Little Castle Head

[SM 855 065]

Introduction

The Little Castle Head section lies on the north shore of Milford Haven, south-west Wales, about 4.5 km west of Milford itself (Figure 6.16). Most exposure is to be seen on the foreshore from the south side of Little Castle Head to Sleeping Bay, 250 m to the north (Figure 6.17). The first general description of note of the general geology of the area, was made by the Geological Survey of England and Wales (Strahan *et al.,* 1914; Cantrill *et al,* 1916). P■ídolí rocks here form the base of a thick Old Red Sandstone sequence, the Milford Haven Group, which cumulatively totals a maximum of 4500 m. The main P■ídolí sequence exposed is the lower to middle part of the Sandy Haven Formation (Allen and Williams, 1978; Allen *et al.,* 1982; Williams, 1971; Williams *et al., 1982*); it includes tuffs, the thickest and most widespread of which is the Townsend Tuff Bed (Allen and Williams, 1981; (Figure 6.18), (Figure 6.19)). These authors suggested that, until the faunas or floras in the Sandy Haven Formation become better known, the latter tuff might be regarded as the local reference level for the base of the Devonian System in southern Wales and the Welsh Borderland.

Structurally, the sequence lies in a fault-bounded slice — the Winsle block of Sanzen-Baker (1972), that is, to the north of the Ritec Fault and to the south of the Benton Fault (Figure 6.16). This block is one of five in the region that have been brought together by north verging thrusting in the Variscan Orogeny. Locally, the tectonics have produced tight folds on the 100 m scale, the axes of which trend a little south of east ((Figure 6.17); Hancock *et al.,* 1982).

Description

The Sandy Haven Formation comprises about 850–900 m of elastic sediments, with interbedded tuff horizons; a representative log, which includes the tuff beds, from the Little Castle Head–Sandyhaven Pill area is shown in (Figure 6.18).

A wide variety of sediments is seen. There are intraformational and extraformational quartz conglomerates, sandstones, and red mudstones. The latter predominate, especially in the lower part of the sequence where they are interbedded with relatively coarse purple and grey-green lithic sandstones. Calcrete horizons are common in the finer-grained sediments, and horizons showing synaeresis structures occur. Many primary sedimentary structures can also be seen in these sediments, including cross-bedding and cross- lamination. In the higher parts of the formation, sandstones become commoner, although of finer grain size than the rarer sandstones lower in the sequence. The sediments are predominantly purple, red or bright red, although green colouration is also seen. These different lithologies and structures occur in a complex relationship to one another.

Yellow, red, blue, magenta, and purple coloured air-fall tuffs occur in the middle to upper part of the formation; the Townsend Tuff Bed as recorded by Allen and Williams (1981, p. 17; (Figure 6.18), (Figure 6.19) is 4.95 m thick and the Pickard Bay Tuff Bed, which occurs some 15 m higher in the sequence, has a thickness of about 3 m. The Townsend Tuff Bed is widespread, occurring over an area from south-west and central South Wales, to the Forest of Dean and Clee Hill areas; it has its thickest development in the Little Castle Head section. It always comprises three distinct normally graded air-fall elements each of which has a crystal tuff at its base that grades up to a green siliceous muddy tuff ('por-cellanite' of Allen and Williams, 1981; (Figure 6.19)).

No fossils have been recorded in the Sandy Haven Formation at Little Castle Head; age determination and correlation are therefore imprecise.

Interpretation

The wide variety and variable relationships of the recorded lithologies indicate a complex of local facies variations. There are no features in the sequence that indicate that any of the rocks were deposited in marine conditions, or that there was any degree of marine influence, an opinion reinforced by the lack of fossils of any kind. In general a tidal mud flat environment is indicated, one that was subject to periodic sub-aerial exposure, as is shown by the synaeresis structures and the abundant calcrete horizons (Allen and Williams, 1978, 1982). This mudflat lay on the very southern margin of the developing Old Red Sandstone continent from which some of the sediments are derived. The land area of Pretannia (Cope and Bassett, 1987) was some unknown distance to the south, from which other sediment was derived and transported to the north and north-east, especially in the upper part of the formation, by rivers of modest size. Thus as is usual in the P■ídolí of the UK, stratigraphical, environmental and geo■graphical conditions between possibly brackish and continental, but certainly not fully marine are represented.

