
River Darwen

Highlights

River Darwen is the only site in Britain to show the complete succession of Chokierian, Alportian and lower Kinderscoutian in a clastic basinal facies, and showing every ammonoid zone and subzone of this interval. In addition, it has been nominated as the international stratotype for the base of the Kinderscoutian Stage (Figure 2.4).

Introduction

This site [SD 608 291]–[SD 618 290] comprises exposures along the River Darwen, 7 km west of Blackburn, Lancashire (the site is sometimes referred to as Samlesbury Bottoms). It has a dual significance. It is the best exposed mid-Namurian fossil-bearing sequence in Britain, but perhaps more importantly, it has been designated as the international boundary stratotype for the base of the Kinderscoutian Stage. The geology was first discussed by Moore (1930) and Hodson (1957), but the most complete account is in Price *et al.*, (1963). A detailed log of the Alportian and Kinderscoutian parts of the section is given in Ramsbottom (1981).

Description

Lithostratigraphy

The Upper Carboniferous strata exposed here underlie the Parsonage Sandstone and comprise 100 m of mudstone with nodular limestone of the Sabden Shales Formation (Figure 2.5).

Biostratigraphy

Marine bands

The lower *Homoceras* Superzone (i.e. H_1) is represented by just two marine bands, 35 m apart, containing *H. beyrichianum* (Haugh) and *Isohomoceras subglobosum* (Bisat) respectively. These are taken as marking the bases of the zones of these species, although the biostratigraphical control here is not good.

The remainder of the sequence consists of c.65 m of marine mudstones. Based mainly on palaeontological evidence, Riley, Owens and Swann (*in* Ramsbottom, 1981) have been able to recognize 19 discrete cycles within this interval, which they term beds A–S. At the base of each cycle, fossils indicate deepest-water conditions, and often include abundant ammonoids. Higher in the cycles, however, the ammonoids decline and then <disappear, and bivalves (e.g. *Dunbarella*, *Caneyella*, *Posidonia*) become proportionally more important; at the top of some of the cycles, drifted plant debris can be found. It is possible to identify in these strata all of the standard zones and subzones of the upper *Homoceras* (H_2) and lower *Reticuloceras* (R_1) superzones, up to and including the *Reticuloceras nodosum* Zone. Ramsbottom (1969b) was initially unable to identify the *Vallites eostriolatus* Subzone here, but Riley, Owens and Swann (*in* Ramsbottom, 1981) subsequently recognized it in their Bed D.

Palynology

Ramsbottom (1981) only lists miospores from the upper part of the sequence here (beds belonging to the upper *Homoceras* and *Reticuloceras* ammonoid (superzones). The presence of *Grumosporites varioreticulatus* (Neves) Smith and Butterworth in the mudstone G_1 , which immediately overlies the lowest bed containing ammonoids of the *Reticuloceras circumplicatile* Zone, supports the correlation of the base of the *Crassispora kosankei*–*G. varioreticulatus* palynological zone with the base of the *Reticuloceras* ammonoid superzone (Owens, 1982, 1984). Unfortunately, none of the other index species for this palynological zone have been identified from here.

Chronostratigraphy

The base of the Kinderscoutian Stage is defined 'at the base of the marine band containing the goniatite '*Hodsonites magistrorum*' (Ramsbottom, 1981). This is Bed G in the section by Riley *et al.* in Ramsbottom (1981), i.e. the Magistrorum Marine Band. The base of the Chokierian Stage is placed at the base of the bed containing *Isohomoceras subglobosum* (Bisat) (presumed to be the Lower Subglobosum Marine Band), and the base of the Alportian Stage at the base of Bed A (the Proteum Marine Band) in the log by Riley *et al.*

Interpretation

The name Kinderscoutian, was first introduced by Bisat (1928) for strata containing what he referred to as the R₁ goniatite zone: A more formal definition was provided by Bisat and Hudson (1943), who placed the base of the stage at the marine band containing what is now known as *Hodsonites magistrorum* (Hodson). Ramsbottom (1977) proposed that the base should be lowered to the base of the *Homoceratoides prereticulatus* Zone, as this represented a more significant change in the ammonoid fossils, but this has not been adopted by the SCCS.

Bisat (1924) used a section at Roughlee, near Barley, Lancashire as the standard for the R₁ zone, but it is disrupted by faulting and exposure is now poor. His use four years later of the name Kinderscoutian implies that sections in the Kinderscout area of Derbyshire should be taken as the type. There are a number of exposures in this area, such as in Grinds Brook near Edale (Ramsbottom *et al.*, 1967), but they are generally small and incomplete. Ramsbottom (1969b) was the first to propose the more complete succession at River Darwen as the type, and this is now accepted by the SCCS (Ramsbottom, 1981).

