Honley Station Cutting

Highlights

Honley Station Cutting is a classic section through part of the lower Langsettian of the Pennine Basin, and is particularly important for the non-marine bivalve fossils (Figure 10.12).

Introduction

This cutting on the Huddersfield–Barnsley railway line [SE 146 125], just north of Honley station, 4 km south of Huddersfield, West Yorkshire, is one of the classic sequences through the lower Langsettian of the Pennine Basin, being particularly important for non-marine bivalve fossils. The geology has been described by Bromehead *et al.* (1933), and the palaeontology studied by Eagar (1946, 1947, 1952a, 1952b, 1953a).

Description

Lithostratigraphy

The sequence consists mainly of dark mudstones and shales immediately overlying the Soft Bed Coal in the lower Productive Coal Formation (Figure 10.13). About 10 m of strata were documented by Eagar (1947), which he divided into three coarsening-upwards cycles. In an idealized section, there should be a marine band at the base of each cycle. At Honley, 'marine' fossils only occur at the base of the upper cycle, although the shale at the base of the middle cycle is very sulphurous, suggesting deposition under brackish or anoxic conditions.

Biostratigraphy

Marine bands

The sulphurous shales at the base of the middle cycle, although lacking fossils, are thought by Calvet· (1968) to be the Holbrook Marine Band. The shales at the base of the upper cycle are the Springwood Marine Band (also known as the Second Smalley Marine Band by Calver, 1968). They only yield *Lingula,* which is typical of this band in the southern part of Yorkshire. According to Calver, both marine bands only occur in the middle of the Pennine Basin.

It should be noted that the Honley Marine Band, which is the next highest in the scheme of Ramsbottom *et al.* (1978) does not occur in this, the classic Honley section.

Non-marine bivalves

Eagar (1947) investigated the bivalves from 19 narrowly defined beds within this section. They belong to what has become known as the *Carbonicola fallax–C. protea* Subzone (or 'faunal-belt'), which characterizes the lowermost Langsettian of the Pennine Basin. Eagar was able to correlate changes in the morphology of the shells with the three sedimentary cycles mentioned above. Near the base of each cycle, the shells were found to be relatively small and elongate, often with a curved ventral margin. They include forms known as *Carbonicola limax* Wright, and even some that superficially resemble *Anthraconaia.* According to Eagar, these represent assemblages that favoured more marine conditions. Higher in the cycle, as the sediment becomes coarser and less marine, the shells become larger and less elongate, with a straighter or even reflexed ventral margin; these include the typical forms of *C. fallax* Wright and *C. protea* Wright.

In the lower and middle parts of each cycle, the variation within a particular assemblage is continuous. Towards the top of the cycles, however, there is evidence of a bimodal distribution of the bivalves, with two groups being distinguishable by their relative growth patterns. Eagar (1952b) argued that this represented speciation within the assemblage, triggered by conditions becoming less marine.

The same general pattern can be identified in each of the three cycles, although it is only completely developed here in the middle one. Eagar nevertheless claims that each cycle has its distinctive faunal character, particularly in the upper part. In the lower cycle, these are characterized by *Carbonicola rectilinearis* Trueman and Weir, in the middle cycle by *C, discus* Eagar and *C. haberghamensis* Wright, and in the upper cycle *C. limax* Wright, *C. declinata* Eagar. This may reflect the migration of outside faunas into the area when conditions were at their least marine.

Eagar (1946) also used specimens from here in his study on the hinge structure of Westphalian non-marine bivalves. He found a wide range of structures in a completely gradational series, but which seemed to be totally independent of the gross morphology of the shell. There is some comparison with the structures described by MacLennan (1944) in *Carbonicola pseudorobusta* Trueman shells from higher in the Langsettian. However, they are clearly distinguishable from those of *Anthracosia* (the '*C. aquilina* group') in having a larger hinge-plate, with less prominent teeth in a higher position (see also comments by Trueman and Weir, 1951).

Interpretation

This is one of the best sites for showing the strata immediately overlying the Soft Bed and Bassy Mine coals of the Pennine Basin. The interval is relatively uniform over a wide area of the basin, such as at Goyt's Moss (see Eagar, 1952b, 1953a). However, Honley Railway Cutting is one of the best for showing the three sedimentary cycles, which is vital for a correct palaeoecological interpretation of the interval.

