# Duffryn Crawnon, Powys

[SO 095 150]

Potential GCR site

W.J. Barclay

## Introduction

Accessible cliff exposures at the head of the Duffryn Crawnon Valley, Powys (Figure 5.35) between the headwaters of Nant ddu and the Mon Crawnon provide a complete transect through the Late Devonian Plateau Beds Formation. These strata are unique in the Anglo-Welsh Basin in containing shallow marine deposits and possible aeolian sandstones, both facies being present here. Following the discovery of fish remains during mapping by the [British] Geological Survey (Hall *et al.,* 1973; Taylor and Thomas, 1974, 1975), a detailed sedimentological analysis was carried out by Lovell (1978a,b). The site's importance is enhanced in it being the type locality for the Plateau Beds (Lovell, 1978a).

## Description

The following account is based largely on the work of Lovell (1978a,b). Earlier descriptions were given by Hall *et al.* (1973) and Taylor and Thomas (1974, 1975). The base of the formation [SO 0908 1547] is placed at the base of a 0.75 m-thick red mudstone containing thin layers of quartz granules and sand. From there, the entire formation can be seen by following the public footpath that contours round the bottom of the steepest part of the cliffs, or by climbing a grassy slope about 80 m south of where the base is exposed. The underlying Brownstones Formation comprises interbedded red-brown sandstones and mudstones.

(Figure 5.36) shows the graphic section compiled by Lovell (1978a,b). The Plateau Beds Formation is 36 m thick, its upper boundary [SO 0930 1518] marked by an erosion surface that truncates a 2.5 m-thick red mudstone unit and is overlain by 0.2 m of grey intraformational fish-bearing conglomerate at the base of the Grey Grits Formation. The formation broadly comprises two units. The lower one is sandstone-dominated and consists mainly of red-brown, sparsely micaceous, fine- to medium-grained sandstone (division 'B' of Lovell), the upper (division 'c') is more heterolithic and comprises interbedded finer-grained sandstones and mudstones.

A thin, channelized small-pebble extraformational conglomerate overlies the basal granular mudstone bed. It has yielded fragments of *Holoptychius* and c.f. *Bothriolepis* (Hall *et al.,* 1973). It is succeeded by 18 m of red-brown and purple-grey, tabular beds of planar large- and medium-scale cross-bedded sandstones, with most of the cross-bedding directed to the northwest. These sandstones are pebble-free, with no mudstone interbeds or clasts, and are either non-micaceous or very slightly micaceous. The overlying heterogeneous beds (division 'c') are laterally variable, but can be subdivided into a lowermost part of 9 m consisting mainly of small, fining-upward, fine-grained sandstone–mudstone cycles 0.75 m to 1.75 m thick. The unit bases are slightly erosional or sharp, and parallel lamination is present in a number of beds. Some channelling is seen locally (Figure 5.37). A few beds have rippled surfaces, and desiccation cracks occur at some levels. Bioturbation is present in some beds in the form of horizontal hypichnial casts. Sediment dispersal in both these beds and the overlying 9 m was towards the south. The upper 9 m commence with a siderite clast and fish-bearing sandstone that passes up into cross-bedded sandstones or is overlain (and laterally cut out) by a channel-fill, cross-bedded sandstone. There are several superimposed and cross-cutting channelized sandbodies, and the bases of two channels contain brachiopod-bearing mudstone clasts. This channel-dominated sequence is overlain by a mudstone-dominated sequence, which, in turn, passes into the uppermost sandstones. Fossils recorded from division 'c' are lingulids (including Lingulid sp. B of Butler, in Taylor and Thomas, 1975), *Ptychomaletoechia omaliusi,* and fragments of fish and plant. Cf. *Bothriolepis* and *Holoptychius* sp. are recorded from an intraformational conglomerate about 12 m below the top of division 'c' (Hall *et al.,* 1973), in a horizon initially correlated by Hall *et al.* (1973) as the Afon-y-Waen Fish Bed (see Mon y Waen GCR site report, this chapter), but the correlation was later abandoned (Taylor and Thomas, 1975).

The Grey Grits Formation is up to 10 m thick and consists predominantly of grey-green, cross-bedded quartzitic sandstones showing SE-directed palaeocurrents. A siderite- and green mudstone-clast conglomerate marks the base of the formation and has yielded fish fragments and the bivalve *Sanguinolites.* Small channel-fill and scour features characterize the immediately overlying beds and are lined with discoidal quartz pebbles.

## Interpretation

The Brownstones Formation is interpreted to be of sheet-flood and braided river origin (Tunbridge, 1981a). It is truncated by a regional unconformity marking basin inversion and erosion during the culmination of the Acadian Orogeny. Although no angular discordance is discernible at Duffryn Crawnon, the unconformity marks a major hiatus in which the Mid-Devonian succession is unrepresented.