Ramsbottom (1969b) had also proposed this site as a stratotype for the Chokierian and Alportian stages. However, the Chokierian part of the section is not as well exposed as at Gill Beck (see above), which is now taken as the stratotype for this stage. However, the case against the Alportian here is less obvious. Initially, the absence of the *Vallites eostriolatum* Subzone was regarded as a drawback, but this has been subsequently identified at River Darwen (Ramsbottom, 1981). Palynological evidence is relatively poor, but such fossils have not so far proved particularly helpful in identifying the base of the stage (it occurs in the middle of the *Lycospora subtriquetra*–*Kraeuselisporites ornatus* Zone). Perhaps the most serious problem is that the entire Alportian here is only 7 m of mudstone, although even at the site now taken as the stratotype (Blake Brook — see above) it is only 10 m thick. With hindsight, it might have been better to accept Ramsbottom's (1969b) original suggestion for the Alportian stratotype. For better or for worse, however, the SCCS has decided to opt for Blake Brook.

The River Darwen, which lies in the Craven Basin, is the best known British section through the Chokierian to mid-Kinderscoutian in a basinal facies. The Edale Shales Formation of Derbyshire is of a similar age and facies, and provides a complete succession of marine zones (Hudson and Cotton, 1945; Ramsbottom *et al.*, 1967). However, no single site in Derbyshire shows the complete succession from the Chokierian to mid-Kinderscoutian. The Bishopston Formation in the southern part of the South Wales basin also ranges through the Chokierian to Kinderscoutian in an elastic basinal facies, and a fairly continuous succession can be seen at Barland Common (see Chapter 4), but the succession of goniatites is nowhere near as complete as in the Central Pennine Province. Exposures along the Shannon Estuary in Ireland may provide a full succession, particularly of the Chokierian and Alportian (Ramsbottom, 1969b), but the geology here has still to be fully documented and further complicated by the fact that the sequence is thermally mature and badly sheared. It seems that no other single site in Britain shows the full sequence of ammonoid zones and subzones between the *Isohomoceras subglobosum* and *Reticuloceras nodosum* zones.

Conclusions

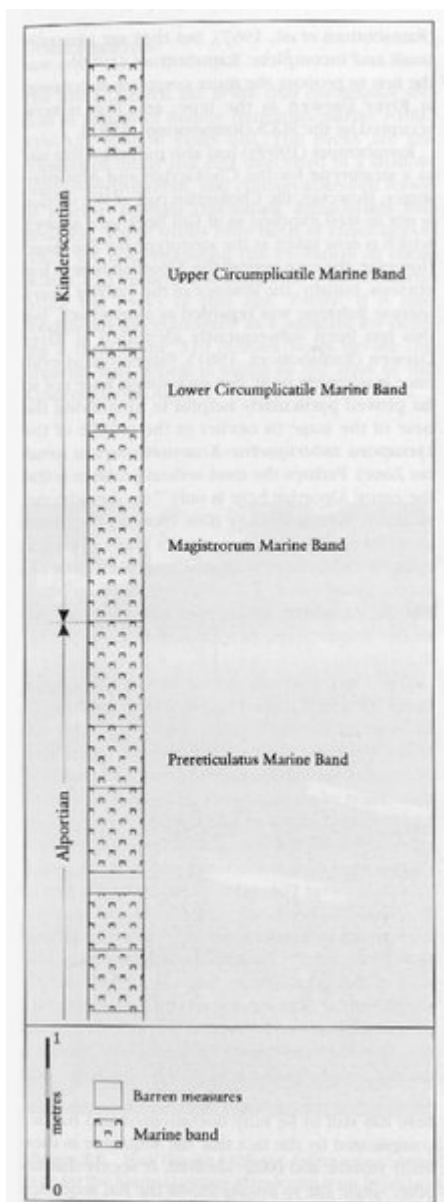
The River Darwen site is the only continuous section in Britain of middle Namurian marine rocks, 319–322 million years old. The rocks are the remains of muds and silts deposited in a shallow marine environment, and contain abundant fossils of marine animals (including ammonoids and bivalves). These fossils have been of major importance for understanding the evolution of these faunas, and for demonstrating their value for correlating the rocks of this age.

Today, it is also recognized internationally as a standard for defining a time plane 319 million years before the present, and which is taken as the start of the Kinderscoutian Age.

References



(Figure 2.4) River Darwen GCR site. International stratotype for the Alportian–Kinderscoutian stage boundary. Photographed during the visit to the site by the IUGS Subcommittee on Carboniferous Stratigraphy, August 1981. (Photo: W. A. Wimbledon.)



(Figure 2.5) Log of part of the section at River Darwen straddling the Alportian–Kinderscoutian boundary. Based on Ramsbottom (1981, pp. 4.5–4.8).