No volcanic source is known for the widespread Townsend Tuff Bed, which in this section has its thickest development, although it is represented throughout south central Wales and as far north as the Clee Hills in Shropshire. It is known that volcanic activity was occurring even farther to the north than Shropshire at about the same time, in what are now the Southern Uplands and Girvan, and to the north of the (presumably closed) Iapetus Suture. As this southern Wales occurrence of the Townsend Tuff Bed is relatively far to the south of Scotland, Allen and Williams (1981) suggested that the source instead might be either to the west or east, directions related to the west to east strike line of the developing Rheic Ocean. From the field evidence, these authors imagined that powerful Plinian-type eruptions of ash were dispersed by strong winds from one of these directions. South Wales, and the areas to the south were under active extension at the time (Powell, 1989), so that the source of the volcanic material might have been to the south, bordering the Cornwall–Rhenish Basin.

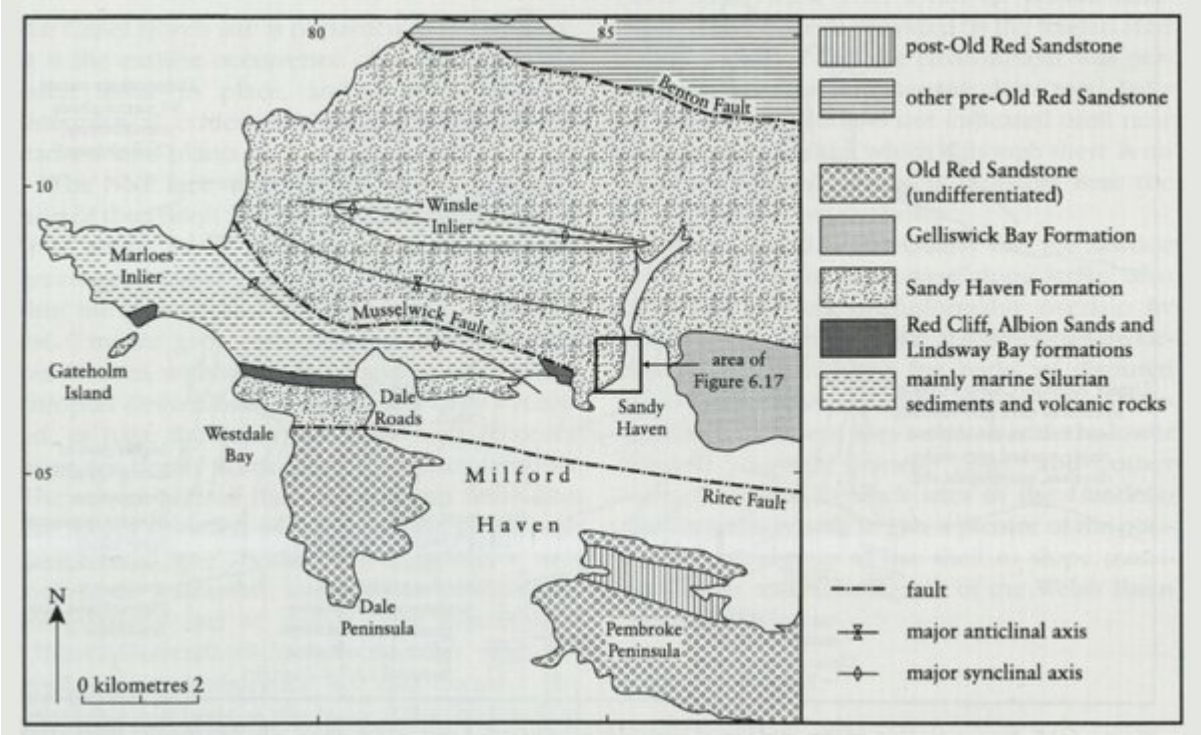
This site like that at Albion Sands and Gateholm Island lacks any evidence of fully marine influence in P■ídolí times. Also like the Albion Sands site and the nearby Marloes (which is described in the Llandovery and Wenlock chapters) there are volcanic rocks. Also of note is the early onset of terrestrial red bed sedimentation in the Ludlow — or possibly even Wenlock times. These three Pembrokeshire sites are situated in fault-bounded blocks that, in the Variscan Orogeny, were transported an unknown, but probably not inconsiderable distance from the south.

