Mousegill Beck

Highlights

Mousegill Beck provides the best section through the Millstone Grit of the Stainmore Trough, a sedimentary basin that lay between the Askrigg and Alston blocks in Northern England.

Introduction

This tributary of Argill Beck [NY 825 129]–[NY 837 124], 4 km ESE of Brough, Cumbria, shows a complete sequence through the Namurian of the Stainmore Trough, an area of downwarp during the Late Carboniferous, that lay between the Askrigg and Alston blocks (Figure 11.2). The geology was mentioned by Goodchild (1890) and Turner (1935), but the most detailed accounts are to be found in papers by Ford (1955) and Owens and Burgess (1965).

Description

Lithostratigraphy

Exposed along this stream is a virtually complete succession through the Namurian of the Stainmore Trough, from the Pendleian up into the lower Westphalian. However, this account will only deal with the Upper Carboniferous (Chokierian to Yeadonian) part of the Namurian here. These strata are some 140 m thick (Figure 11.3).

The base of the Upper Carboniferous is taken to be at about 2.5 m above the Peasah Wood Limestone. The lowest unit is about 39 m thick, and consists of two fining-upwards cycles, with sandstone at the base and passing up through siltstones into brackish/marine mudstones. The mudstones at the top of the first cycle are thin and brackish. Those at the top of the second cycle, however, form an 18 m thick interval called the Mousegill Marine Beds. They are of much more marine character, consisting predominantly of shales and thin limestones, although there is also a thin coal.

Above the Mousegill Marine Beds are 54 m of shales and sandstones, that may be interpreted in terms of three coarsening-upwards cycles. From marine or brackish mudstones, each cycle passes up through siltstones into sandstones, which is then capped by a thin coal or seat earth. The coal or seat earth is then overlain by the next marine or brackish mudstone. The cycles are probably the result of small-scale deltas prograding into a shallow marine basin.

The third of these cycles is incomplete, there being no coal or seat earth. Instead, it is capped by a marine mudstone, known as the Swinstone Bottom Marine Band. This seems to mark a change in style of sedimentation, with alternating marine mudstones and thick cross-bedded sandstones indicating a pronounced change from deeper-water marine to delta-top fluvial channel deposits. In addition to the Swinstone Bottom Marine Band, this part of the succession also includes the Swinstone Middle and Swinstone Top marine bands. The latter marks the top of the Namurian in this succession (see below).

Biostratigraphy

Marine bands

Most of the so-called marine bands in this sequence contain little more than *Lingula* and *Planolites,* and are thus difficult to relate on faunal grounds with the marine bands found in the classic succession of the Central Province. There have been attempts to correlate the *Lingula* bands with the Pennines marine bands, but this has sometimes caused confusion. For instance, the Cancellatum Marine Band was correlated by Taylor *et al.* (1971) with one of the *Lingula* bands between the Mouse Gill and Swinstone Bottom marine bands, by Owens and Burgess (1965) with the Swinstone Bottom Marine Band and by Ramsbottom *et al.* (1978) with the Swinstone Middle Marine Band. There is not even any unequivocal faunal evidence as to the position of the Namurian–Westphalian boundary. It is widely believed that the Swinstone Top

Marine Band is a correlative of the Subcrenatum Marine Band, but the index ammonoid has not been found here.

In fact, only two horizons have yielded diagnostic marine faunas. Firstly, the Mousegill Marine Beds have yielded *Vallites henkei* (Schmidt), which is generally taken as an index of the *R. circumplicatile* Subzone (Owens and Burgess, 1965), and secondly, the Swinstone Middle Marine Band, which contains a much more diverse fauna including the ammonoid *Cancelloceras* cf. *cumbriense* (Bisat), and thus correlates with the middle Yeadonian Cumbriense Marine Band of the Central Province.

Palynology

The details of the palynology of this sequence are described by Owens in Owens and Burgess (1965), who prepared microfossils from 12 horizons between the Mousegill Marine Beds and the Swinstone Top Marine Band. The lowest Upper Carboniferous sample that he had was from imme diately below the Mousegill Marine Beds, where he recognized a significant influx of *Crassispora kosankei* (Potonié and Kräusel) Bhardwaj. Such an influx is generally taken to mark the base of the *C. kosankei–G. varioreticulatus* Zone, which is a good index to the base of the Kinderscoutian Stage. This is in full agreement with the faunal evidence found in these marine beds (see above).

Broadly similar assemblages were identified for about 20 m above the Mousegill Marine Beds. However, from there upwards, the assemblages changed, to include taxa such as *Dictyotriletes varioreticulatus* Neves, *Secarisporites lobatus* Neves, *S. remotus* Neves and *Cirratriradites ornatus* Neves. This is characteristic of the *R. fulva–R. reticulatus* Zone, indicating the upper Marsdenian to Yeadonian.

