Duckmanton Railway Cutting

Highlights

Duckmanton Railway Cutting is the international stratotype for the base of the Duckmantian (Westphalian B *auct.*) Stage.

Introduction

This is a cutting on the disused Bolsover to Chesterfield railway line near Arkwright Town, 4 kin east of Chesterfield, Derbyshire [SK 424 704]. It is in the middle of the Notts–Derbyshire Coalfield, and is thus near the centre of the Pennine Basin. The geology was first described by Smith *et al.* (1967). It was proposed as the stratotype for the base of the Duckmantian Stage by Calver and Owens (1977), and as a result there have been detailed biostratigraphical analyses of the interval near the boundary by Ramsbottom (1981) and Owens *et al.* (1985). The exposure here has become largely grassed over, but rock can easily be revealed by trenching, and the key parts of the section can be seen in permanently protected enclosures. The site was purchased by the Derbyshire Naturalists' Trust in 1976, and is now known as the W.H. Wilkinson Nature Reserve.

Description

Lithostratigraphy

The sequence originally exposed along this cutting was c.150 m thick (Figure 2.11). It consists mostly of mudstones, but also includes four coal seams: in ascending order, the Chavery, Joan, 2nd Ell and 1st Ell seams.

Biostratigraphy

Marine bands

The 3 m of mudstone overlying the Joan Seam have yielded a restricted marine assemblage, including *Dunbarella, Myalina, Lingula,* and the ostracods *Geisina* and *Hollinella.* No ammonoids have been found here, but what is believed to be the same band in neighbouring sites has yielded *Anthracoceratites vanderbeckei* (Ludwig) (Owens *et al.,* 1985). Traditionally, this marine band, which is the only one normally occurring between the basal Langsettian and the middle Duckmantian, was known in the Notts–Derbyshire and Yorkshire coalfields as the Clay Cross Marine Band. However, in the scheme proposed by Ramsbottom *et al.* (1978) to try to provide a unified marine band nomenclature, it is known as the Vanderbeckei Marine Band.

Non-marine bivalves

These occur both above and below the marine band here. All the assemblages are dominated by *Anthracosia ovum* Trueman and Weir and *A. phrygiana* (Wright). However, from immediately above the Chavery Seam, *Anthracosia regularis* (Trueman) and *Naiadites productus* (Brown) also occur. Mudstones above the 1st Ell Seam yield *Anthracosia lateralis* (Brown) and *Anthracosphaerium* aff. *turgidum* (Brown). This suggests that the junction between the *A. lateralis* and *A. ovum* subzones of the *Anthraconaia modiolaris* Zone occurs here at about the Vanderbeckei Marine Band.

Palynology

Ramsbottom (1981) lists pollen and spores extracted from 18 samples from just above and below the Vanderbeckei Marine Band. According to Owens *et al.* (1985), assemblages from below the Joan Coal contain the eponymous species of the *Radiizonates aligerens* Zone, although it is not mentioned in the lists given by Ramsbottom. From the base of the Vanderbeckei Marine Band upwards, Ramsbottom shows the frequent presence of *Endosporites globiformis* (Ibrahim) Schopf *et al.,* which Owens *et al.* (1985) state is a characteristic of the *Microreticulatisporites nobilis–Florinites junior*

Zone. This appears to support the generally accepted view that the boundary between these two zones in western Europe coincides with the Vanderbeckei Marine Band (e.g. Clayton *et al.,* 1977).

Chronostratigraphy

The base of the Duckmantian Stage is defined at the exposure here of the base of the Vanderbeckei Marine Band (Ramsbottom, 1981).

Interpretation

The Westphalian B was part of the original 1927 tripartite division of the Westphalian Stage (Jongmans, 1928). It was later upgraded to a stage (George and Wagner, 1972) and renamed the Duckmantian (Owens *et al.,* 1985). The type horizon denoting the base of the stage was originally taken at the Katharina Marine Band in the Ruhr, but there are no surface outcrops in this coalfield. It was therefore decided to define the stage boundary at a site in Britain (George and Wagner, 1972) and, after a number of candidates were considered, Duckmanton was selected (Calver and Owens, 1977; Ramsbottom, 1981; Owens *et al.,* 1985). Both the name Duckmantian and the location of the stratotype were ratified by the SCCS in 1989, although they have not yet been ratified by the IUGS.

