Roundham Head, Devon

[SX 896 603]–[SX 894 598]

Introduction

The sea cliffs and foreshore exposures at Roundham Head are the type locality for the Tor Bay Breccia; this unit includes fluvial breccias, most of which were deposited by formed during ephemeral sheet floods. On the south side of the headland are interbedded aeolian sands, with cross-bedding indicating a palaeowind direction towards the north-west, contrary to the prevailing direction to the south-west (cf. (Figure 2.31)). This contrasts with the direction of fluvial transport, deduced from sedimentary structures such as imbrication and cross-bedding in the breccias, which was towards the south-east (cf. (Figure 2.31) where the prevailing direction is o the north-east).

The red-bed succession at Roundham Head has been described by Ussher and Lloyd (1933), Laming (1966, 1969, 1982) and Perkins (1971).

Description

The Tor Bay Breccia at Roundham Head (Figure 2.35)a, and on the adjacent wave-cut platform, comprises some 80 m of interbedded sandstones, sandy breccias, and breccias, which are poorly sorted and contain clasts, up to 0.2 m in diameter, of porphyry, quartzite, and Devonian limestones and sandstones. Smaller clasts consist largely of shale and slate. The matrix is a medium-grained sandstone, and is well-cement ed by calcite (Laming, 1969).

Sedimentary structures in the Tor Bay Breccia include planar bedding and trough cross-bedding, both highlighted by clast orientations and by grading of clast sizes. The smaller plate-like fragments of slate and shale are frequently orientated parallel to the bedding planes (Figure 2.35)b,c and the larger limestone and sandstone clasts may display coarse imbrication, although they are frequently randomly oriented. The imbrication indicates fluvial transport to the south-east.

The Tor Bay Breccia at Roundham Head includes a 6-m-thick lens of sandstone, composed primarily of well-rounded, polished lithic clasts (mostly slate), all with a thin haematite coating, indicative of aeolian processes. Cross-bedding preserved in the lens indicates a predominantly south-westwards palaeowind direction (Figure 2.36).

The Tor Bay Breccia grades up into the Livermead Beds, which comprise soft cross-bedded sandstones, mudstones, and sparse units of breccia containing fragments of igneous material. Higher up the cliff, these sediments are succeeded by planar-bedded mudstones, whose exposed surface is cut by many sub-vertically orientated sandstone ribs, which are the vertical expression of desiccation cracks (Laming, 1966, 1969; Perkins, 1971).

Interpretation

The sediments at Roundham Head were deposited under terrestrial conditions in an area that was experiencing a semi-arid climatic regime (Laming, 1966, 1968, 1982). The Tor Bay Breccia was deposited on a large-scale alluvial fan complex, initiated during periodic floods. Initial transport was through canyons and channels cut into the margins of the surrounding highland areas and the top of the alluvial fans. On reaching the more open areas of the fans, the waters dispersed over a wider area, causing the velocity to decrease and sediment to be deposited. The coarser-grained breccias and sandy breccias were deposited on the proximal areas of the fan, the sandstones in more distal parts.

The well-rounded polished grains and cross-bedding in the large sandstone lens are characteristic of aeolian deposits, and of crescentic barchan dunes in particular. The presence of this facies suggests that there was a period when flooding declined significantly, allowing purely aeolian processes to predominate, and fluvial sands to be reworked by wind action. Analysis of the dominant orientations of the dune fore-sets indicates that the prevailing winds blew to the south-west.