Conclusions

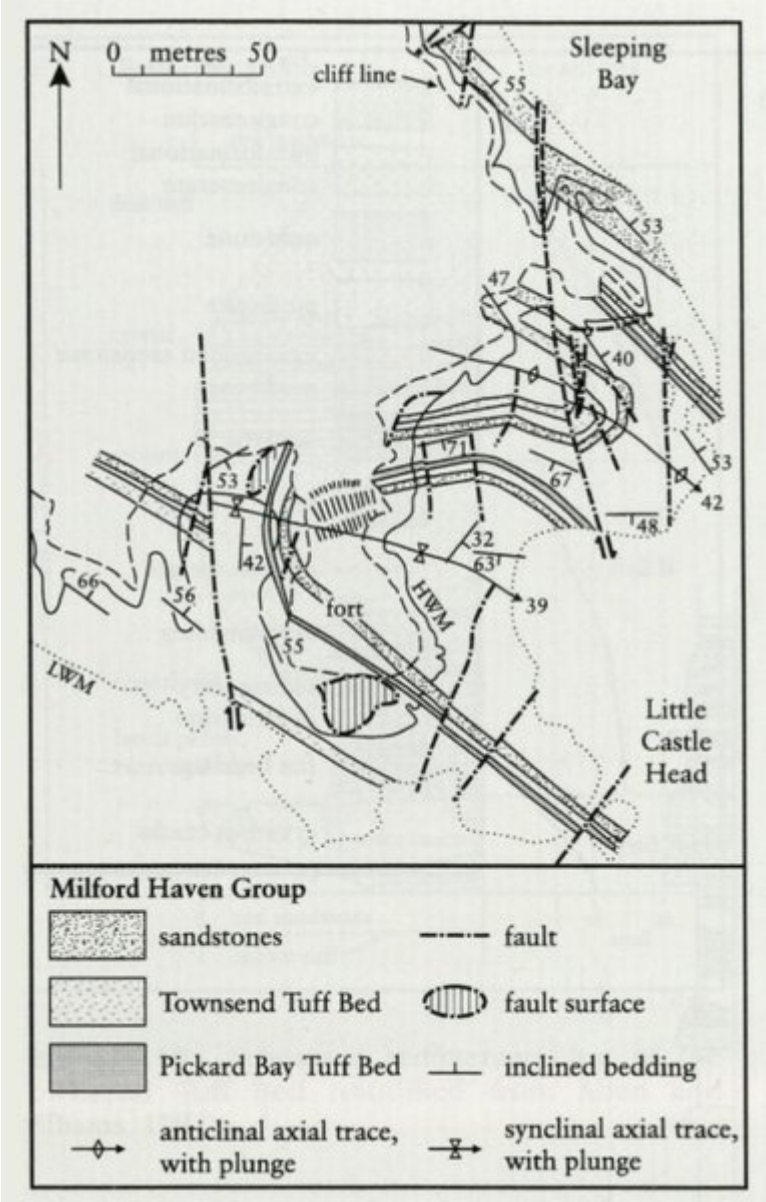
The Little Castle Head section illustrates the conditions of deposition in a totally non-marine environment towards the southern margin of the Old Red Sandstone continent. Although of all P■ídolí sites, Little Castle Head and Albion Sands and Gateholm Island sites are nearest to the presumed position of the Rheic Ocean here in the Winsle Block, there is no evidence of a direct link to this ocean.