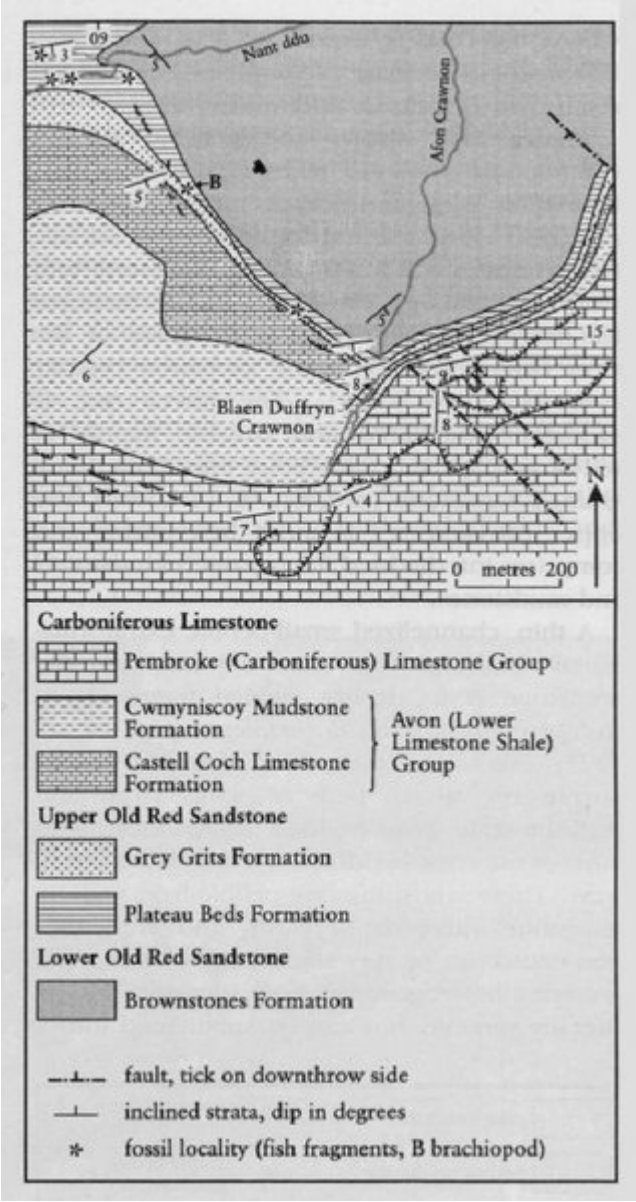
The granule-rich mudstone at the base of the Plateau Beds is recognized widely (Hall *et al*., 1973; Lovell, 1978a,b) and is interpreted by Lovell (1978a) as an alluvial mudflow deposit. Hall *et al.* (1973) subdivided the Plateau Beds into lower and upper units at the level of the Afon-y-Waen Fish Bed, but Lovell (1978a) concluded that fish-bearing conglomerates such as this are lenticular and not laterally persistent, and probably occur at different levels. The main differentiation of the succession is lithological, with a lower sandstone-dominated unit (division 'b') and an upper heterolithic unit (division 'c').

Some cross-bedded sandstones of division 'b' show NW-directed palaeocurrents, opposite to the regional drainage direction. Lovell (1978a,b) considered that these may represent wind-blown dune sets, either interbedded with unconfined waterlain (?wadi) sands or forming part of a coastal dune sequence. Lovell (1978a) noted, however, that if an aeolian environment is represented, dune formation appears to have been relatively limited. If Lovell's aeolian interpretation is correct, this is the first recorded occurrence of wind-blown sand deposition in the Anglo-Welsh Basin (but see also Portishead GCR site report, this chapter). The more heterogeneous deposits of division 'c' were interpreted as marginal marine sediments, with evidence of supratidal, tidal-flat and possibly subtidal deposition (Allen, 1965b; Lovell, 1978a,b). The fish fragments and brachiopods recovered from here and elsewhere constrain the age of the Plateau Beds to the late Frasnian–Famennian. The Grey Grits were interpreted by Allen (1965b) and Lovell (1978a) as fluvial deposits, although Taylor and Thomas (1975) suggested marginal marine deposition. At least some of the fluvial channels may have been affected by the influx of shallow marine waters (B.EJ. Williams, pers. comm.).