Interpretation

This is the best exposure of Millstone Grit in the Stainmore Trough. Exposures are limited to stream sections in this small area near Brough, known as the Stainmore Outlier. Alternative outcrops can be found along Argill Beck and Hocker Gill, but Mousegill Beck provides by far the most complete and well exposed succession.

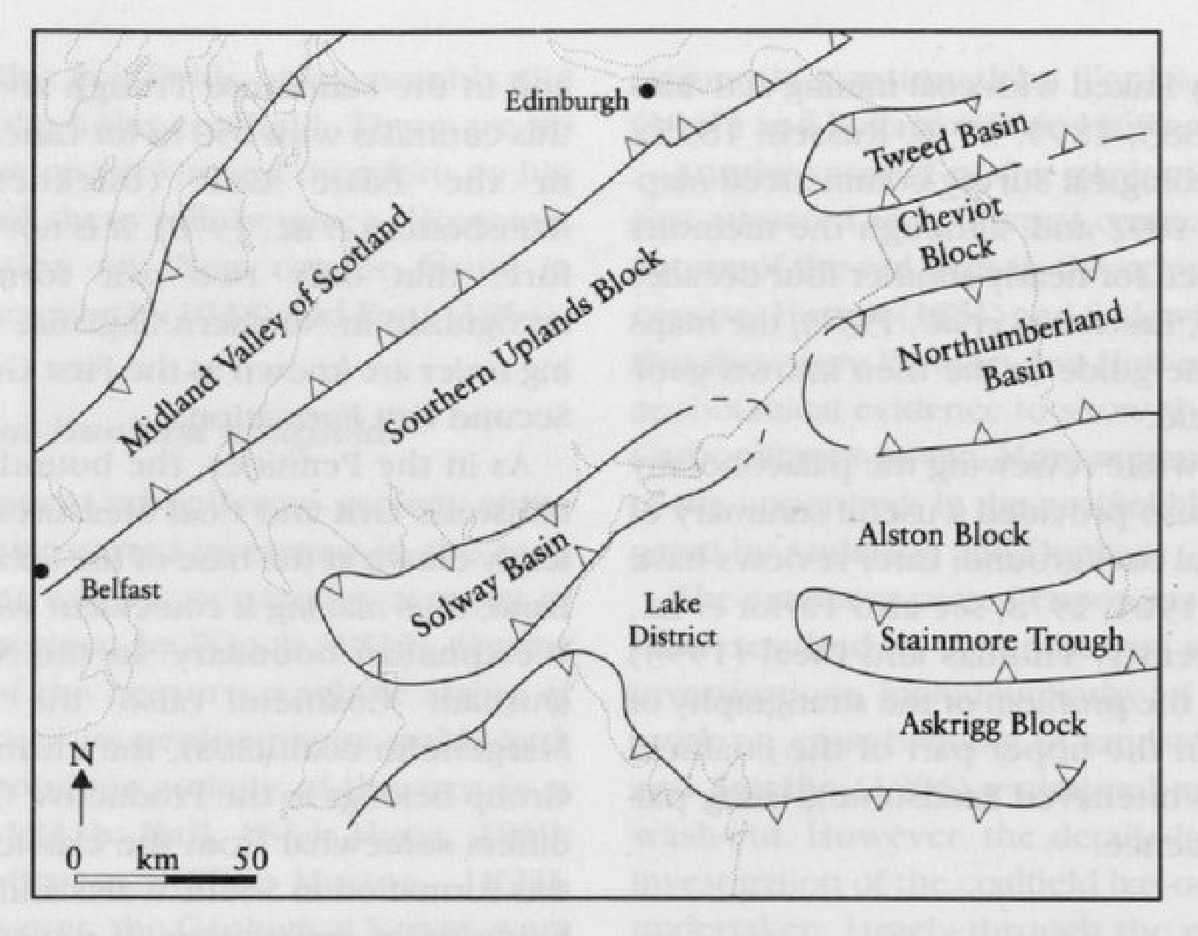
The sequence is typical of the Namurian in Northern England, north of the Central Province. For one thing, it is much more condensed — for instance, the Chokierian to Yeadonian of the Rossendale area is about 1200 m thick, in contrast to about 140 m at Mousegill Beck. Also, the Stainmore succession is typically poor in ammonoids, again contrasting sharply with the more basinal sequences of the Central Province.

This scarcity of ammonoids is one of the reasons why there have been so many difficulties in establishing the exact chronostratigraphical position of the Stainmore sequence. Owens and Burgess (1965) clearly demonstrated the value of palynological biostratigraphy in such sections where the marine faunas are poor or absent, but this did not solve all of the problems. For instance, although Ford's (1955) postulated stratigraphical gap of Arnsbergian to Langsettian appears to be exaggerated, there may nevertheless be a gap below the Mousegill Marine Beds incorporating the Chokierian and Alportian. It has become widely quoted that Owens and Burgess regard the interval between these marine beds and the underlying Peasah Wood Limestone as representing these two stages (e.g. Ramsbottom *et al.,* 1978), but there is no biostratigraphical evidence to support this; it would be just as acceptable to have a non-sequence somewhere between these two marine units. Also, palynology has not been able to resolve the problem of the detailed correlations of the 'marine' bands in the upper part of the Namurian here, and the location of the Marsdenian–Yeadonian boundary.

