ORFORDNESS

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OS Grid Reference: TM358400

Introduction

The shingle ridges that form Orfordness (see Figure 6.2 for general location) extend about 15 km south from Aldeburgh on the Suffolk coast and divert the River Ore for a similar distance (Figure 6.40). South of the mouth of the river, the shingle ridges at Shingle Street continue southwards towards Bawdsey. Orfordness comprises three elements: storm beach, undergoing erosion, to the north; cuspate foreland; and shingle spit to the south, terminating at North Weir Point. On the opposite side of the estuary of the River Ore is the complementary, but gradually disappearing, Shingle Street ridge and lagoon complex. The Orfordness ridges provide evidence for oscillations in sea level, and research work on the spit and in the estuary has helped clarify many of the processes that are relevant in spit development worldwide.

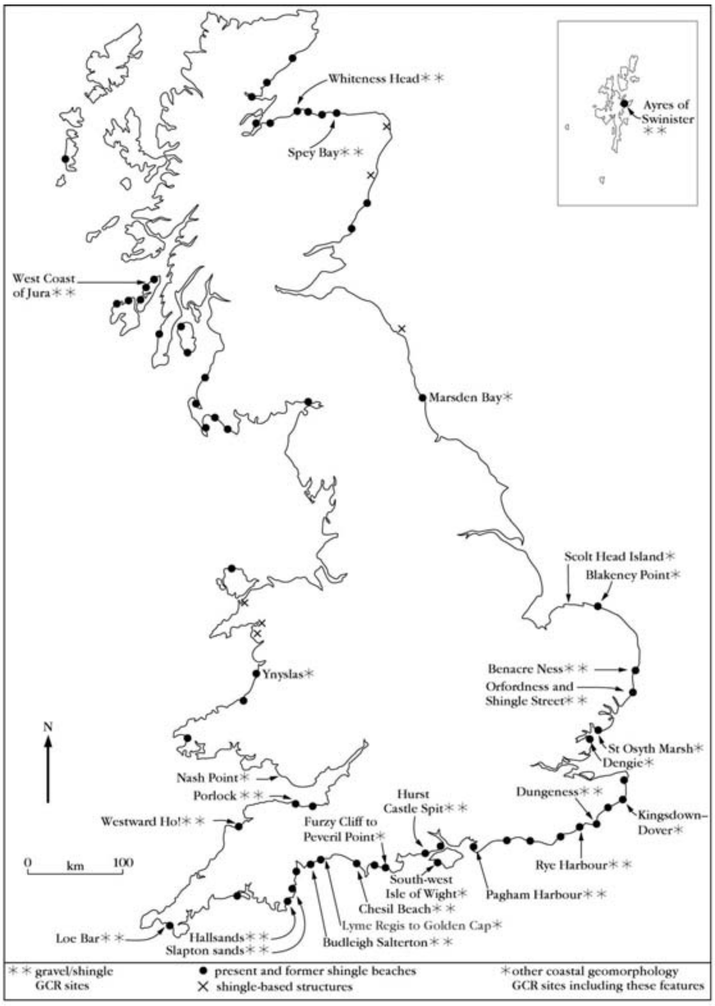

Figure 6.2: Coastal shingle and gravel structures around Britain, showing the location of the sites selected for the GCR specifically for gravel/shingle coast features, and some of the other larger gravel structures.