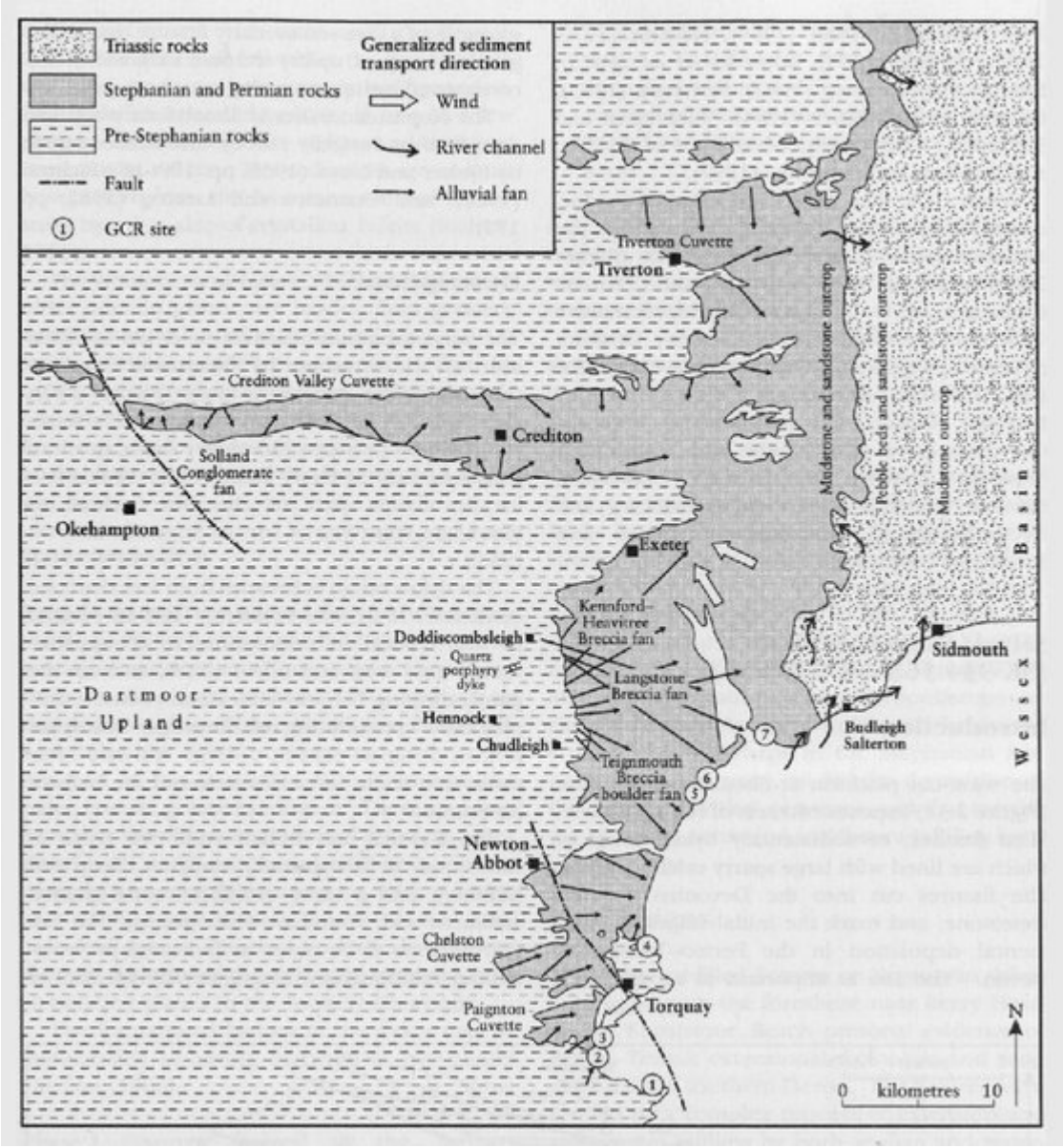
The Livermead Beds comprise interbedded sandstones and mudstones that were deposited on the extreme distal portions of the alluvial fan complex. After a flood, water that had soaked into the more permeable gravels of the proximal zone of the fans formed small resurgent streams at the fan margins and fine-grained sediment carried by these streams was deposited in a series of small-scale fans at those margins. Desiccation of the argillaceous layers produced mud flakes and polygons.

The Tor Bay Breccia and Livermead Beds form the base of the red-bed succession in the Paignton Cuvette. There is no direct evidence of dating, other than that they are clearly post-Devonian and pre Triassic in age. Laming (1965, 1968, 1982) and Perkins (1971) suggested a latest Carboniferous (Stephanian) age, while comparison with the Exeter Group farther north (Edwards *et al.,* 1997), suggests an age tentatively spanning the Carboniferous–Permian boundary.