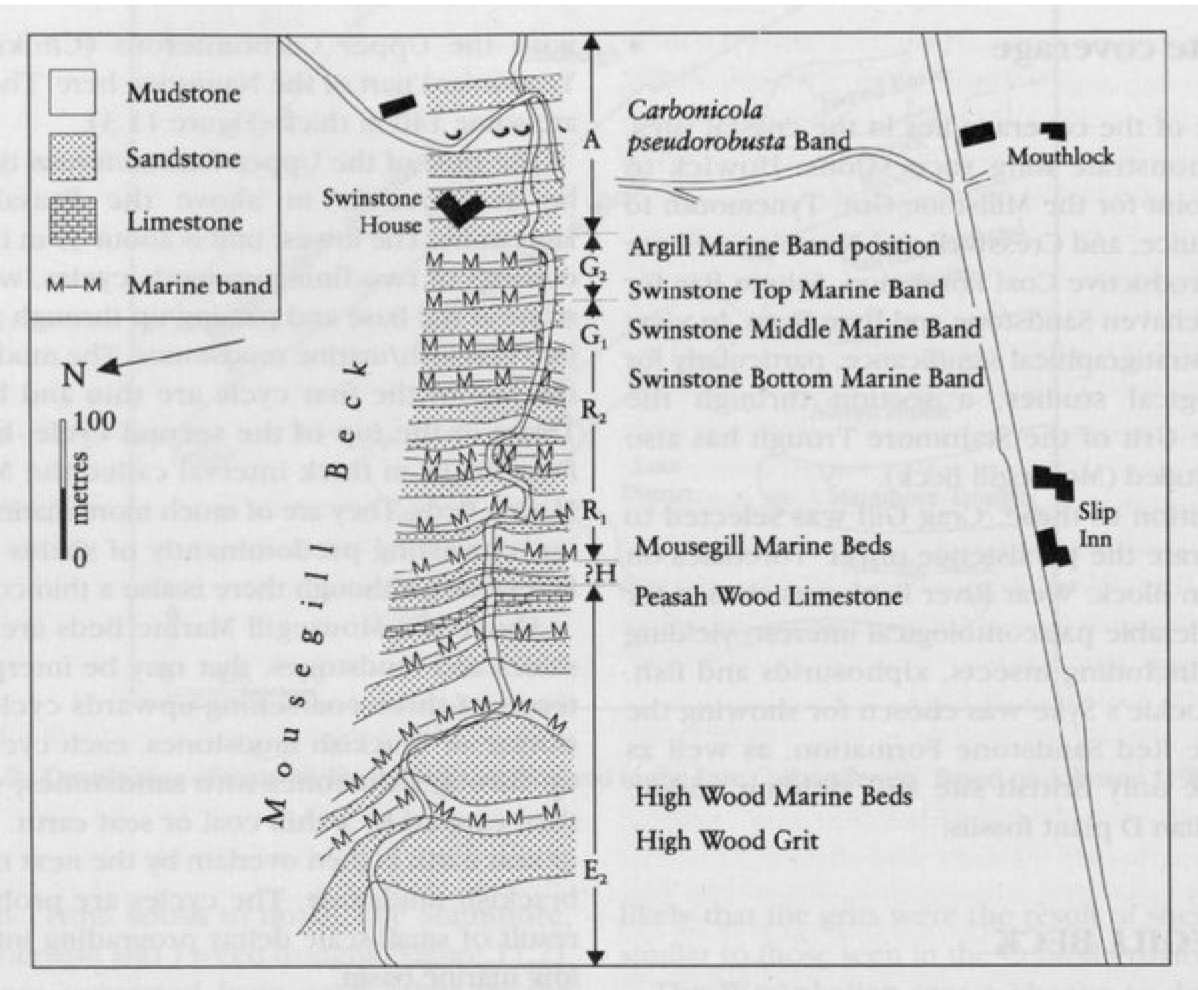
Conclusions

Mousegill Beck is the best locality for examining rocks of the Millstone Grit, as found in an area of deposition known as the Stainmore Trough. The site is particularly important for fossil pollen and spores, which have proved of considerable value in establishing the age of the rocks (about 315–325 million years old).

References



(Figure 11.2) Distribution of main basins in Northern England in the Late Carboniferous. Based on Johnson (1984, fig. 1).



(Figure 11.3) Millstone Grit exposed along Mousegill Beck. Based on Owens and Burgess (1965).