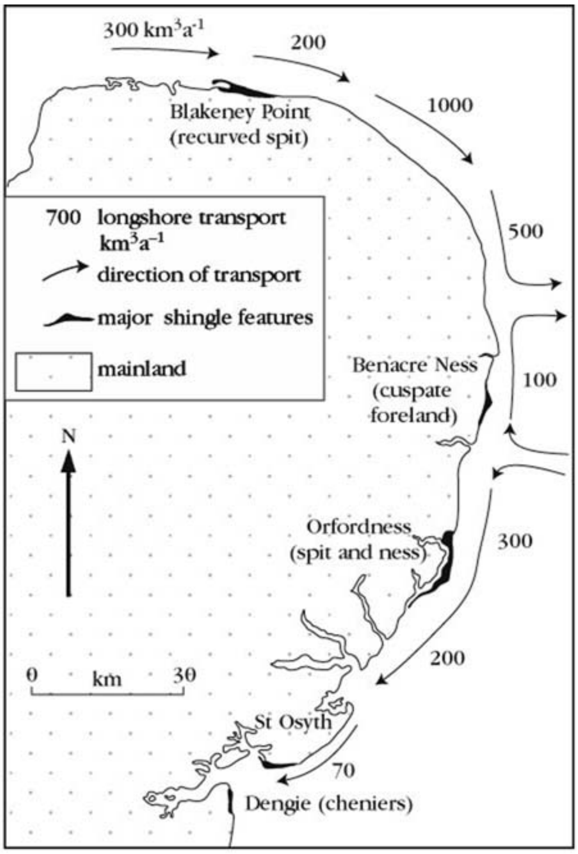

Fig 05.26

Figure 6.40: Longshore transport data for the East Anglian coast, showing estimated volumes and transport directions related to major shingle features. (After Cambers, 1975).

The site has been well documented (Redman, 1864; Redstone, 1908; Steers, 1926a; Grove, 1953; Cobb, 1957; Kidson *et al*., 1958; Kidson and Carr, 1959; Kidson, 1961, 1963; Carr, 1962, 1965, 1967, 1969b, 1970, 1971c, 1972, 1973, 1986; Carr and Baker, 1968; Randall, 1977; Green and McGregor, 1986) but with the exception of Steers (1926a) and Carr (1965, 1967, 1969b, 1970, 1971c, 1972, 1973, 1986), most have considered either only part of the shingle structure, or have concerned themselves with it in a wider context (Redman, 1864; Kidson, 1963). Generally, writers agree that this is one of the largest and most important shingle structures on the British coast. They include Redman (1864) who referred to 'This extraordinary mole of shingle', Steers (1964a) who described it as ' ...the largest of the east coast shingle spreads', and Carr (1969b) who commented that it is 'one of the most important shingle formations on the coast of the British Isles'. In the HMSO report (1947) Orford Beach and Shingle Street was described as being 'of the very greatest importance and interest physiographically'.

The area had been used for military purposes from 1914 and as a bombing range during World War II (1939–1945), but this seems to have not greatly harmed its scientific interest. However, post-war military pressures were particularly damaging to the northern and ness areas of the site. At Orfordness, though it was still possible to map the sequence of ridge heights in the late 1960s, the evidence near Stonyditch was damaged by the extraction of shingle there and its transference by light railway to Slaughden, south of Aldeburgh, for a beach-nourishment scheme. Further damage resulted from the construction of an abortive early-warning system on Lantern Marshes in 1971. This affected the neighbouring shingle spreads, which were practically destroyed. More recently, Green and McGregor (1986) have assessed the geomorphological quality of features within the site, where significant geomorphological interest still remains. The lagoons noted by Cobb (1957) at Shingle Street have largely disappeared. Mostly the legacy of a previous phase of development of the River Ore, the lagoons have been the victims of the natural changes that take place at Shingle Street as the distal point of the spit changes its position. The southern part of the spit is outstanding, for it is virtually undisturbed.

Description

Orfordness comprises three elements: a storm beach undergoing erosion in the north, together with some intermittent shingle spreads; an extensive spit in the south where the shoreline is either accreting or being slowly eroded; and linking these, the ness proper. This is a cuspate foreland situated where there is a change in the orientation of the beach from approximately north–south to north-east–south-west. It consists of a complex series of ridges piled one against another. Such ridges extend from opposite Lantern Marshes (TM 458 525) as far as North Weir Point (TM 376 436) and across the mouth of River Ore to Shingle Street (TM 374 434) and Bawdsey (TM 359 401). Over much of this length, there is a systematic overall series of sub-parallel ridges, except at Shingle Street where ridges are less continuous and more ephemeral.

