Sutton Flats, Mid Glamorgan

[SS 861 757]–[SS 864 745]

Introduction

This locality provides excellent three-dimensional sections through Triassic alluvial fan deposits, that formed by both stream and mudflow processes on the palaeoslope of a Carboniferous Limestone landmass. Particle size in the deposits varies markedly between clay grade and boulders approaching three metres in diameter. The fan deposits occupy channels in the surface of the underlying Carboniferous Limestone. This is an important locality for the study of Triassic sediments, palaeoenvironments, and palaeogeography.

Detailed descriptions of the sedimentology of the Sutton Flats Triassic have been published by Bluck (1965) and Thomas (1968), and short notes are included in Ivimey-Cook (1974), Waters and Lawrence (1987), and Wilson *et al.* (1990).

Description

Sutton Flats is generally referred to as 'Ogmore' or 'Ogmore-by-Sea' (Bluck, 1965; Thomas, 1968; Wilson *et al.,* 1990). The coastal exposures of the unconformity between the Carboniferous and the overlying Triassic alluvial fan sediments form part of the Sutton Flats Site of Special Scientific Interest (SSSI).

At Ogmore-by-Sea, marginal Triassic sediments rest unconformably upon the Carboniferous (Dinantian) Gully Oolite and High Tor Limestone (Figure 3.60), the surface of which has been eroded into a series of flat steps (Figure 3.61)a. The marginal Triassic facies consists of a mass of sediments with a wide range of grain sizes. The dominant lithology is a breccio-conglomerate, which is interbedded with red arenaceous and argillaceous sediments (Bluck, 1965). The basal bed is a poorly sorted conglomerate, overlain by a series of well-sorted conglomerates (Figure 3.61)b. The conglomeratic facies contains clasts of Carboniferous Limestone up to 3 m in diameter, although most have a diameter of only a few centimetres, in a reddish-brown sandy matrix with local patches of pale buff marl. The fabric of the conglomerate varies from poorly sorted to well-sorted, and in places contains irregular, often erosional, bedding planes. Trough cross-bedding and imbrication of some of the smaller, flatter pebbles have been recorded. The sediments are cemented by calcium carbonate (Bluck, 1965). Within the breccio-conglomerates, thin beds of reddish calcarenite, sandstone, siltstone, and reddish mudstone occur, often containing angular pieces of limestone and chert (Ivimey-Cook, 1974).

There is some lateral variation in the sediments. Towards the northern end of the low-lying sea cliffs, in the vicinity of Bwlch Cae Halen (Figure 3.60), the base of the Triassic section is marked by an extremely coarse-grained, poorly sorted conglomerate. This is overlain by a fining-upwards sequence of coarse- and finer-grained conglomerates, which are also poorly sorted. Approximately 1 m from the top of the conglomerates is a thin (approximately 0.25 m thick) bed of breccia. This is in turn succeeded by two beds of poorly sorted, finer-grained conglomerate. The top of the sequence at Bwlch Cae Halen consists of some 1.5 m of well-sorted, coarse-grained conglomerate (Bluck, 1965). Thin sedimentary dykes and calcite veins cut through the sediments in this area. The dykes consist of red calcarenite and reddish breccia composed of very angular fragments of limestone (Thomas, 1968).

Approximately 50 m farther south, the relative proportions of the rudaceous lithologies change. Here, the poorly sorted coarse conglomerates comprise less than half of the sedimentary section. As at Bwlch Cae Halen, they are overlain by well-sorted conglomerates. The southernmost part of the sea cliffs, near Bwlch Gwyn (Figure 3.60), exposes a more complex sequence of rudaceous rocks. The stratigraphic-ally lower unit consists of poorly sorted, coarse-grained conglomerate, succeeded by a thick (approximately 7 m) sequence of poorly sorted, often extremely coarse-grained conglomerate. This bed contains large fragments (rip-up clasts) of the well-sorted conglomeratic sediment (Bluck, 1965).

Interpretation

The poorly sorted breccio-conglomeratic sediments have been interpreted as a chaotic mud-flow (Ivimey-Cook, 1974) or a preserved scree deposit (Wilson *et al.,* 1990). These are overlain by conglomerates characterized by a high degree of sorting and cross-bedding, thought to have been deposited by ephemeral rivers on an alluvial fan, probably during flash floods caused by heavy storms in an otherwise arid climatic regime. The well-sorted conglomerates generally overlie erosion surfaces and occupy channels, often directly on the Carboniferous Limestones. The fan sediments were deposited initially as screes in the steep-sided canyons cut into the Carboniferous Limestone. Reworking of the screes during torrential rainstorms produced the alluvial fan sediments (Ivimey-Cook, 1974). The positioning and orientation of the fans suggest that during the Late Triassic the land surface sloped towards the south-east (Bluck, 1965).

