Porth Nanven

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Highlights

Possibly the most spectacular section through raised beach deposits in Britain, the raised 'boulder' bed at Porth Nanven comprises a thick development of granite clasts, some in excess of 0.6 m diameter.

Introduction

Porth Nanven provides one of the finest examples of a raised 'boulder' beach in Britain. This classic raised beach deposit was first noted by Borlase in 1758, and was subsequently included in De la Beche's (1839) treatise on the geology of Cornwall. The site has also featured in studies by Austen (1851), Whitley (1866), Ussher (1879a), Reid and Flett (1907), Robson (1944), Guilcher (1949), Savigear (1960), Everard *et al.* (1964), Stephens (1973), Todd (1987), James (1994) and Scourse (1996c). The most detailed descriptions are provided by Scourse (1985a) and Goode and Taylor (1988).

Description

Particularly fine exposures of raised beach and head deposits occur between [SW 355 310] and [SW 356 308] in the small bay of Porth Nanven, 0.75 km south-east of Cape Cornwall (Figure 6.8). Here, a straightforward sequence occurs on top of a shore platform (Reid and Flett, 1907; Scourse, 1985a):

2. Coarse breccia of angular granite clasts (up to 4 m)

1. Large rounded cobbles and boulders, principally of granite (up to 8 m)

The shore platform, lying at *c.* 8.5 m and developed across the Land's End Granite, terminates inland at a nearby vertical granite cliff. The latter, according to Reid and Flett (1907), shows signs of being 'water-worn' almost up to 12 m above OD. Overlying the platform, and banked up against the fossil cliff, is a deposit comprising mainly large granite cobbles and boulders. This bed (bed 1 raised beach deposit) is clast-supported, and discernibly coarser in the upper 2 m of the bed where boulders in excess of 0.6 m in diameter occur (Scourse, 1985a). The basal 4–6 m of the bed consist of cobble- and gravel-sized clasts. The bed contains much Killas and greenstone gravel near its base (Reid and Flett, 1907).

The overlying breccia or head (bed 2) consists of angular granite fragments which fine-upwards within the bed. The base of the bed consists of coarse angular boulders of granite. The sequence is capped by a thin soil developed directly on the head. The latter can be traced inland via stream sections which have been comprehensively worked for 'stream tin' (Reid and Flett, 1907; Scourse, 1985a).

Interpretation

The remarkable development of the raised beach deposits at Porth Nanven was first noted in Borlase's treatise on the natural history of Cornwall in 1758; he also referred to the overlying head as … a load of rubbish … ' (Borlase, 1758; p. 76). The spectacular development of the bed, and its unusually large cobbles also ensured that it was referred to in De la Beche's (1839) classic work on Cornish geology. The best early description of the Porth Nanven sequence was, however, given by Reid and Flett (1907). They regarded the raised platform as a marine surface of Pleistocene age cut into an older, Pliocene, surface. The water-worn granite face on the landward side of the platform was regarded as an ancient Pleistocene cliffline (Reid and Flea, 1907).

Although regarded as the oldest Pleistocene deposit of the region, the precise age of the raised beach deposit was not discussed. However, on the basis that similar beds elsewhere contained erratics (e.g. a pebble of 'biotite-trachyte' from nearby Priest's Cove), Reid and Flea argued that the raised beach had formed in one of the 'Glacial Stages' of the Pleistocene. Such contemporary thinking was also mirrored in other parts of Cornwall (e.g. Hill and MacAlister, 1906; Reid and Scrivenor, 1906; Reid *et al.,* 1910; Flea and Hill, 1912). The overly ing head (bed 2) was also attributed to cold conditions in the Pleistocene (Reid and Flett, 1907), frost-shattering of the local bedrock having been followed by the redistribution of material along the coastal slopes and local valleys by meltwaters during the 'Glacial epoch'. It was during this latter phase that stream tin was washed from the shattered debris and deposited, selectively, within the gravel and head sequence by virtue of its high specific gravity (Reid and Flett, 1907).

