BUDLEIGH SALTERTON BEACH

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OS Grid Reference: SY040801

Introduction

The coastline of east Devon is characterized by several river valleys that are infilled by alluvium, and their mouths partially blocked by shingle or cobble beaches. Although the beaches at Seaton and Sidmouth have some similarities in form with the beach at Budleigh Salterton, they have suffered considerable erosion in recent years and sea defences and coast protection works have been erected to protect the low-lying towns behind them. However, Budleigh Salterton Beach (see Figure 6.2 for general location) remains largely undisturbed. The beach is formed primarily of shingle- and cobble-sized material derived from the erosion of cliffs cut into Triassic sandstones and pebble beds at the western part of the site. The beach is unusual among English beaches because it is fed with material derived entirely from erosion of cliffs, which cut into Triassic strata. There is a noticeable lack of flint and chert in the beach clasts. The plan form of the beach shows a strong relationship to the refracted Atlantic waves and more direct, but less frequent, waves from the eastern English Channel. The cliff–beach–estuary assemblage was once a very common feature of the coastline of south and south-east England, but most examples have been modified by coast protection works. At Budleigh Salterton, the relative stability of the beach and the lack of natural evolution of the estuary mouth have not required artificial protection.

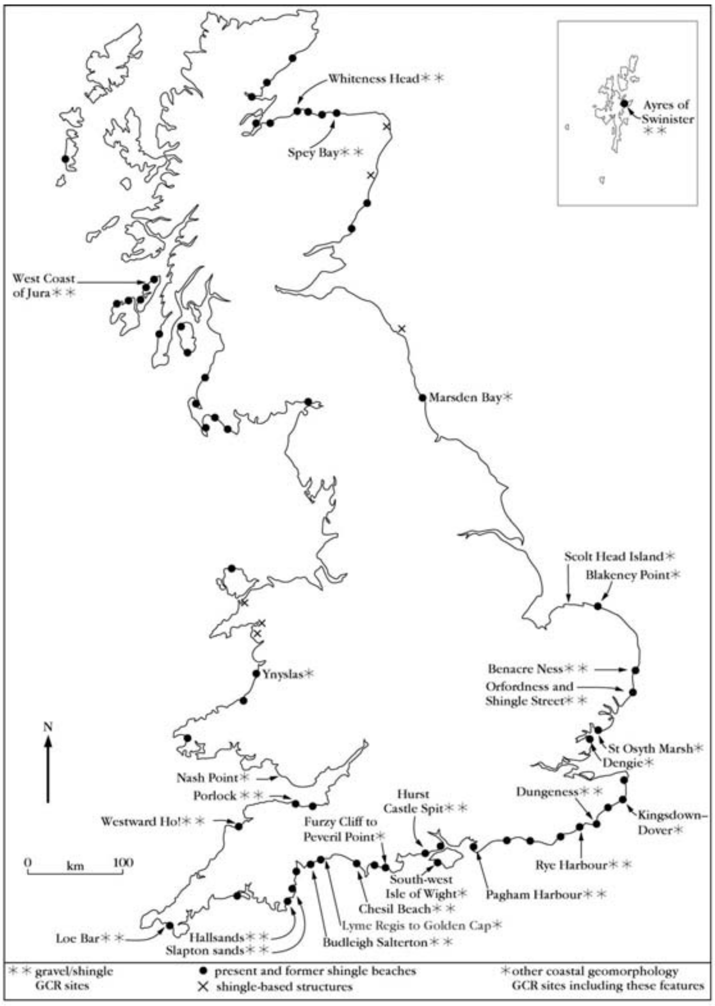

Figure 6.2: Coastal shingle and gravel structures around Britain, showing the location of the sites selected for the GCR specifically for gravel/shingle coast features, and some of the other larger gravel structures.

Research on the site has been limited, although distinctive clasts derived from the Budleigh Salterton Pebble Beds occur in many of the beaches within Lyme Bay and are reported in the literature (Ward, 1922; Steers, 1946a; Bird, 1989; Carr, 1974; Carr and Blackley, 1974a).

In recognition of the site's importance for coastal geomorphology and Triassic stratigraphy, it is one of the GCR sites that form the Dorset and East Devon Coast World Heritage site.

Description

The site comprises five morphological units.

1. The western cliffs around Littleham Cove, where a narrow platform formed of more resistant sandstones provides a headland against which a zeta-shaped beach is beginning to form.

2. The high cliffs at West Down Beacon, which reach over 125 m in height and are affected by considerable landsliding, a process that feeds sand, clay and pebbles to the beach below.

3. The eastern cliffs that are more affected by rock falls and are increasingly protected by the beach itself.

4. The barrier beach, which rests on the terraces of the Otter Valley and extends across the floodplain as a spit.

5. The cliffs and platform at Otterton Point.

As erosion of the cliffs has taken place, particularly by landslipping around West Down Beacon (Kalaugher *et al*., 1995), clasts have been added to the beach and distributed throughout its length. The beach is lower, narrower and sandier at its western end in Littleham Cove and becomes higher, wider and less sandy eastwards, especially to the east of West Down Beacon. Although the cliffs decline steadily towards the Otter valley so that the pebble beds do not crop out there, there has been sufficient input of eroded material from the western cliffs to maintain a supply, albeit spasmodically. At the eastern end of the site, the pebbles not only form a barrier across the valley, but also spread seawards around the river mouth lodging against Otterton Ledge, a rock shore-platform. The shingle bank blocked the Otter estuary by the mid-16th century (Ward, 1922). There is no record of substantial erosion or flooding at the town. It appears that, although there has been some retreat of the coastline to the west and that the barrier beach has moved slightly landwards over the valley floor, the clasts are retained within the bay and provide an effective form of coast protection.

