
Ladram Bay, Devon

[SY 096 847]–[SY 104 858]

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Introduction

Ladram Bay comprises a series of well-developed stacks, cliffs and platforms cut into the red sandstones of the Triassic succession, one of very few assemblages of such features in southern Britain. To the east, similar forms are well developed in the Chalk at Ballard Down in the Isle of Purbeck, at the Needles at the western tip of the Isle of Wight and near Joss Bay in the Isle of Thanet (see GCR site reports in the present volume). Ladram Bay is unique in Britain in having been cut in the comparatively easily eroded sandstone, but the forms have been preserved largely because this is a relatively low-energy site. On the west coast of Britain, most examples of stacks and associated forms are cut into more resistant sedimentary rocks of the Carboniferous, Devonian and Torridonian successions. In recognition of the importance of the site for geology and coastal geomorphology, it is part of the Dorset and East Devon Coast World Heritage Site.

The cliffs vary in height from about 25 m to over 40 m. The shore platform is rarely wider than 150 m, even where it extends below low tide levels. A beach of large shingle and cobbles masks the cliff-platform junction at some points, there being a tendency for the beaches to be better developed where the platform is absent or narrow. The platforms are structurally controlled to the extent that some surfaces coincide with near-horizontal joint planes. Erosion along near-vertical joints has played a major role in the isolation of the stacks from the mainland.

Description

Ladram Bay is a small site comprising cliffs, stacks and platforms between Smallstones Point [SY 096 847] and High Peak ([SY 104 858]; see (Figure 4.1) for general location). The southern part of the site (just over 1 km in length) has cliffs that are, for the most part, about 25 m in height, whereas they rise to over 120 m at High Peak. The lower cliffs here, as elsewhere in the site, are steep (with angles of inclination generally in excess of 80°). At High Peak, however, the upper part of the cliff is more complex, with multiple mass-movements producing a stepped profile (Figure 4.4)a. Stacks occur at Ladram Bay itself, and off High Peak, where they are known as 'Little and Big Picket Rocks'.

A series of platforms occur at Smallstones Point, at Ladram, and below High Peak in association with more resistant layers of the sandstone. Their slope reflects the dip of the beds forming them (about 4°). Erosion along near-vertical joints appears to have been important for the separation of the stacks from each other. Therefore, this is a coastline that is strongly controlled by structure. Between the headlands, there are small pocket beaches composed mainly of large mostly locally derived shingle and cobbles, but very little flint. Any sand that occurs is derived locally from rock outcrops.

Interpretation

The development of stacks and associated forms in the more easily eroded materials such as chalk and sandstone depends upon the ability of the sea to exploit weakness in the rocks and the

resistance of the rocks to undercutting at the points where the stacks occur. At Ladram Bay, the stacks appear to result from a combination of:

1. local structural weaknesses,
2. wave energy sufficient to exploit rock weaknesses,
3. the occurrence of resistant strata at the base of the stacks. Owing to the dip of the strata, stacks only occur where the harder strata crop out at sea level (Figure 4.4) and (Figure 4.5).

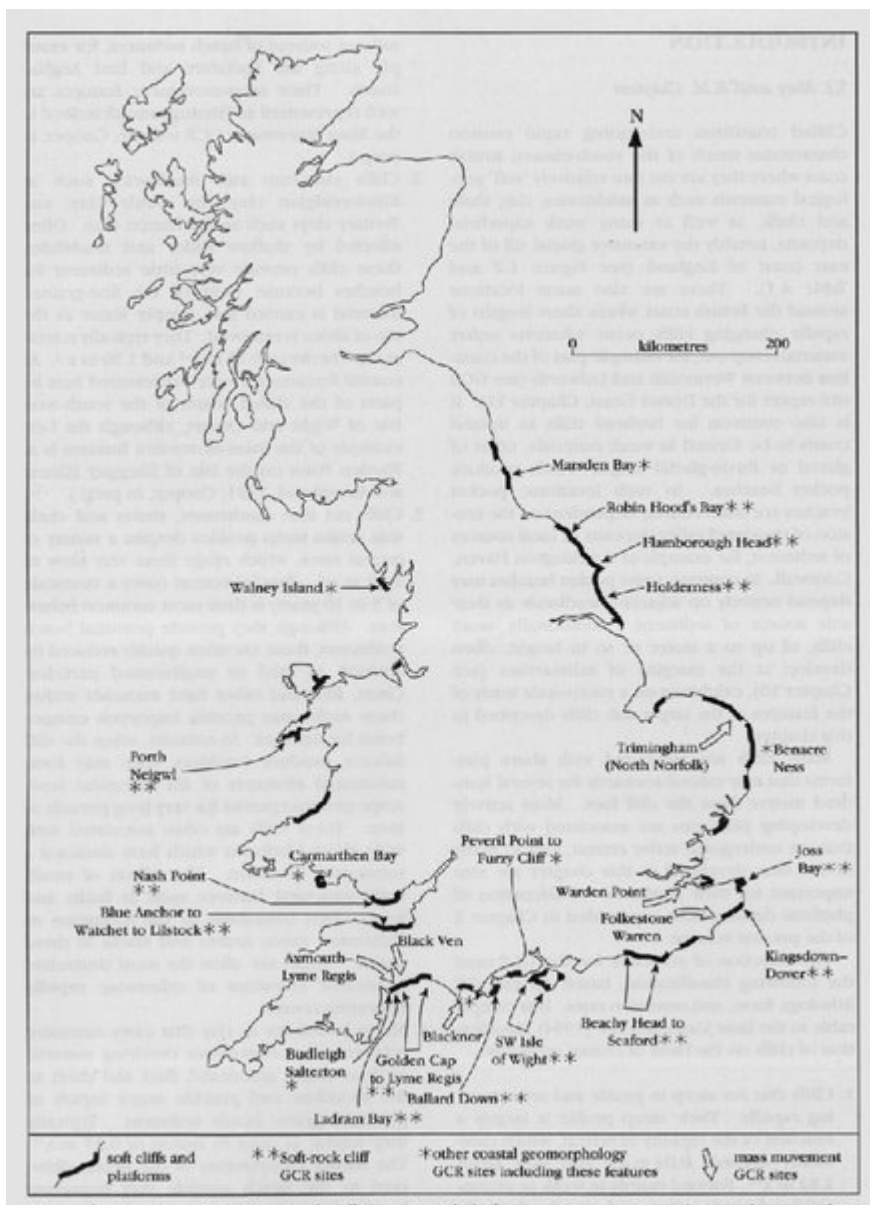
The combination of mass-movements and a platform is unusual, according to Wright (1969), yet at High Peak both occur. It could be argued that the existence of the platforms here owes more to structural effects than to marine processes. This site is scientifically important as:

