Hallsands, Devon

[SX 819 382]

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Introduction

Hallsands lies at the south-western end of Start Bay (Figure 6.6); the scientific interest in this site arises from:

1. its location at a point where wave energy is focused at the shoreline by offshore banks,
2. the catastrophic destruction of Hallsands village, and
3. the formerly buried cliff forms that were exhumed by removal of gravel and shingle during storms in January 1917.

The cliffs are cut in mica-schist and quartz-schist, an emerged ('raised') platform of which provided the foundation for part of the former hamlet of Hallsands, other parts having been built on the shingle beach itself. The site is regarded by many coastal scientists as being a classic and vivid exemplar of the dangers of beach sediment extraction, as well as having intrinsic geomorphological interest in its landforms. Work by Hails and Carr (1975) has shown, however, that the concentration of wave energy on this part of the coastline by the offshore Skerries Bank during north-easterly gales was of primary importance in bringing about the rapid localized erosion at Hallsands (as well as at Beesands and Torcross to the north). The destruction of Hallsands village has provided a stimulus for research that has led in turn to a substantially better understanding of both this site and the wider geomorphological history and hydrodynamics of Start Bay and its coastline.

Hallsands is unusual among British coastal erosion sites in being very well documented and internationally renowned (e.g. Komar, 1976; Bird, 1984, 1985; Holmes, 1965). Its renown results from the much-reported destruction of the cliff-foot hamlet of Hallsands in January 1917. Detailed surveys were carried out between 1903 and 1923 by Worth (1904, 1909, 1923), during 1956–1957 by Robinson (1961) and in the 1970s by Hails and Carr (1975). There are few erosional sites in the UK that have been studied and reported in such detail. The wider physical links with Slapton Sands and the question of the anthropogenic origins of the Hallsands disaster have ensured that it has retained its interest as a site of international importance.

Description

The site is about 500 m in length, and is part of a cuffed shoreline between Start Point and Hallsands. Although the cliffs have a slope-over-wall form, the lower wall is distinguished at locations such as Hallsands by a bench about 7 m in height above sea level (Figure 6.9). Photographs in Mottershead (1986) show that the village stood on the rock bench, about 1–2 m above the shingle beach, contrary to the impression given by the beach profiles in Worth (1904), Robinson (1961) and Goudie and Gardiner (1985) that the beach and platform were a continuous unbroken form. Robinson (1961) described the rock bench as a wave-cut bench overlain by a considerable thickness of head. The bench is discontinuous, with promontories separated by deep ravines. At two locations, emerged beach deposits with bands of rounded pebbles occur beneath the head. The steeply sloping cliffs behind the bench have been modified by solifluction since their formation.

Mottershead (1986) described a notch at the top of the lower platform that may be as much as 2 m deep and certainly pre-dates the extraction of shingle, which was removed at the end of the 19th century. The notch is at about Ordnance Datum on the promontories, but rises to +1 m OD within the ravines. These ravines can be traced in places to the base of deep gashes containing rotten rock in the upper high cliffs. Freshly fallen debris, large boulders, small stones and clay often fill the upper end of the ravines. Mottershead suggested that the ravines represent the former location of deeply weathered rock now eroded by wave action.

Worth (1904, 1909, 1923) surveyed the beach at Hallsands immediately after the cessation of commercial gravel extraction and subsequently after the disaster of 1917. In 1897, a local contractor, Sir John Jackson, was licensed by the Board of Trade to remove sand and other materials from the beach of Start Bay at Hallsands and Beesands. Up to 1600 tonnes was removed daily for the extension of the Royal Dockyard at Devonport. Worth estimated that 395 x 10^3 m^3 was removed before the licences were withdrawn in 1902, when the beach level had fallen by at least 3 m. During the winter of 1900–1901 storms undermined sea-walls and removed sand and shingle from the rock ravines behind. Buildings situated at these points collapsed and as a result, dredging was stopped in 1902. By 1904, Worth estimated that the beach had fallen by as much as 6 m, and that 97% of the former beach volume had been removed. Continuing damage occurred with each major storm and a sea-wall was built during 1904. This appears to have been effective until January 1917, when, during a north-easterly gale, waves over 12 m in height destroyed much of the remainder of the village.