Interpretation

The distinctive form and petrology of the clasts, which distinguish them from the predominantly flint or chert content of many English south coast beaches, make them a useful 'tracer' for studies of longshore movements of sediment, especially because the clast source is very restricted in outcrop, both at Budleigh Salterton on the coast and offshore on the seabed.

The beach is unusual in that it shows a very high degree of stability, which is probably a result of its position between two relatively stable headlands, and the fact that the beach rests for much of its length against the cliff foot.

The Triassic Budleigh Salterton Pebble Beds were described byHenson (1970) as a poorly sorted, braided river deposit consisting mainly of ellipsoidal quartzite pebbles with subordinate pebbles composed of vein quartz, 'schorl', sandstone and porphyry. They have a maximum dimension between 19 mm and 100 mm (Carr, 1974) and all show a high degree of rounding. The formation dips to the east at about 5° and forms a marked escarpment running northwards from the coast at West Down Beacon. Carr and Blackley (1974a) described more fully what they identified as metaquarzite clasts from this beach. Pebbles from this distinctive formation have been identified within many other beaches on the southern coastline of Britain, notably at Chesil Beach, Langney Point and Dungeness (Ward, 1922; Steers, 1946a; Lewis and Balchin, 1940). Steers (1946a) suggested that the sites most distant from Budleigh Salterton contain pebbles probably transported as ballast, but there is no reason to reject natural processes as a source for the Chesil Beach examples (Carr and Blackley, 1974a).

The plan form of the beach is largely controlled by the wave-energy distribution between Littleham Cove in the west and Otterton Point in the east where the beach diverts the river Otter eastwards. The alignment of the beach is also affected by the shore platform at Otterton Ledge.

The small estuary of the Otter may allow some sediment to be stored in this embayment. More important is the very high permeability of the pebble ridge at its eastern end so that the ridge is little disturbed except by the largest waves. Unlike the part of Chesil Beach formed of large clasts, Budleigh Salterton beach is not exposed to the full strength of the south-westerly waves. It is aligned towards the SSE. Periods of storm-wave attack from the more easterly directions move sediment along the beach and on occasions denude parts of it. At West Down Beacon, Kalaugher *et al*. (19951995) have shown that intermittent movements in a mudslide at the base of the cliffs can be linked to large-scale collapses of the conglomerate that forms the upper cliff. In stormy conditions the mudslide is triggered at high tide. The landslides interrupt longshore transport and add new material to the beach. Bird (1989) identified this beach as the only one within Lyme Bay that is not laterally graded. Carr (1974) considered that when significant grading was observed, it occurred along the whole beach, with the smallest grade material at the eastern end. He noted that in June 1972 mean clast size increased from the centre of the beach. This observation is consistent with the patterns of sorting described by Heeps (1986) in similar confined beaches in south-east Dorset. Carr also demonstrated that not only was sediment graded in size from the centre of the bay, but it also changed in shape from the end of the beach.

This site is one of the few beaches of the English Channel coast that has avoided any significant coast protection works; furthermore, the size of its clasts appears to have made it less attractive for commercial extraction. These circumstances make it an important locality for further geomorphological investigation of a 'natural' pebble and cobble beach system.

Moreover, it is unusual to find a beach where the sediment source can be so readily identified and the inputs to the beach monitored. It is all the more unusual for the sediment to enter the beach system already well rounded. Unlike other small bayhead beaches on the southern English coast, Budleigh Salterton has a single main source of clasts. It is dissimilar in that it is sheltered from the main wave-energy inputs from the Atlantic Ocean. Whereas those of south-east Dorset (Heeps, 1986) have a reduced energy input as a result of submarine barriers, it is the effects of refraction that have been most important in reducing the energy inputs to Budleigh Salterton Beach. Large beaches of cobbles are comparatively rare on the English coast, but they are commonly found in association with large south-west fetches. This site thus provides a substantial contrast with cobble beaches at Westward Ho! and Porth Neigwl, as well as with the cobbled part of Chesil Beach (see GCR site reports in the present volume).

As a site for the investigation of sediment budgets, beach adjustment to wave conditions and the effects of beach permeability on both beach and cliff stability, Budleigh Salterton offers considerable opportunities for field investigation and coastal modelling. Owing to the distinctive clast source, the site provides a rare opportunity to observe the ways in which clasts survive or change in shape following their introduction into the marine environment. The clasts can be readily identified amidst large volumes of flint gravel, confirming their longevity. Furthermore, it is the only site that has large well-rounded clasts dominated by a single rock type other than flint and chert. The unusual quantity, hardness and shape of clasts from the Budleigh Salterton Pebble Beds have given rise to a unique beach.

Conclusions

This pebble and cobble beach is uniquely fed by pebbles and cobbles derived entirely from Triassic sediments. This is the only point where these pebbles enter the coastal system at present, although they are found in beaches along the length of the south coast of England. The lack of anthropogenic influence greatly increases the geomorphological importance of this site as one in which an intact and virtually unmodified natural system can be studied. Owing to its important geology and geomorphology, it is part of the Dorset and East Devon Coast World Heritage site.

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