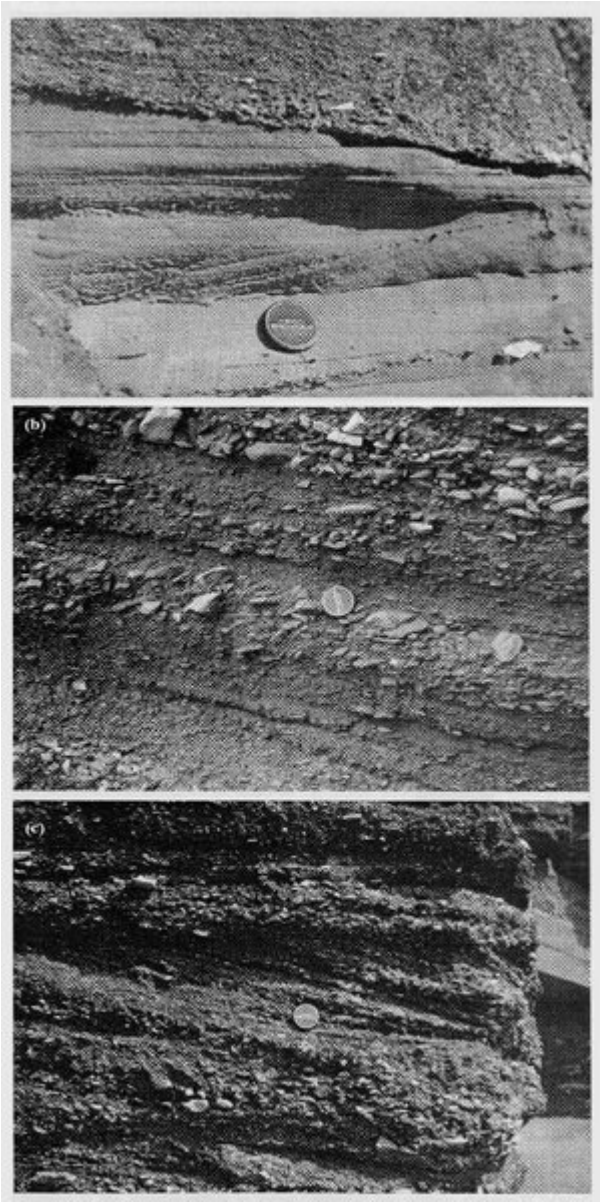
Conclusions

Roundham Head provides the best section through the Tor Bay Breccia on the Devon coast. These sediments consist of interbedded sandstones and breccias and represent deposition on a large alluvial fan complex. The overlying Livermead Beds are finer-grained sandstones and mudstones, and were deposited on the downstream margins of the alluvial fans. This site is important for understanding the geological history and palaeogeography of Devon around the beginning of the Permian Period.

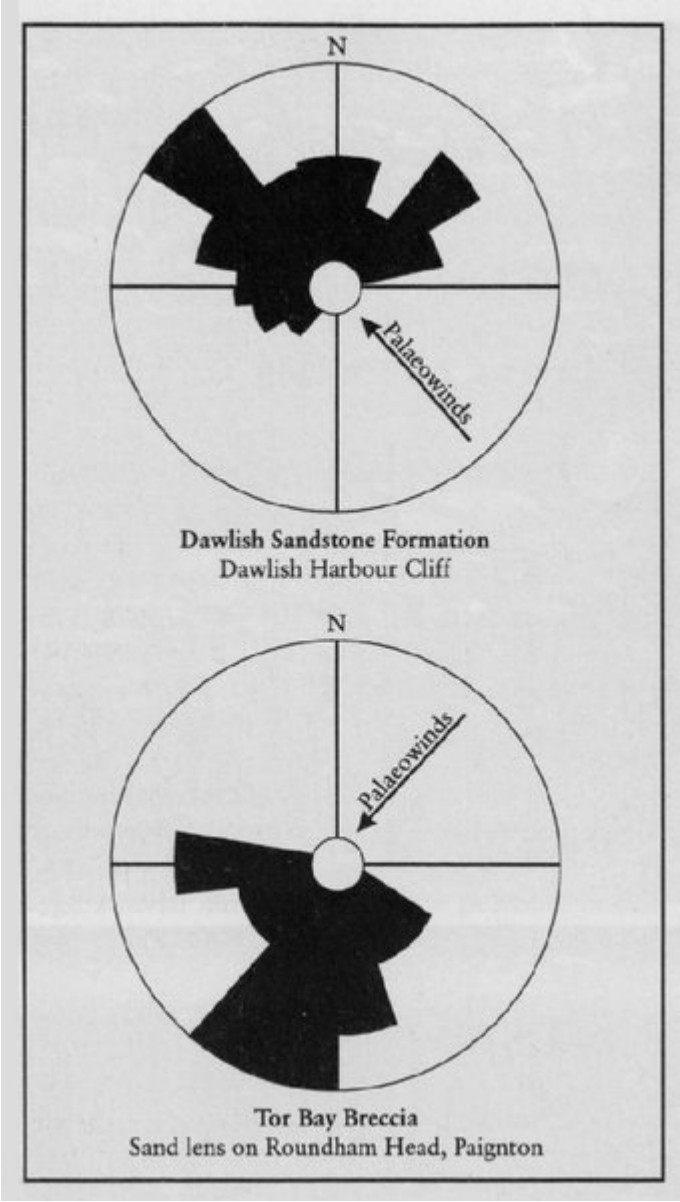
References



(Figure 2.31) Depositional basins and sediment transport trends in the Permian of Devon. GCR sites are: (1) Shoalstone; (2) Saltern Cove; (3) Roundham Head; (4) Oddicombe Beach; (5) Coryton's Cove; (6) Dawlish; (7) Orcombe Rocks. (After Laming, 1982.)



(Figure 2.35) The Tor Bay Breccia at Roundham Head. (a) Contact between sandstone and breccia. (Photo: P Turner.) Figure 2.35 — contd. The Tor Bay Breccia at Roundham Head. (b) Coarse, imbricated, red, sandy fan breccia composed of locally derived angular clasts of Devonian rocks, mainly limestone. (c) Crudely stratified gravels interbedded with finer-grained cross-stratified gravel. In both (b) and (c) the palaeoflow direction is to the right (west). (Photos: P Turner.)



(Figure 2.36) Rose diagrams of palaeowind directions from aeolian foreset orientations for the Tor Bay Breccia and the Dawlish Sandstone Formation. (From Laming, 1982.)