Interpretation

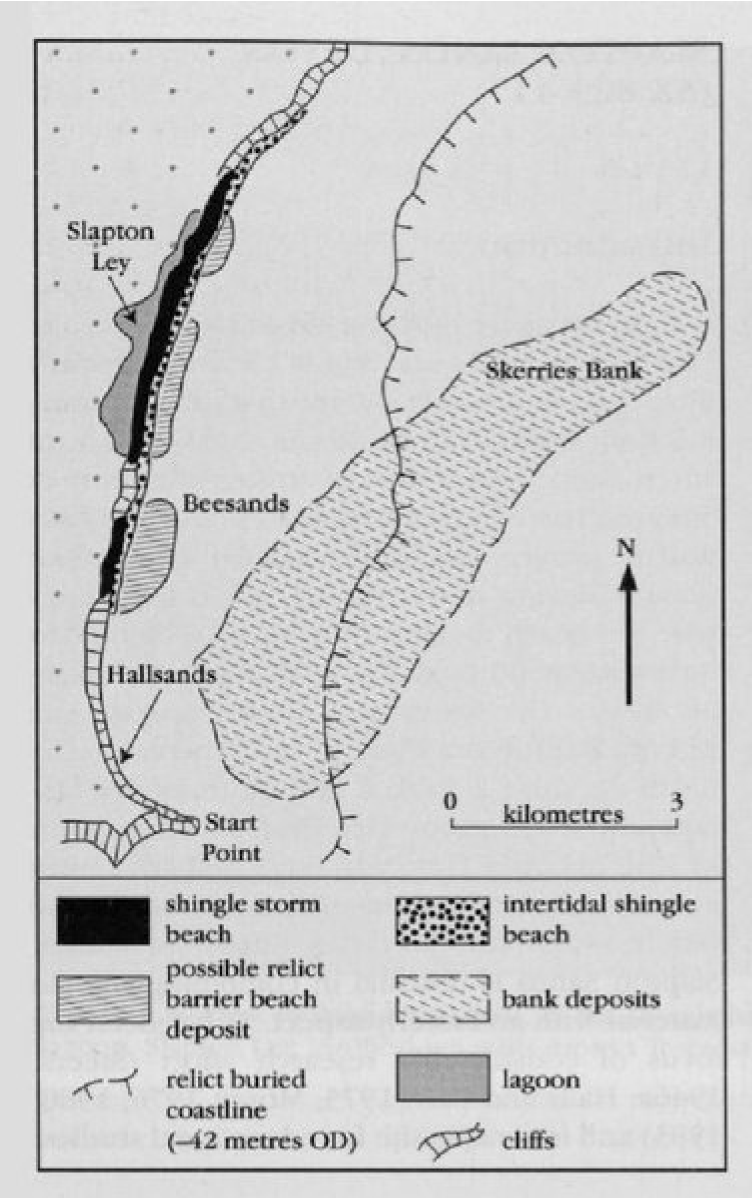
At the time, local opinion attributed the disaster to the effects of gravel extraction. Hails (1975a, p. 3) commented that this 'view of the reckless exploitation of shingle...has never been scientifically substantiated'. Worth (1904, 1909, 1923) had never accepted the official view that the beach would be naturally replenished and so set out to monitor the post-excavation changes. He was able to estimate the former extent of the beach by using photographs taken before and after the dredging occurred. In particular, a small stack or stump known as Wilson's Rock', which was covered by shingle before the start of dredging, stood afterwards over 3.5 m above the lower rock platform. Up to 1907, there was some gradual rebuilding of the shingle barrier beach to the north of the village, but elsewhere there was little change in the beach. The 1917 storm lowered much of the beach by almost 2 m. Robinson (1961) repeated Worth's surveys and found that the beach was lower in parts than it had ever been previously. Today, the beach has become very limited in volume and a rock platform is usually exposed below the bench on which the shells of the houses stand (Figure 6.10). Robinson noted that the most depleted conditions occurred after a period of easterlies, but did not discuss the reasons for the 1917 disaster. The very limited supply of shingle to the beach could not result from longshore transport since there are no sources to the south and any shingle moving southwards was probably retained by Tinsey Head about 800 m to the north.