Analysis of the grain sizes of the clasts contained in the conglomerates has helped to identify several generations of sedimentary fans at the site (Bluck, 1965), based on the maximum size of the clasts. The fans range in size from 150 to 300 m long, and have a maximum thickness of 12 m, although they tend to thin distally. Bluck (1965) defined two categories of fan based on the data collected from Ogmore and other nearby localities, for example Sker Point and Newton. Type-A fans are characterized by a triangular plan, poor sorting of the sediments, channelled bases, cross-bedding (trough and planar), imbricated pebbles, and a low proportion of argillaceous and arenaceous grains. An example is seen in the northern part of the Ogmore coastal section. It is thought that type-A fans were deposited by streams occupying an alluvial fan.

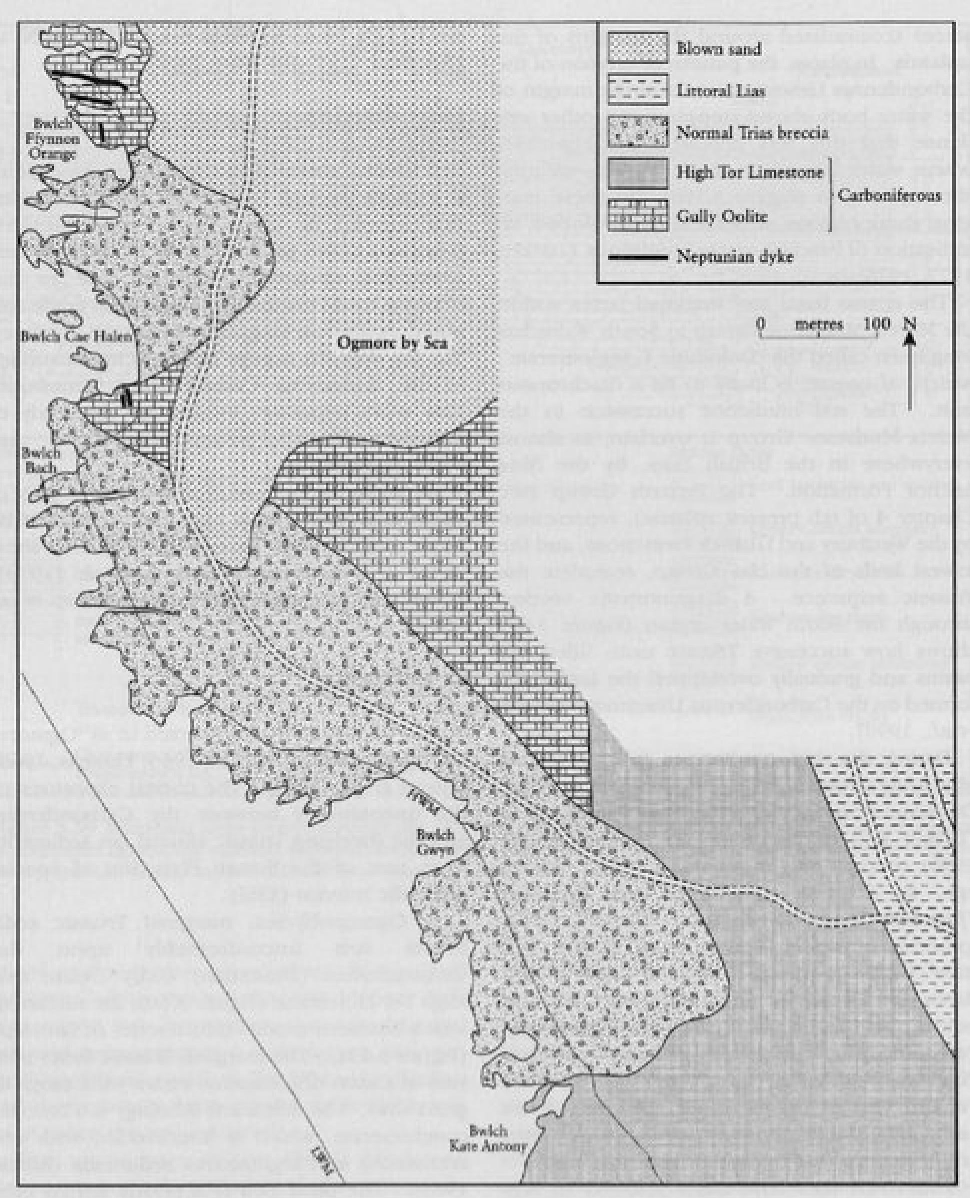
Type-B fans have a lobate outline, are poorly sorted, and generally contain a higher proportion of argillaceous sediments than type A. The bases of these fans are erosive and display channels; at Ogmore a channel in excess of 9 m deep is recorded in the cliffs to the south of Bwlch y Ballring. Sedimentary bedding is generally poorly defined. Soft-sediment deformation structures that incorporate fragments of preexisting sediment are common towards the bases of the beds. These characteristics are in keeping with deposition by mudflows or stream floods (Bluck, 1965).