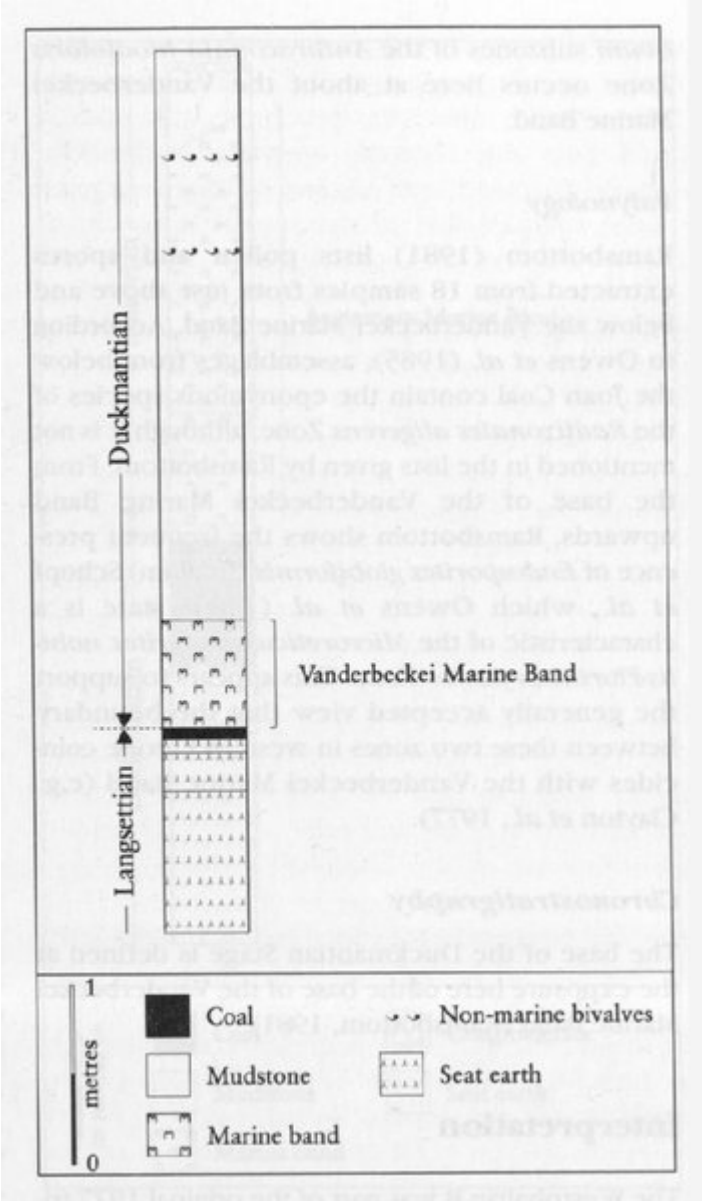
A weakness of the site as a stratotype is the relatively restricted assemblage of fossils present in the marine band. However, it makes up for this by the excellent non-marine bivalve and palynology record that it provides across the boundary (plant macrofossils are to all intents absent, but this is also the case in all of the other Upper Carboniferous stage stratotypes).

The Vanderbeckei Marine Band is the only fully marine band between the lower Langsettian and topmost Duckmantian; the only possible exceptions are some thin bands with estheriids in the middle Langsettian of the Notts–Derbyshire Coalfield. Nevertheless, it is an extremely widespread marine band, having been identified in every British coalfield with lower Westphalian strata. It is also widely found in northern Europe, having been identified as far east as the Lublin Coalfield in Poland, where it is known as the *Dunbarella* Marine Band (Musia *et al.,* 1983). According to Calver (1968), it ranges over an area 960 km by 650 km, and is one of the most reliable horizons for establishing inter-coalfield correlations.

Conclusion

Duckmanton Railway Cutting is an internationally recognized standard for defining a time plane, 313 million years before the present, and marking the start of what has become known as the Duckmantian Age.

References



(Figure 2.11) Log of section at Duckmanton Railway Cutting. Based on Owens et al. (1985, fig. 3).