Hails (1975a) also questioned whether the village had been constructed on bedrock that was sufficiently resistant to withstand storm wave attack. Robinson (1961) reported that at the Coastguard Cottages the cliff top retreated almost 7 m between 1907 and 1961, commenting that there had been a surprising amount of cliff recession. The schists possess many structural features that weaken the cliffs, and the sea has exploited these weaknesses. To the south of Wilson's Rock, however, there has been substantially less general cliff retreat. Mottershead (1986) described the tendency of houses that had been built on the sediment-filled clefts to collapse during storms, and demonstrated the variable strength of different parts of the village site. Nevertheless, the bedrock exhumed from beneath the shingle shows considerable resistance to erosion. The importance of this site is based on the following:

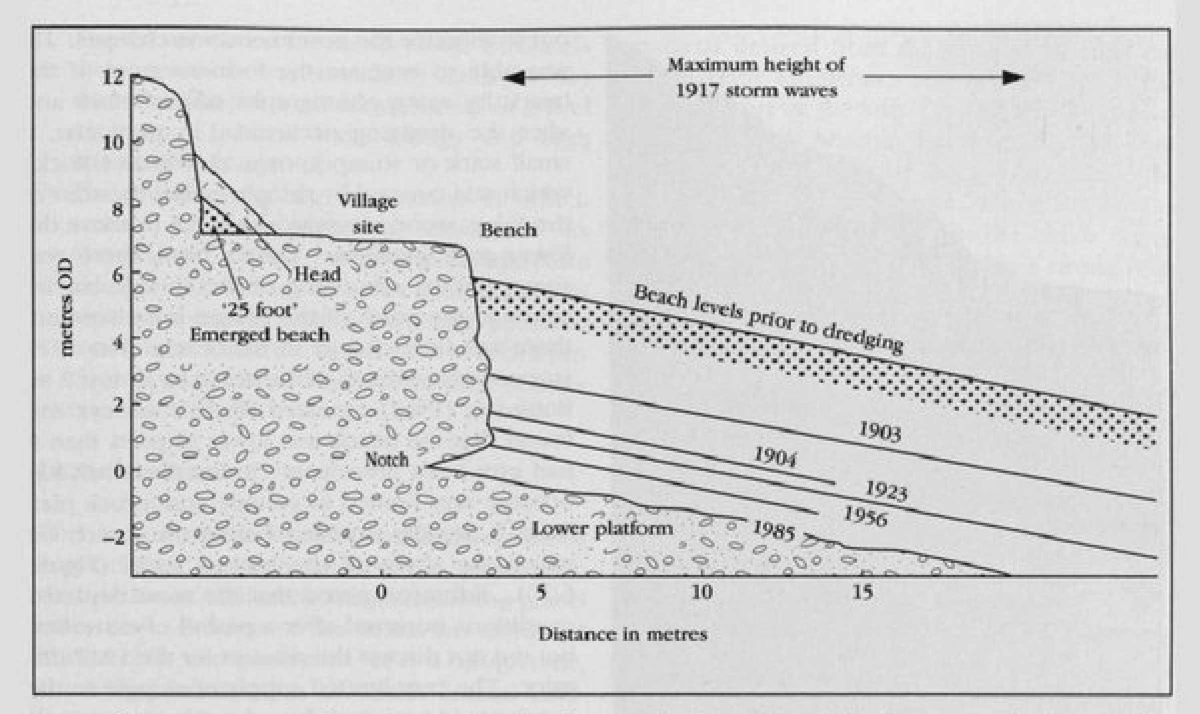
1. The detailed survey record, which is rare among coastal sites. Indeed it appears to be the longest time-series of beach profiles recorded in the British literature. (There are of course much longer series of repeated plan surveys.)
2. The debate about the causes of the Hallsands disaster, and the explanation by Hails (1975b) that it resulted from a combination of gravel extraction, focused wave energy and high wave and tide conditions.
3. The evidence of the timescales at which coastal systems adjust to change. As Mottershead (1986) pointed out, large-scale changes did not occur until a combination of high wave-energy from a particular direction took place. Once the beach was eroded, a further 15 years elapsed before the final disaster occurred.

