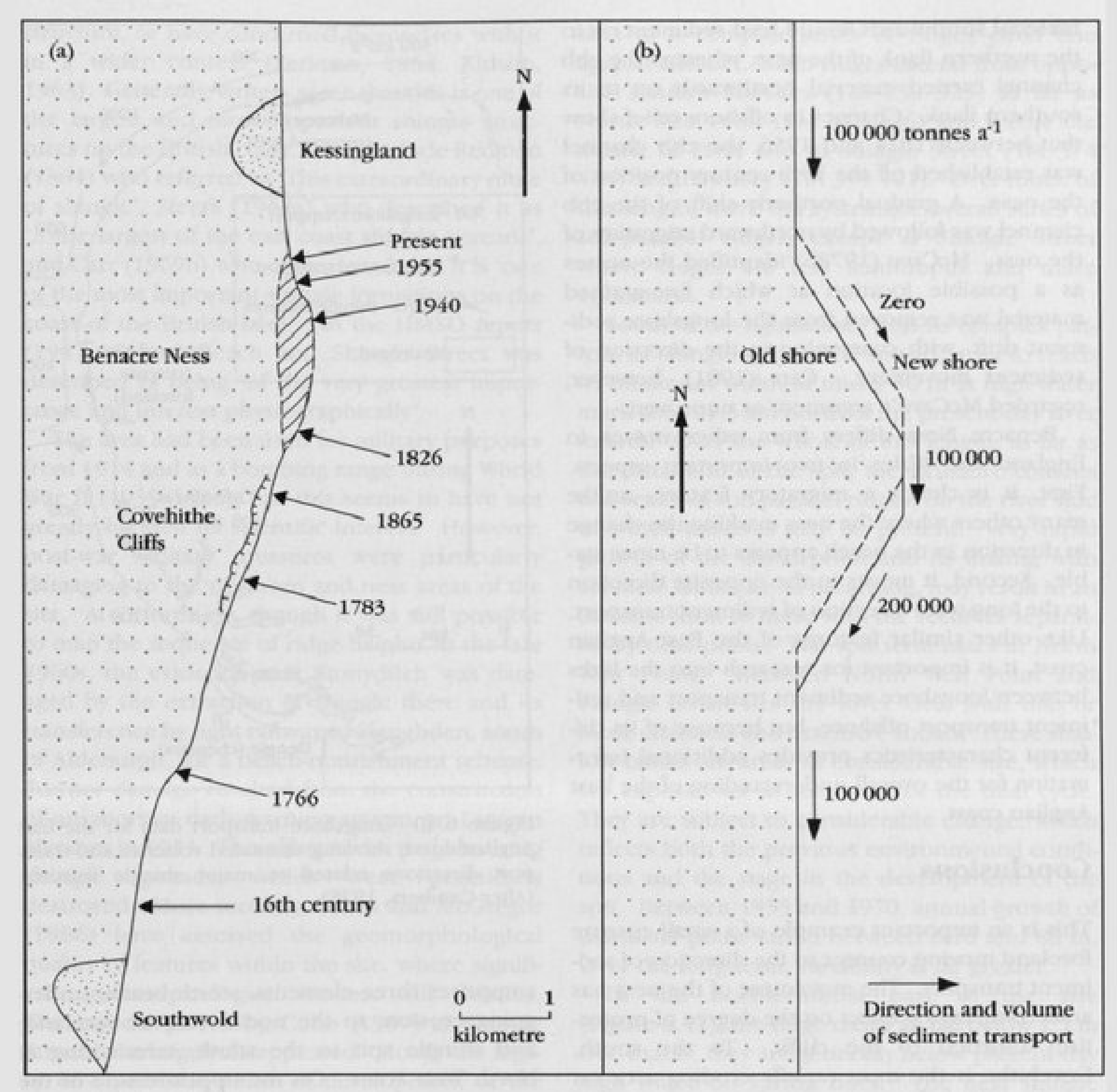
Benacre Ness differs from other nesses in England and Wales in two important aspects. First, it is clearly a migratory feature, unlike many others where the ness marking the change in direction in the beach appears to be more stable. Second, it moves in the opposite direction to the long-term direction of sediment transport. Like other similar features of the East Anglian coast, it is important for research into the links between longshore sediment transport and sediment transport offshore, but because of its different characteristics provides additional information for the overall understanding of the East Anglian coast.

Conclusions

This is an important example of a small cuspate foreland moving counter to the direction of sediment transport. The movement of the ness has an accompanying effect on the degree of protection afforded to the cliffs. To the south, Covehithe is the most rapidly eroding area on the English coast.



(Figure 6.2) Coastal shingle and gravel structures around Britain, showing the location of the sites selected for the GCR specifically for gravel/shingle coast features, and some of the other larger gravel structures.



(Figure 6.39) Cliff erosion and ness migration at Benacre Ness. The ness moves at 25 m a^{-1} to the north. The early accounts interpret the movement of the ness northwards as a result of accretion on the updrift side of the ness. The alternative view is that transport is towards the north (see Figure 6.40) and that accretion occurs on the lee (northern) side of the ness. Hardy (1966) suggests a reversal of movement of both the spit and direction of transport. (After Williams, 1956.)