Savigear (1960) briefly referred to Porth Nanven in a study of the morphology of the local coastal slopes and cliffs. He identified four narrow and fragmentary benches below the main granite cliffs at Porth Nanven, the uppermost of which was overlain by the raised storm beach and head sequence. He concluded that the main shore platform, the beach deposits, cliffs, spurs and bevels of the coastal zone all, therefore, antedated the whole, or part of the last glaciation, since they were blanketed by head up to a height of some 30 m OD.

The most recent interpretation of the Pleistocene sequence at Porth Nanven was given by Scourse (1985a, 1996c) and James (1994). Scourse also interpreted the beds as a raised beach deposit (bed 1; Godrevy Formation) overlain by solifluction deposits (bed 2; Penwith Formation). He commented that the raised beach deposit was the thickest and coarsest in Cornwall, its pronounced upward coarsening perhaps showing a regression of the high Pleistocene sea level.

Despite these preliminary lithostratigraphic correlations, the age of the Porth Nanven raised beach deposit is far from certain. Preliminary amino-acid data from fossil shell material in the Godrevy raised beach deposit indicate that it was perhaps not formed in the Ipswichian Stage (Oxygen Isotope Stage 5e) (Bowen *et al.,* 1985). If the present correlation of the Porth Nanven and Godrevy raised beach deposits (Scourse, 1985a, 1996c), based entirely on lithostratigraphy, is correct, then the Porth Nanven example too may date from a pre-Ipswichian (pre-Oxygen Isotope Stage 5e) high sea-level event. Such an ascription, however, is unproven (Pendower; this chapter).

Complementing the stratigraphic importance of the site, the nature of the raised beach deposit itself is of great interest. Its perceived coarsening-upward sequence and upper, substantial, boulder layer is unusual, perhaps reflecting a progressive regression in relative sea level. The coarseness of the bed may reflect both the nature of the sediment source (coarse, widely jointed granite) and the prevailing wave energy; the site faces due west and lies only a few kilometres from Land's End, one of the most exposed coastal locations in southern Britain today. As such, the site provides a fine example of a raised 'boulder' beach, a facies variation rarely recorded elsewhere at other British Pleistocene localities.

On the basis of a radiocarbon date (*c.* 29 ka BP) from organic sediments interbedded in the head sequence at nearby Boscawen, Scourse (1985a) has attributed the bulk of head deposits there, and other examples of the Penwith Formation, to the Late Devensian (see Boscawen). Problems in estimating the age of the underlying raised beach deposit (bed 1), however, make estimates of the age of the overlying head at Porth Nanven tenuous. The possibility clearly remains that if the raised beach deposits accumulated during a pre-Ipswichian (Oxygen Isotope Stage 5e) high sea-level event, then solifluction deposits from sev eral subsequent cold phases of the Pleistocene may be present. It seems likely, however, that a substantial part of the head sequence accumulated in the Late Devensian (Scourse, 1985a). To some extent, the nature of the head deposits at Porth Nanven may throw light on the relative dating of the beds. The well-developed and clear fining-upward head sequence may show that in fact there was only one major phase of periglacial activity, and a single cycle of head formation at the site, the coarsest material representing the products of a previous weathering cycle (interglacial or interstadial?), and the progressive fining of the beds reflecting the diminution in availability of weathered products for solifluction.

Conclusion

Porth Nanven is an important Pleistocene stratigraphic locality providing fine examples of a shore platform, raised beach and head deposits. The raised 'boulder' beach is particularly unusual and was probably formed as a storm beach during

a fall in relative sea level. Its coarseness reflects a high energy wave regime promoted by the particularly exposed westerly location of this part of the Cornish coast. Porth Nanven is also notable as one of the first raised beach localities to have been described in Britain.

References

(Figure 6.8) Porth Nanven, west Cornwall: the spectacular 'raised boulder beach' overlain by solifluction deposits. (Photo: D.H. Keen.)