Conclusions

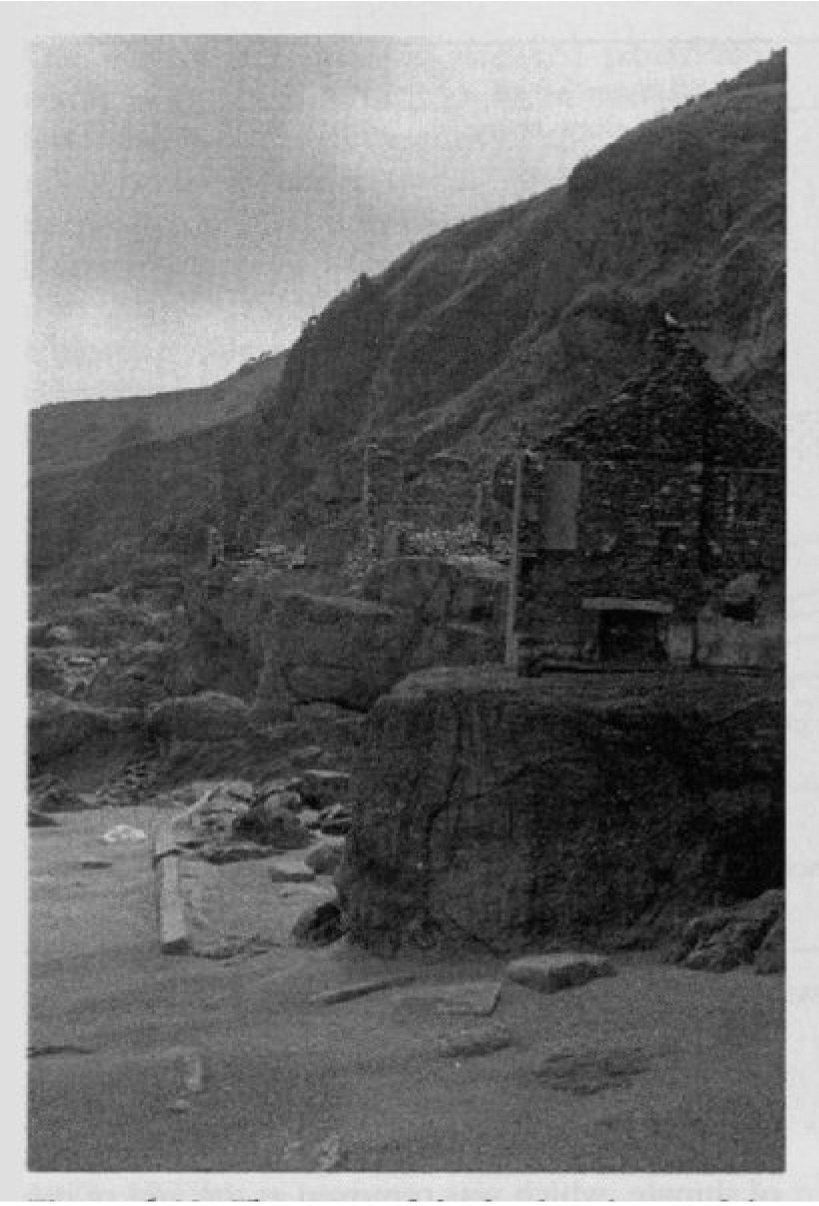
This is one of the world's best-known coastal erosion sites, mainly because of the catastrophic destruction of Hallsands village following gravel extraction. Erosion of the beach has exhumed buried cliffs and platforms. It is a unique site, combining exhumation of earlier coastal land-forms with a long record of surveys that show how this exhumation took place. It is especially important because it is a rare location in which the effects of beach erosion related to both wave conditions and gravel extraction can be demonstrated convincingly. In the context of coastal management worldwide, Hallsands is especially important because it shows the environmental impact of gravel extraction at a site where the coastal processes are not fully understood.



(Figure 6.6) Hallsands and Slapton Sands represent parts of a once-continuous gravel beach. Offshore, there is evidence of buried shorelines and a possible former barrier beach. The present-day shingle beach is separated by rock headlands. (After Hails, 1975a.)



(Figure 6.9) Cross-section of beach at Hallsands, showing the historic beach levels prior to dredging. (After Mottershead, 1986.)



(Figure 6.10) The ruins of the landward row of the houses of the former village of Hallsands. The seaward row of houses has completely disappeared. Compare with Figure 6.9. (Photo: V.J. May.)