1. a representative of the coastal landforms in the Triassic and in sandstone, both of which crop out only to limited extent on the coastline of Britain;
2. a good example of stack development in relatively weak material in a sheltered location, the nearest comparable site being in the rather less well-sheltered chalk at Ballard Down;
3. an excellent example of the relationships between structural features and the development of stacks and platforms;
4. part of a suite of erosional landforms in contrasting energy and rock settings, namely the Magnesian limestone at Marsden Bay, the Chalk at Flamborough Head, Joss Bay, the Needles, and Ballard Down and more resistant materials at Gwithian Towans and Tintagel.

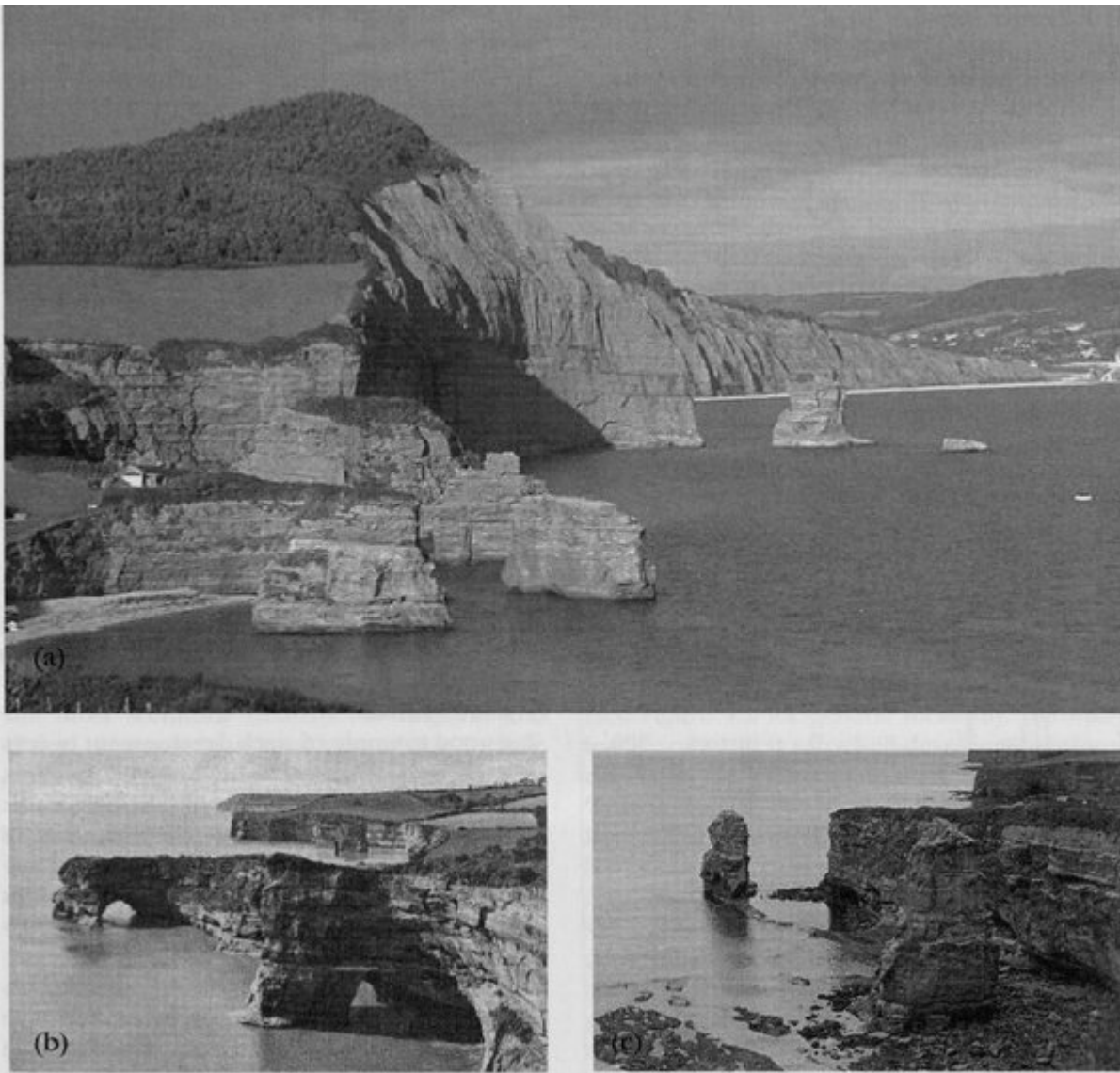
As a result, this is an important site in the national GCR network of coastal landforms which, although not as well documented as coastal sites within the Chalk, demonstrates how erosional features such as stacks and arches may develop in low-energy environments when a resistant gently-dipping basal stratum, with intersecting vertical joints or faults, and less resistant upper strata occur together. The presence of the slightly harder pedestal-forming bed appears to be particularly important to stack formation in relatively weaker strata no matter what the wave climate may be.

