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# Tongwynlais Road Section, South Glamorgan

[ST 127 825]–[ST 131 824]

## Introduction

The Tongwynlais Road Section GCR site consists of the road cuttings in the Taff Gorge on the east side of the road, 8 km north-west of Cardiff [ST 127 829]–[ST 131 824]. The importance of the site lies in the exposure spanning the Devonian–Carboniferous boundary, which coincides at this locality with the change from predominantly non-marine terrigenous clastic deposition to marine carbonate deposition. The most detailed descriptions of the site can be found in Gayer *et al.* (1973), Burchette (1977) and Waters and Lawrence (1987).

## Description

The most important part of this site is at the southern end where beds dip SSE on the southern limb of the Casten Coch Anticline. Gayer *et al.* (1973) recorded 19.3 m of Old Red Sandstone in the core of the anticline, overlain by at least 44.9 m of Carboniferous Limestone, now ascribed to the Lower Limestone Shale Group. The contact was taken at the base of the lowest limestone of the marine succession. Later workers placed the boundary differently: according to Waters and Lawrence (1987), the base of their newly defined Tongwynlais Formation (the lowest part of the Lower Limestone Shale Group) lies 2.6 m beneath the horizon chosen by Gayer *et al.* (1973) and 5 m lower than the base as taken by Burchette (1977, 1987).

The Upper Old Red Sandstone here consists of red and greenish-grey, micaceous, cross-bedded sandstones of the Quartz Conglomerate Group, becoming increasingly calcareous upwards (Gayer *et al.*, 1973). Waters and Lawrence (1987) recorded that the contact with the Tongwynlais Formation is sharp but conformable. Much of the Tongwynlais Formation comprises interbedded bioclastic limestones and shales, but with a more varied unit, 12 m thick, at the base. This basal unit comprises three divisions (Waters and Lawrence, 1987); the lowest, with calcretized sandy limestones and calcareous sandstones, is within the top of the Old Red Sandstone of Gayer *et al.* (1973). The middle unit consists of interbedded bioclastic limestones and shales, and the uppermost unit comprises red bioclastic grainstones resting on an erosive contact with the limestones beneath, overlain by oolitic and bioclastic grainstones (Figure 9.32) (Gayer *et al.*, 1973; Waters and Lawrence, 1987). The red unit contains haematite and is known as the 'Rhiwbina Ironstone' (Rogers, 1861; Squirrel and Downing, 1969). Haematite occurs as a replacement of skeletal grains, infilling pores within crinoids and bryozoans, as coatings on grains and as irregular rounded masses (Gayer *et al.*, 1973).

The remaining 30 m of the Tongwynlais Formation consists of bioclastic packstones and grainstones interbedded with micaceous, calcareous shales. Fossils include crinoids, ostracodes, brachiopods, bivalves, gastropods, orthoconic nautiloids and fish debris (Waters and Lawrence, 1987). The topmost-exposed bed is an oolitic and crinoidal grainstone attributed to the Castell Coch Formation by Waters and Lawrence (1987).

Gayer *et al.* (1973) made a detailed study of plants, spores and brachiopods in the Upper Old Red Sandstone, together with conodonts and brachiopods from the Lower Limestone Shale Group. They also provided detailed faunal and floral lists. Limited further sampling for conodonts was reported by Waters and Lawrence (1987). According to Gayer *et al.* (1973), the conodonts indicate the *Patrognathus variabilis*–*Spathognathodus plumulus* and *Siphonodella*–*Polygnathus inornatus* assemblage zones as recognized in the Avon Gorge succession by Rhodes *et al.* (1969). (Figure 9.32) Sedimentary log of the Courceyan Tongwynlais Formation (Lower Limestone Shale Group) at Tongwynlais Road Cutting. After Waters and Lawrence (1987), with interpretations based on information from Burchette (1987) and Burchette *et al.* (1990).

The northern limb of the Castell Coch Anticline is less well exposed in the road cutting and is eventually truncated by the Castell Coch Thrust (Gayer *et al.*, 1973). Farther north, dolomitic limestones, probably belonging to the Black Rock Limestone Group, can be seen dipping northwards and passing into brecciated mineralized dolomites whose structure is

obscure (Gayer *et al.*, 1973).