The site is particularly important as being where Eagar made his initial investigations into morphological variation of Westphalian non-marine bivalves, and where he developed his methodology for understanding these difficult fossils (Eagar, 1947). They had long been recognized to be important biostratigraphical tools (e.g. Dix and Trueman, 1937), but their extremely variable morphology made them difficult to use in practice. Two approaches had been tried. The most widely used was developed mainly by Trueman, who used a set of artificial form-species, each describing a very limited range of morphology (Trueman and Weir, 1946); the range of morphology of an assemblage would thus be expressed by the list of form-species. The drawback with this is that it produces very inflated taxonomic lists, and the names have little biological meaning. A second approach was more statistical, and involved the use of univariate and regression analyses on certain shell parameters such as length, height, etc. One of the best examples of this sort of study was by Leitch (1940). The resulting taxa had far more biological meaning, but unfortunately were not always easy to recognize in small assemblages, which thus limited their biostratigraphical utility. Also, and perhaps more significantly, the statistical techniques then available (essentially restricted to bivariate statistics) were not really adequate for providing an overall view of the variation of the shells. In recent years, the first attempts have been made to use multivariate methods (principle components and cluster analyses — Vasey and Bowes, 1985), but it will need considerably more work before the full potential of these powerful techniques will be achieved.

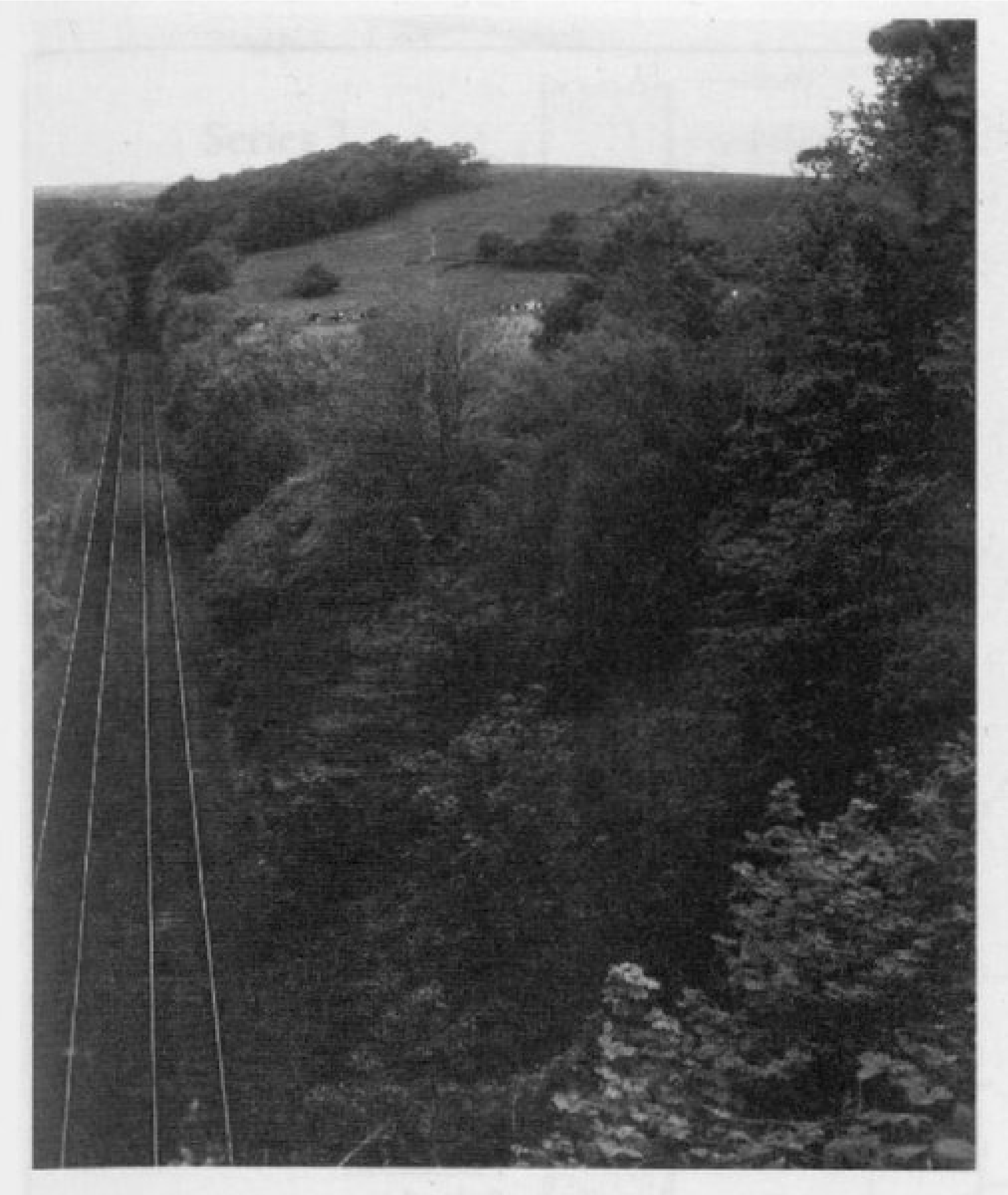
Eagar adopted aspects of both of the traditional approaches, while adding significant improvements of his own. For instance, he found that by only measuring shells from from a narrowly defined stratigraphical interval, only a few centimetres thick, the range of variation was dramatically reduced. He could then use the statistical approach to establish patterns of relative growth of the shells within each assemblage. He also found it valuable to identify accurately the lithology containing each assemblage, as it allowed at least some of the morphological variation of the shells to be correlated with environmental effects, and separated from the residual, possibly phylogenetic changes. By plotting the morphology of shells from each horizon on a standard pictograph or variation diagram from a species, which he had synthesized from all the known specimens of that species (a technique developed from earlier work by Leitch 1936, 1940), he found a ready means of expressing stratigraphical trends in morphology, without having to resort to potentially indigestible statistics (e.g. (Figure 10.14)).