The associated finer-grained sandstones and calcarenites are typical of sediments deposited by sheet floods and probably accumulated on the more distal parts of the alluvial fans. These sediments often separate phases of conglomerate deposition (Bluck, 1965).

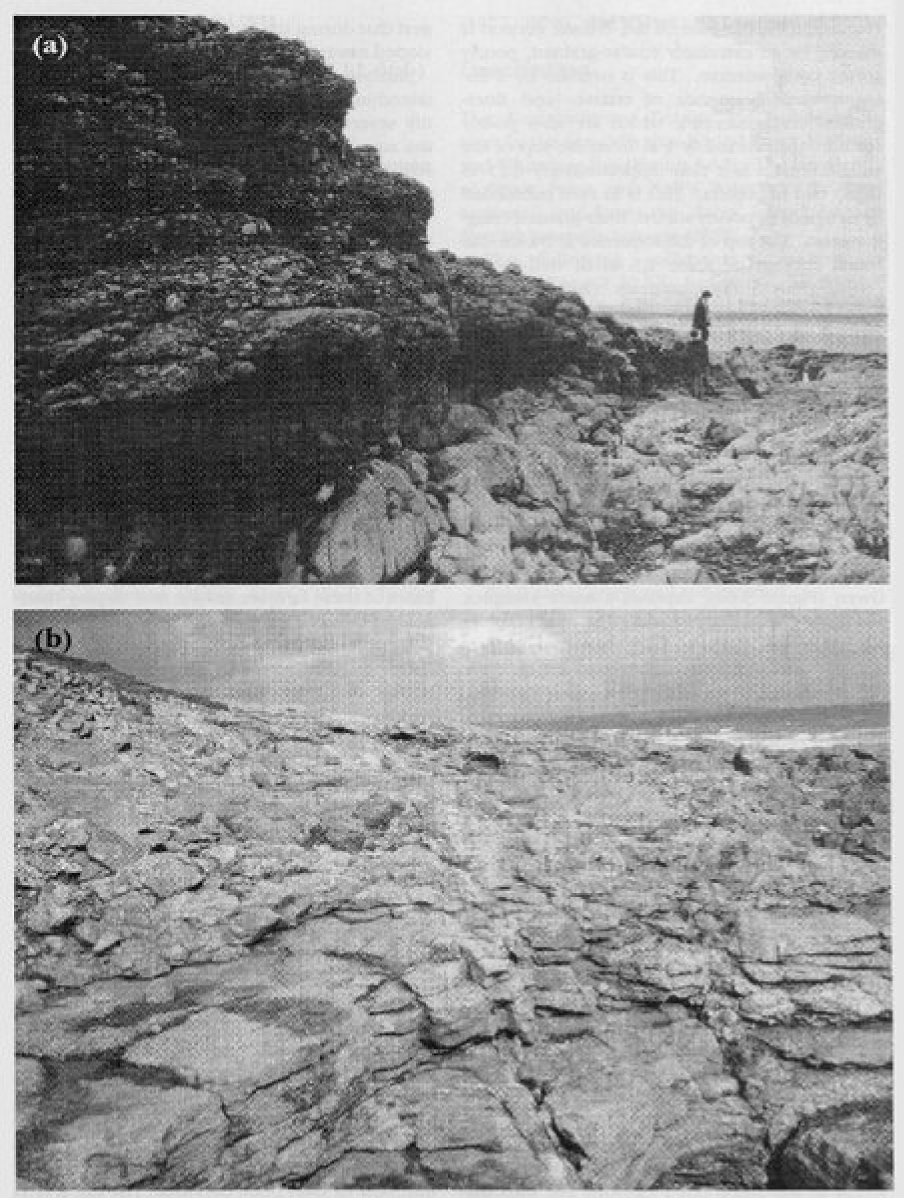
Conclusions

The Upper Triassic sediments at Ogmore-by-Sea preserve an excellent example of the facies changes within an alluvial fan complex. The lithologies and sedimentary structures have been interpreted as a complex of stream sediments, probably reworked screes, which overlie mudflow or river flood deposits. The site is critical for the understanding of the marginal palaeoenvironments of the upper Mercia Mudstone Group and for the Late Triassic palaeogeography of this area.

References



(Figure 3.60) Map of the coastal exposure of the Carboniferous and Triassic deposits at Sutton Flats, Ogmore-by-Sea. (After Thomas, 1968.)



(Figure 3.61) Triassic clastic sediments overlying Carboniferous Limestone at Sutton Flats, Ogmore-by-Sea. (a) Irregular beds of Triassic conglomerate resting unconformably on steeply dipping Carboniferous Limestone. (b) Close-up of the lower portion of a poorly sorted Triassic conglomerate, showing incorporation of boulders of Carboniferous Limestone; field of view in (b) is about 5 m. (Photos: K. A. Kermack.)