South of the lighthouse, with its complex pattern of shingle ridges, the spit narrows to reach its minimum width of under 50 m at high-water mark about 1.5 km north of the present-day river mouth. Over the whole of this length, as far as the distal end of the spit, the structure consists of a series of sub-parallel ridges, on the river side of which recurves may be present. Very rapid growth of the distal point and its linking with estuarial banks, or its breaching, may result in an extreme form of these with the recurves separated by tidal pools. The spit terminates at North Weir Point. Between North Weir Point and Shingle Street lies the River Ore, with one or more channels and extensive shoals. These shallow banks are areas of considerable size, which are exposed for at least part of the tidal cycle. They are subject to considerable change, which reflects both the previous environmental conditions and the stage in the development of the spit. Between 1955 and 1970, annual growth of the distal point varied between zero and 88 m. Over the long-term, variability is far greater.

In the northernmost part of the site (Figure 6.41), the ridge crests all fall below 1.5 m OD, that is, they are generally below present-day high water on spring tides. The next shingle structure to the south is below 2.0 m OD and most of the remaining area north of Stonyditch (TM 455 497) is less than 2.5 m OD. The broad increase in height continues immediately south of Stonyditch where most of the ridges fall into the ranges 3.0 m to 3.5 m and 3.5 to 4.0 m OD. There is an extensive area towards Stonyditch Point, where the ridge crests are below 3.0 m OD. Most of these ridges, which fall in the range 2.5 to 3.0 m OD are either cut by ridges on the seaward side or are truncated near The Crouch, but one or two extend along the spit as far as the present-day Havergate Island where the relationship between the ridges again becomes more complex.

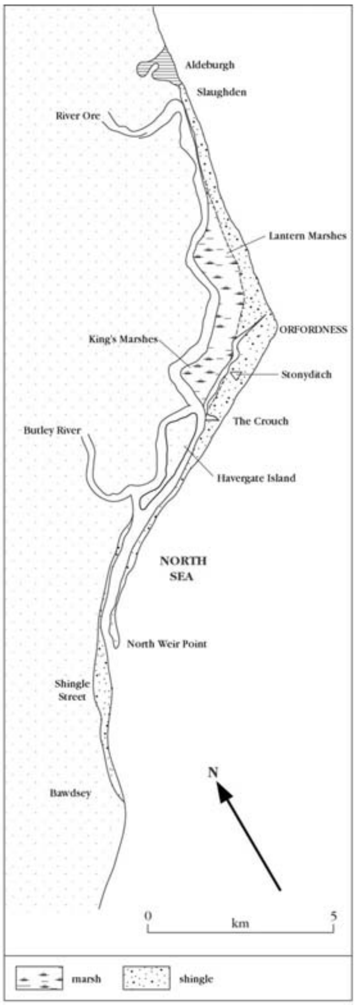

Figure 6.41: Sketch map of the Orfordness–Shingle Street area.

Apart from the fairly extensive area of ridges in the range 3.0 to 3.5 m OD on the ness, where they fall in height to seaward, only small areas of similar height occur elsewhere along the length of the spit. At the ness, both 2.5 to 3.0 m and 3.0 to 3.5 m groups are truncated on the seaward side by ridges between 3.5 and 4.0 m OD (Figure6.43). These, together with the highest category (greater than 4.0 m OD with a maximum of approximately 5.0 m OD), extend throughout the spit to the distal point.