Eagar has used this methodology in other parts of the Westphalian with considerable success (e.g. Eagar, 1960, 1987). However, it was here in the lower Langsettian of Honley that the early breakthrough was made. It may thus be taken as the birth-place of Carboniferous non-marine bivalve palaeontology in its modern sense.

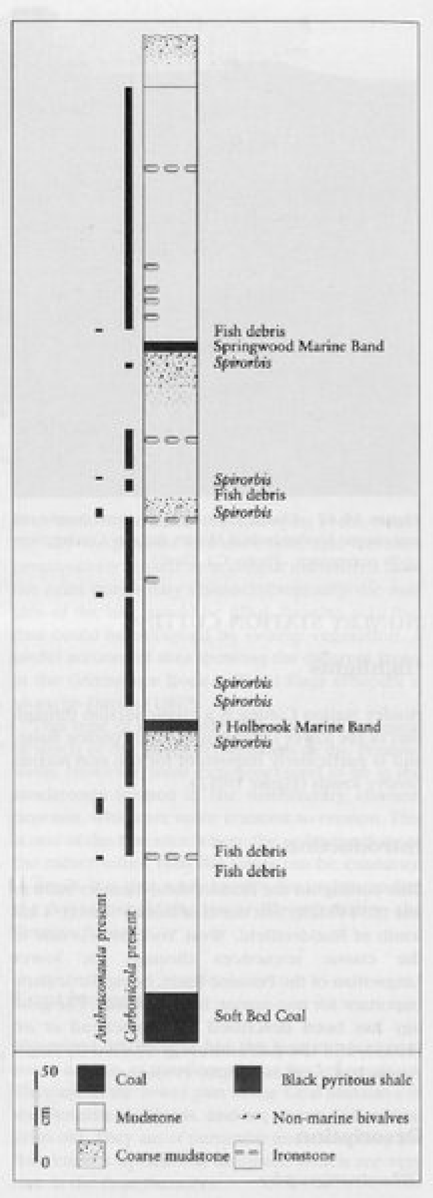
Conclusions

Honley Station Cutting is a classic exposure of fossiliferous Lower Coal Measures rocks, about 315 million years old. It was where some of the pioneering work was carried out on the influence of ecology on the morphology of freshwater bivalve shells, which has proved of great importance for using these fossils for establishing stratigraphical correlations of Coal Measures rocks.