Conclusion

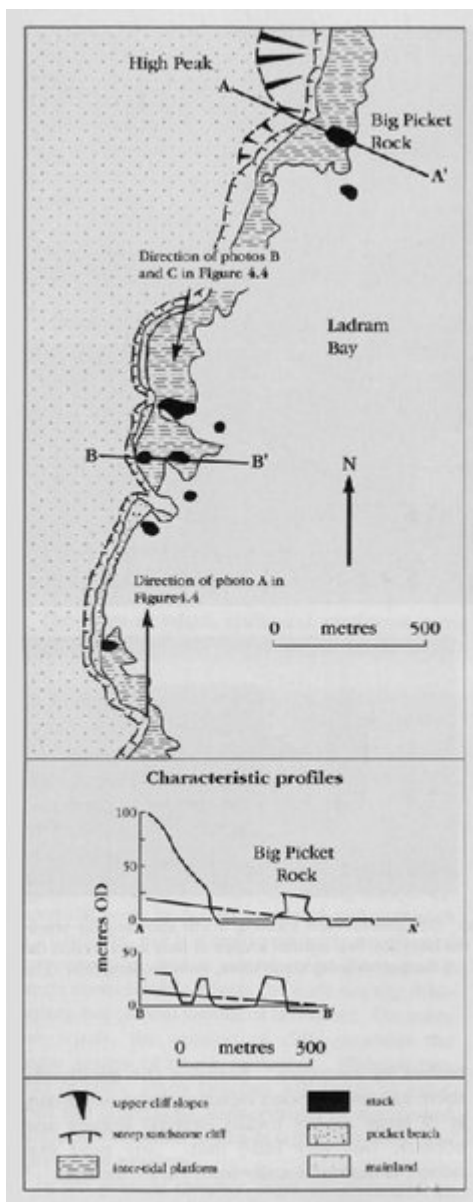
Ladram Bay is a small but important locality for geomorphology, because of the development of stacks and associated features in lithologies different from many better-known examples. The site demonstrates the role of slightly harder pedestal-forming beds in the formation of stacks in generally more easily eroded coastlines such as those comprising sandstone and chalk. The site is unusual in that mass movements and platforms are found together.



(Figure 4.1) Location of significant soft-cliffed coasts and platforms in Great Britain, indicating the sites selected for the GCR specifically for soft-rock cliff geomorphology. Other coastal geomorphology sites that include soft-rock cliffs and sites selected for the Mass Movements GCR 'Block' that occur on the coast are also shown.



(Figure 4.4) (a-c) Undercutting of the cliffs at Ladram Bay. (a) General view looking north showing the stacks associated with headlands; small pocket beaches occupy the bays (b) Two natural arches as they appeared at the beginning of the 20th century in a picture postcard, and (c) the present-day equivalent, view looking SSW. The strata are dipping seawards. (Photos (a,c): V.J. May.)



(Figure 4.5) The cliffline, platforms and stacks at Ladram Bay. Characteristic profiles are shown (A-A' and B-B'). Of particular note are the absence of stacks below the high cliffs, the presence of strata with fewer discontinuities in the lower stacks, and the tendency for stacks to be associated with headlands.