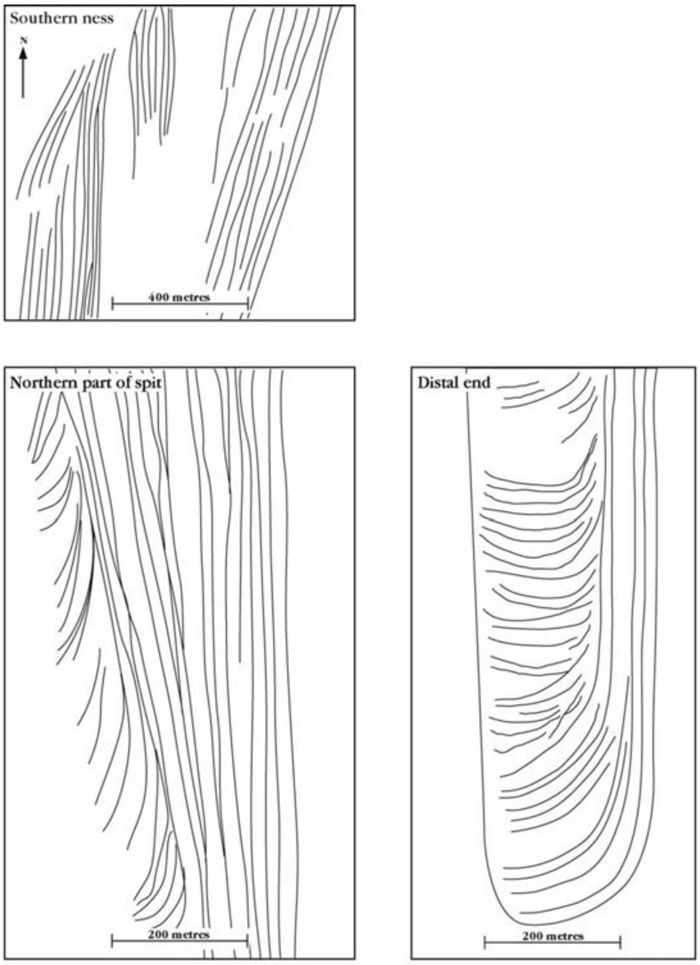

Figure 6.43: Variations in ridge patterns of Orfordness, in the southern part of the ness, the northern part of the spit with an earlier recurved spit fronted by individual shingle ridges, now largely destroyed, and also at the distal end of the spit, showing recurves. (Based on Carr, 1973; Green and McGregor, 1988.)

The height between the shingle ridges ('fulls') and the intervening hollows ('swales' or 'lows') varies. Generally there is about 0.3 m difference between adjacent ridges and hollows but occasionally this reaches a maximum of 1.5 m. The base of the shingle under the ness, and much of the nearby area, lies between –0.2 and –10.7 m OD. It appears to rest on marine planation surfaces of various ages. Shingle forms the river bed at The Narrows (TM 420 475), and one borehole records 'stone' under the estuarine clays on the northern part of Havergate Island from –10.1 to –14.0 m OD.

The well-rounded clasts of the ness and the spit range between 4 mm and 75 mm in length. Over 99% are flint. Elsewhere in the site, if pebbles are present, they are found in small quantities only: they are frequently rectangular rather than rounded, and are slightly more varied in composition. Most occur in a primarily sandy matrix.

The River Ore runs roughly parallel to the spit from Slaughden to North Weir Point (Figure 6.41). Its bed ranges in depth from –5.0 m to –12.5 m OD. Except near the present-day river mouth, the maximum depth at any given place has remained almost constant for the last 160 years and probably longer. The mouth of the Ore appears to have been displaced towards the south as the shingle structure lengthened in that direction. This impression is correct only in part. Displacement is likely both immediately south of Aldeburgh and south of The Crouch, although at the latter site it was complicated by the precursors of Havergate Island and the Butley River. Elsewhere, existing creeks, which ran approximately parallel to the coastline, were joined together as their exits became blocked.

Marshes that have been the subject of land-claim are present on the landward side of the River

Ore throughout its whole extent. They vary in width from 0.4 to 2.4 km. Marshes also occur at Havergate Island (the interest in which is now almost entirely ornithological), and from Slaughden to The Crouch on the southern side of the river. On the spit farther south, there are only small areas of saltings. The reclaimed marshes are at –0.3 m to +0.6 m OD and the saltmarshes at 1.2 m to 1.5 m OD. King's Marshes are separated from the shingle of the ness by a tidal creek (Stonyditch), which runs approximately north-east–south-west. The truncated head of this creek rises in an area of saltmarsh between two series of ridges, so that northward of this point the shingle ridges and marshes are adjacent. This is the only instance where the major shingle structure abuts the marshes. Borehole logs suggest that at least some of the shingle and estuarine clay were deposited contemporaneously. The differing depths at which bands of shingle occur both in nearby boreholes and within the same borehole indicate how complex the sequence of events must have been. Although the ridges south of The Crouch are about 1000 years old or less, radiocarbon dates from the Aldeburgh Marshes suggest some form of barrier may have been in existence to seaward as early as 6500 years BP. There is evidence for such a feature existing by about 3500 years BP.