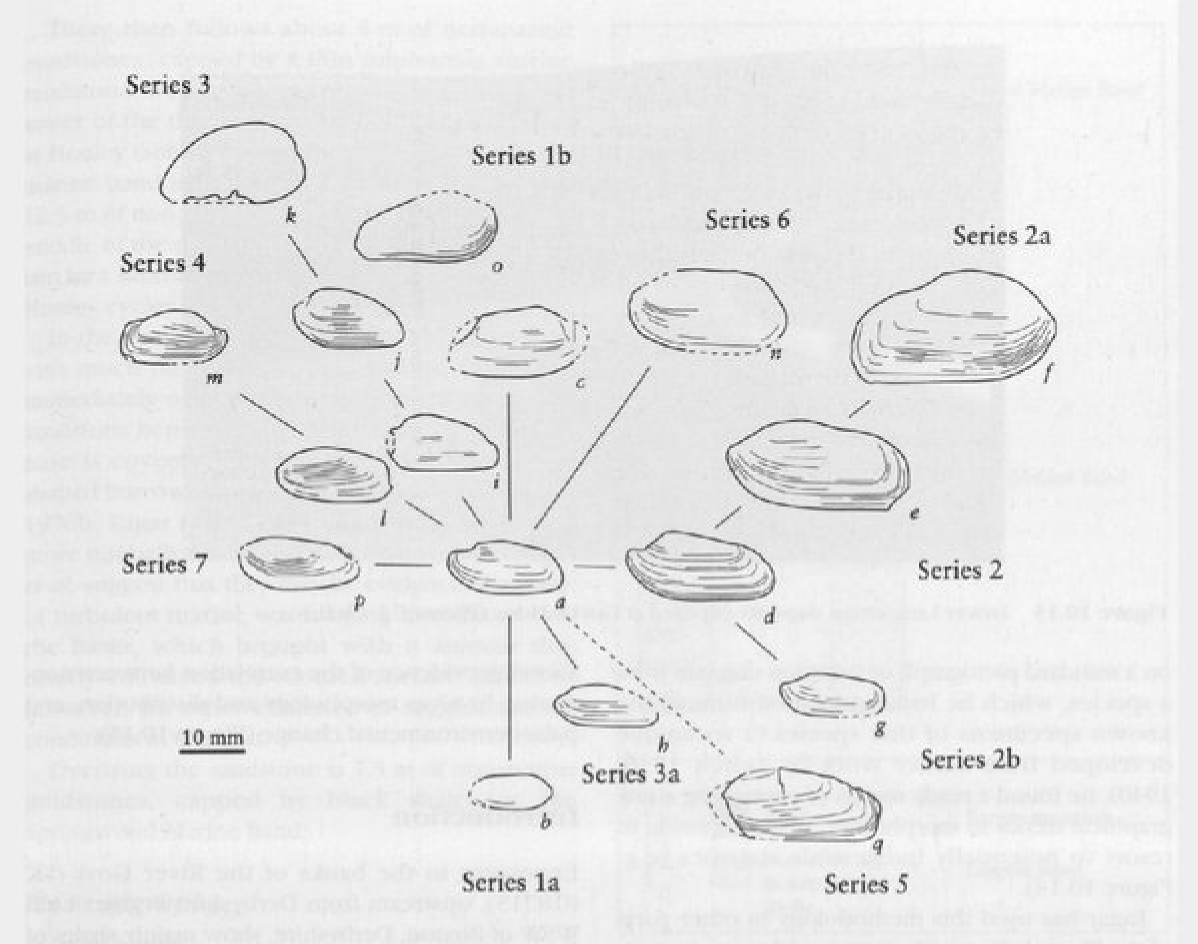
References



(Figure 10.12) Classic exposure of marine bands and non-marine bivalve beds at Honley Railway Cutting, now badly overgrown. (Photo: C.J. Cleal.)



(Figure 10.13) Sequence originally exposed at Honley Railway Cutting. Based on Eagar (1947, fig. 7c).



(Figure 10.14) Example of the type of pictogram developed by Eagar to express the variation in non-marine bivalve shells. This one represents the assemblage from a 0.6 m thick mudstone immediately overlying the Holbrook Marine Band. Based on Eagar (1947, fig. 8).