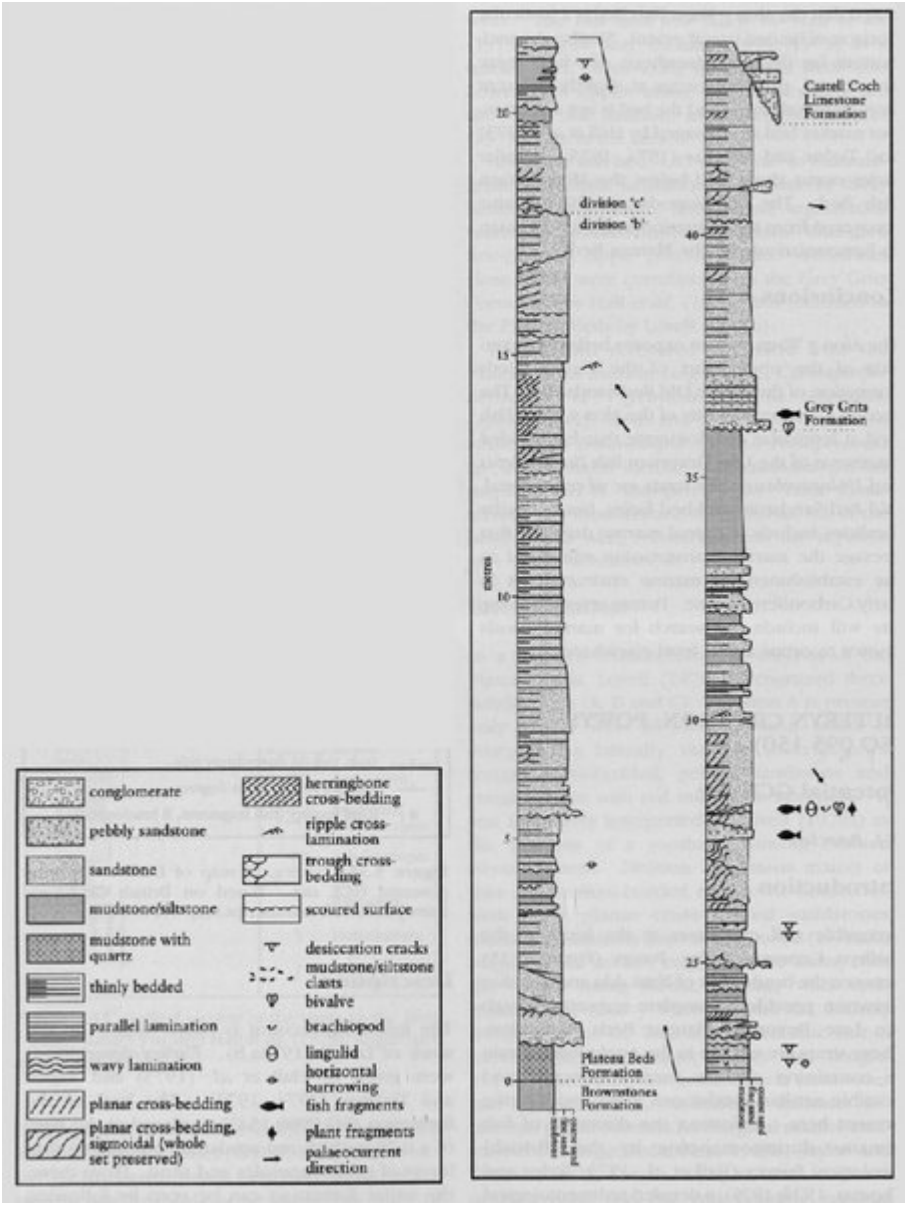
## Conclusions

Duffryn Crawnon is the type locality of the Late Devonian Plateau Beds Formation and provides an excellent, complete transect through the entire formation. These strata are unique in the Anglo-Welsh Basin in containing shallow marine deposits and aeolian sandstones, and the site's importance lies in the presence of both of these facies. The site also exposes the lower and upper boundaries of the Plateau Beds, thereby providing evidence on the inter-relationships of the formations present. Fossil fish fragments from the site have provided information on the age of the Plateau Beds, and the sporadic presence of shallow marine fossils adds further importance.

**References**




*(Figure 5.35) Geological map of Duffryn Crawnon potential GCR site. Based on British Geological Survey 1:10 560 manuscript map SO 01NE (1973).*




*(Figure 5.36) Vertical section of the strata at Duffryn Crawnon. After Lovell (1978a,b).*

*(Figure 5.37) South face of Blaen Duffryn Crawnon [SO 0936 1507]. Sandstones and siltstones fill a channel in the upper part of the Plateau Beds Formation. Brachiopods are present in the channel-fill. (Photo: BGS No. A12015, reproduced with the permission of the Director, British Geological Survey, NERC.)*