Historical evidence suggests rapid growth of the spit towards the south-west in the later 16th century. Until 1800 AD, cartographic evidence is rather inconclusive, but since the 19th century, a widely fluctuating distal point (Figure6.44) can be seen in maps. Over the period 1812 to 1921, fluctuations within the range of approximately 2900 m in total length took place, the maximum recorded southerly growth being at the beginning of that period, although a comparable length was also attained about 1892. It seems likely that similar fluctuation took place in the period immediately before accurate maps and charts were available, a view supported by Hodgkinson's map of 1783. The position of the distal point in 1980 was comparable to that of 1804 and 1902.

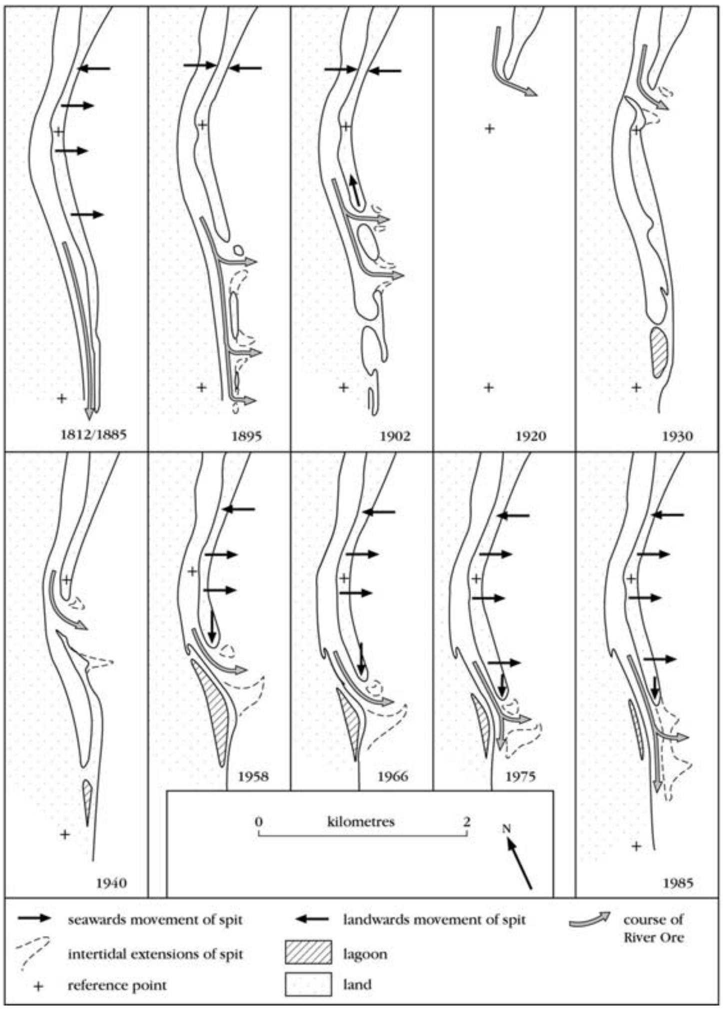

Figure 6.44: Historical changes in the position of distal features at Orfordness. (After various authors, mainly Carr, 1965; and Green and McGregor, 1988.)

Interpretation

The stretch of coast that comprises the Orford shingle spit and the estuary of the River Ore has been the subject of extensive geomorphological research, especially during the period 1955–1970, and several new concepts or modifications of previous ideas about such environments have resulted (e.g. the 'counter-drift' concept ofKidson, 1963). In Britain, Carr has argued that it is the only remaining natural, dynamic and sustainable cuspate foreland, as well as being an outstanding example of a shingle spit.