The original spatial relationships of the five fault blocks that can be traced in the Palaeozoic geology of Pembrokeshire is not known (Sanzen-Baker, 1972; Powell, 1989). However, tracing them from south to north, the sedimentological features indicate a marine to increasingly terrestrial environment of deposition. The local effects of the Variscan orogeny on these Lower Palaeozoic sediments are well displayed in the folds seen at this site.

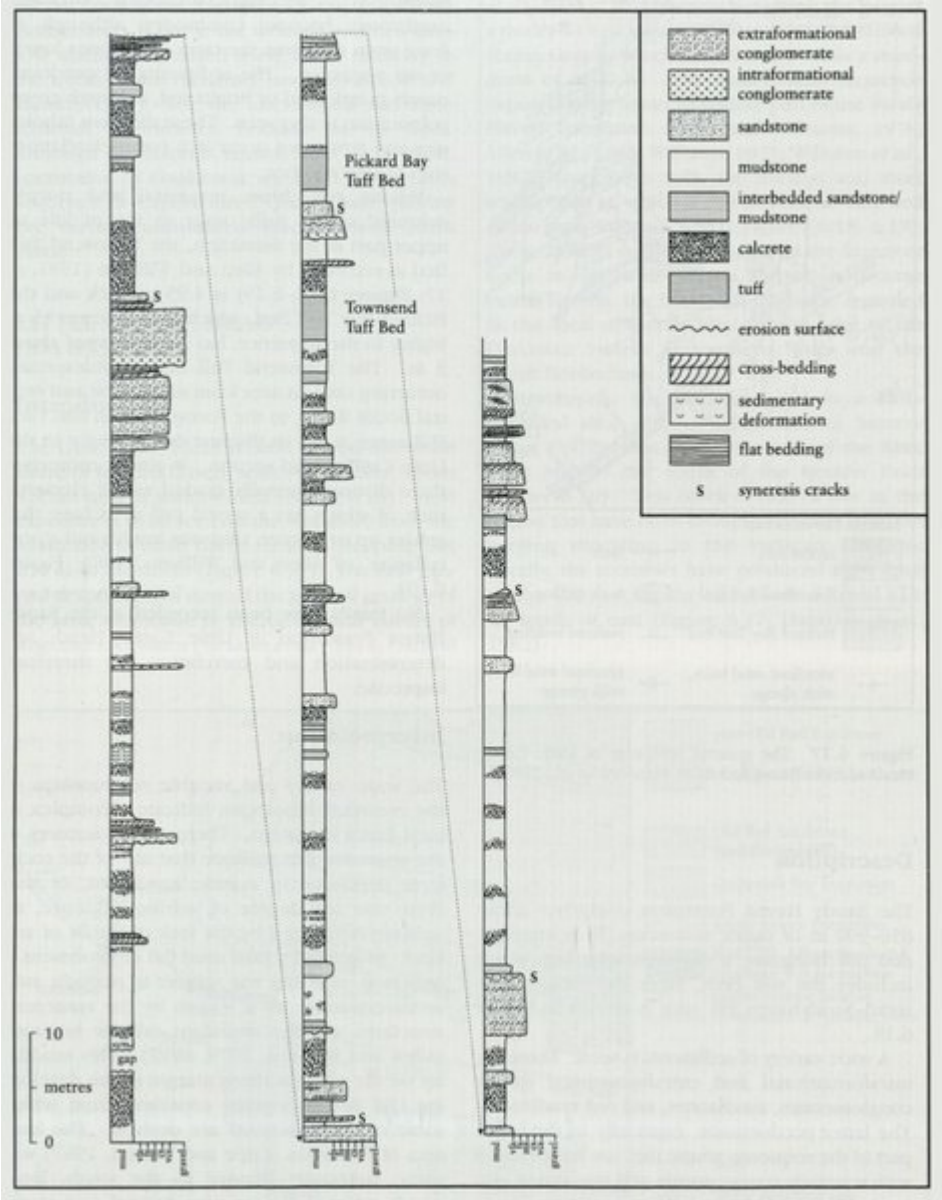
References



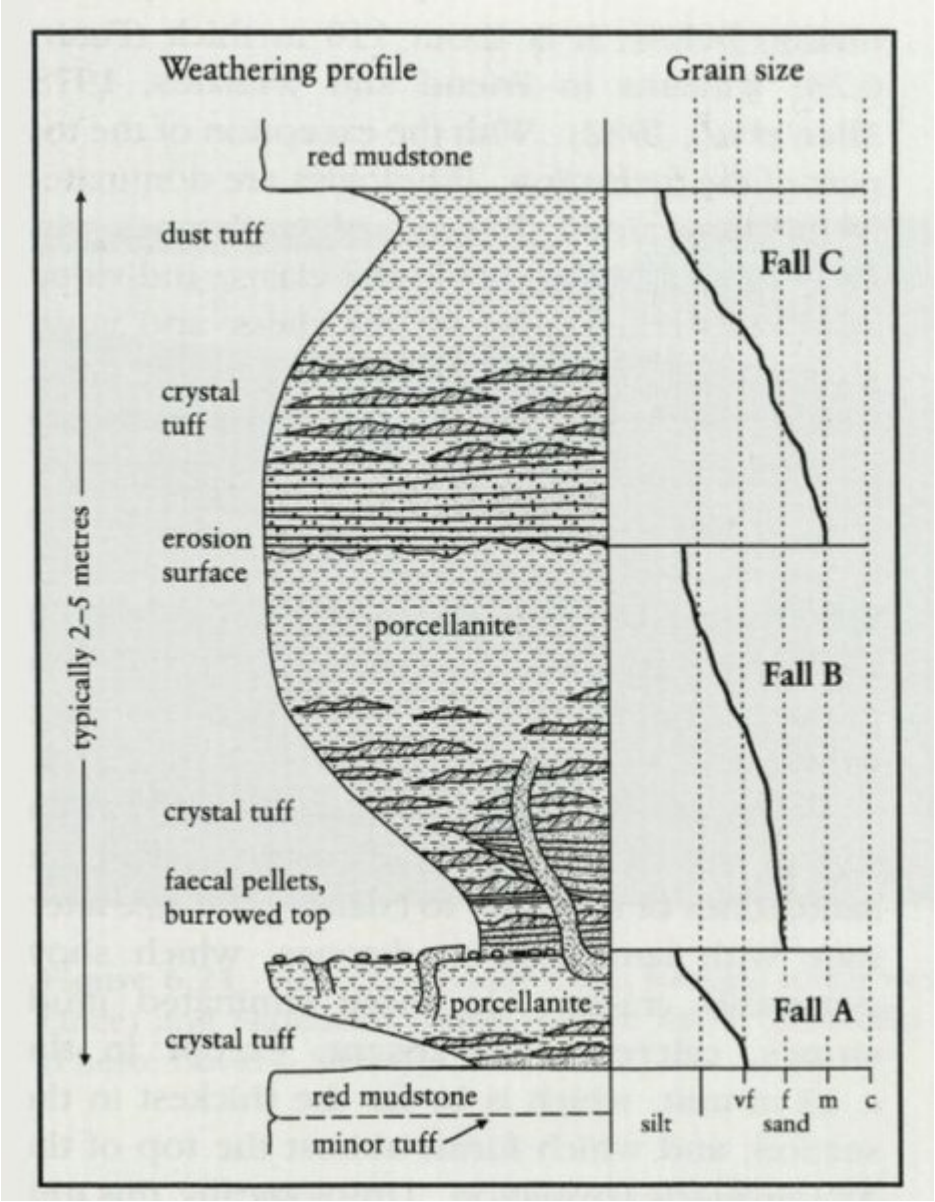
(Figure 6.16) The geology of the Milford Haven area (modified from Allen and Williams, 1978).



(Figure 6.17) The general structure of Little Castle Head section (modified from Hancock et al., 1982).



(Figure 6.18) A measured representative sedimentary log of part of the P■ídolí Sandy Haven Formation in the Little Castle Head–Sandyhaven Pill area, Pembrokeshire (modified from Allen and Williams, 1978).



(Figure 6.19) Schematic sedimentary log of the Townsend Tuff Bed (modified from Allen and Williams, 1981).