## Interpretation

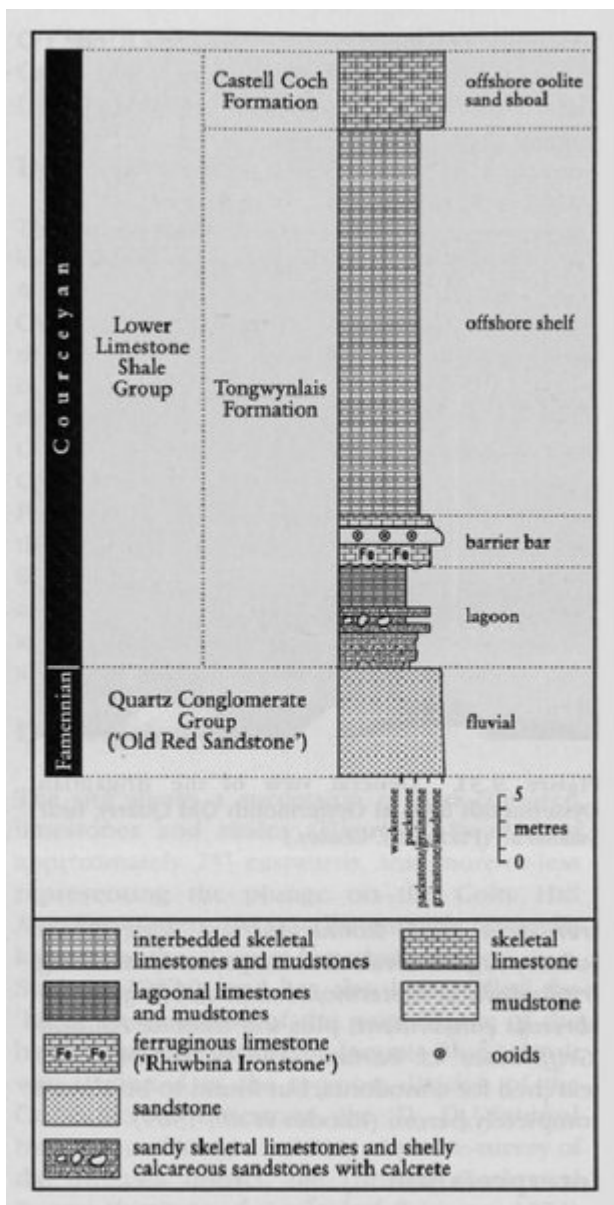
The succession on the southern limb of the Casten Coch Anticline records the transition from the dominantly fluvial environment of the Old Red Sandstone to the dominantly marine environment of the Lower Limestone Shale Group-Tongwynlais Formation, although the exact position of the boundary has varied by a few metres according to different workers. Gayer *et al.* (1973) recorded spores which they attributed to the early Tournaisian within the upper part of the Old Red Sandstone and placed the Lower Limestone Shale–Old Red Sandstone boundary in the lower part of the Belgian Tn1b spore zone. However, as recorded by Waters and Lawrence (1987), Conil *et al.* (1977) revised the Famennian–Dinantian boundary in Belgium such that these floras now lie within the Famennian Stage. Waters and Lawrence (1987) recorded an earliest Courceyan conodont fauna between 1.5 m and 3 m above the base of the Tongwynlais Formation and thus the Devonian–Carboniferous boundary must lie very close to the lithostratigraphical boundary. Waters and Lawrence (1987) also discussed the significance of the conodont faunas recorded by Gayer *et al.* (1973) from the Lower Limestone Shale Group and cast doubt on the validity of the correlation of the upper part of the exposed section with the zones derived from the Avon Gorge succession, suggesting that the distribution of species was facies controlled.

The environment of deposition of the Tongwynlais Formation has been discussed by Burchette (1977, 1987). In the road section a channelled surface separates lagoonal deposits from the Old Red Sandstone (Burchette, 1987). These lagoonal deposits themselves are cut by a major channelled horizon representing a 'ravinement' surface that developed during transgression and the establishment of a barrier bar (Figure 9.32). The remainder of the succession records a transition to an offshore shelf environment where storm processes were important (Burchette, 1987).

## Conclusions

This site is invaluable for its section across the Old Red Sandstone–Carboniferous Limestone boundary and for the biostratigraphical data it has yielded which suggest that the lithostratigraphical boundary is more-or-less coincident with the boundary between the Famennian (uppermost Devonian) and Courceyan stages. The locality is also important for allowing the study of the faunas, floras and strata developed during the transgression that established marine conditions in the area after deposition of the largely fluvial Old Red Sandstone.

## [References](#)



(Figure 9.33) The Brofiscin Oolite (left) and the Friars Point Limestone (top centre and right) at Brofiscin Quarry near Groes Faen. The development of the oolitic and shelly beds of the Brofiscin Oolite, with its prominent chert nodules, records a regional shallowing event across the South Wales area during Courceyan times. (Photo: P.J. Cossey.)