Carr (1962, 1965, 1967, 1969b, 1970, 1971c, 1972, 1973, 1986) demonstrated the path of the shingle across the estuary, the absence of supply of material from offshore, the way in which new ridges may be melded onto earlier ones without obvious trace, and the inter-relation of spit, bar, banks and the Shingle Street features. The southward progression of the distal point results in the landward recession of the shoreline at Shingle Street. Nevertheless, each sequence of spit development has occurred in the same lateral position, probably due to the artificially constrained channels of the River Ore, which prevent landward migration of the position of the spit. In this respect, the spit differs from many other sites, such as Spurn Point, which have a history of spit breaching and lateral displacement. There appears to be no direct relationship between the extension of Orford spit and wave incidence, for instance, there is no correlation between annual southward growth and the prevalence of winds from a north-easterly quarter, a relationship that might have explained the longshore movement of shingle along the spit (Steers, 1926a). Carr (1986) suggested that the changing position of the distal point followed a cyclic pattern of development (Figure6.44). It is not possible to confirm this model because of a lack of early records and a gap in the recent record. Carr suggests that the last breach occurred in 1920, but there is no mention of this in Steers' account. Carr's model would predict a rapid southward extension of the spit in the near future followed by breaching and an equally rapid reduction in the spit.

Carr (1972) also explains the periodic recession of the spit. As the spit grows southwards, both its shoreline and that of Shingle Street become straighter, thus allowing material to leave the system more quickly, especially as the offshore banks are eliminated. Counter-drift (Kidson, 1963) would be unlikely and the spit would become thinner and more susceptible to breaching. The protection of the offshore Whiting Bank would also be reduced as the spit extends southwards, the offshore zone would become steeper and waves would affect the spit from a greater range of directions. There would be a greater likelihood that the river would be blocked at its mouth and also that accretion in the river would become more rapid. The lengthening of the spit reduces the time for river discharge during periods of higher runoff, and increases both the hydraulic gradient between the two sides of the spit and the time-lag between high or low tide in the river and on the seaward side of the spit. During surges, there could be greater susceptibility to seepage and overtopping, and thus a greater likelihood of breaching of the spit.

Carr (1970) suggested development stages of the shingle, and Green and McGregor (1986) proposed a stratigraphical classification of the shingle. Each shingle ridge or group of ridges represents a stage in the development of the shingle complex, but not all stages are represented at Orfordness because of natural erosion and human activity. Green and McGregor (1986) argue that, in any area of Orfordness, an individual ridge or group of ridges can be classified in terms of the extent to which the stage that it represents is found elsewhere in the complex. The continuity and relationships of groups of shingle ridges can be traced using aerial photographs, and the shingle system can be divided into development stages and sub-stages. These are either individual ridges partly or entirely isolated in marshland, or groups of ridges separated from one another by a major erosional contact. In several cases, sub-stages consist of several groups of ridges (usually 5–10 ridges per group) with similar alignments, but separated from each other by erosional contacts. Green and McGregor (1986) believe that their interpretation confirms, and in places refines, the pattern of development stages proposed by Carr (1970).

Where successive stages are in direct contact with each other, the sequence and relative age of the ridges can be ascertained. Continuity of development is poorly represented in contrast to Dungeness, reflecting the limited extent of the shingle and its greater susceptibility to natural change. In particular, the limited seaward progradation of the ness itself over less than 1 km has allowed only 50 to 60 ridges to develop in contrast to more than 500 at Dungeness. Ridge continuity has been interrupted by natural erosion, usually as a consequence of the narrowness of the spit and its extreme elongation. The ness is also migrating towards the south. Green and McGregor (1986) have regarded overlapping groups of ridges in erosional contact as being separate development stages whenever their age relationships are uncertain. The small, frequently isolated, areas of shingle on the landward side of the estuary are also regarded as separate development stages.

Conclusions

Orfordness comprises three elements: a storm beach in the north, the ness itself, and a spit in the south. One of the largest and most important shingle structures on the British coast, it is an outstanding example of a shingle spit and shingle-spit cuspate foreland complex. Orford Beach and Shingle Street have the very greatest physiographical importance and interest. The international reputation of Orfordness rests primarily upon the history of scientific investigation and the existence of detailed records of its early growth and present-day dynamics.

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