Goyt's Moss

Highlights

Goyt's Moss is an important exposure of lower Langsettian in the Pennine Basin, in particular for showing evidence of the correlation between non-marine bivalves morphology and distribution, and palaeoenvironmental change (Figure 10.15).

Introduction

Exposures in the banks of the River Goyt [SK 018 715], upstream from Derbyshire Bridge, 4 km WSW of Buxton, Derbyshire, show mainly shales of the lower Langsettian of the southern Pennine Basin. They are on the axis of the Goyt Syncline, one of a series of N–S trending structures that lie between Derbyshire Dome and the Cheshire Plain (Francis, 1967). The site was first described by Cope (1948). The field geology is described in detail by Eagar (*in* Broadhurst *et al.,* 1970) and Eagar and Broadhurst (1991), and the palaeontology has been dealt with by Eagar (1956), Hardy (1970b) and Eagar *et al.* (1985).

Description

Lithostratigraphy

A sequence about 18 m thick can be seen here (Figure 10.16). The lowest visible bed is a 1.5 m thick coal known as the Goyt's Coal, overlying about 1 m of seat earth. Although of poor quality, the coal has been worked in the past for lime burning, and there is a disused pit just to the west of the site. It is generally assumed to be the same as the Soft Bed/Bassy Mine coal seam that occurs extensively through the Pennine Basin.

There then follows about 4 m of non-marine mudstones, capped by a thin sulphurous marine mudstone. According to Eagar (1956), this is the lower of the three sedimentary cycles recognized at Honley (see above). In the north of the site, the marine band is conformably overlain by a further 12.5 m of non-marine mudstones, representing the middle of the cycles at Honley. This is in turn overlain by a sandstone, which cuts out the third of the Honley cycles.

In the southern part of the site, this sandstone cuts much further down into the sequence, and immediately overlies the lower marine band. The sandstone here is 0.2–0.3 m thick, and its erosional base is covered with horizontal or oblique '·11% shaped burrows known as *Rhizocorallium* (Hardy, 1970b; Eagar *et al.,* 1985). Such trace fossils are more normally associated with marine strata. Eagar *et al.* suggest that they may be evidence of a pulse of turbulent marine water being introduced into the basin, which brought with it animals that briefly colonized the scoured surface. There is, however, no other evidence to suggest marine conditions in this unit.

Overlying the sandstone is 7.5 m of non-marine mudstones, capped by black shales of the Springwood Marine Band.

Biostratigraphy

Marine bands

Only two beds in this sequence contain unequivocal evidence of marine or brackish conditions. The shale 4 m above the Goyt's Seam has only yielded *Lingula, Orbiculoidea* and rare *Gastrioceras. It is* assumed to be the Holbrook Marine Band, and is the only known locality where this band yields ammonoids. The shale near the top of the section has *Lingula, Posidonia* and *Caneyella,* as well as indeterminable ammonoids, and is probably the Springwood Marine Band.

Non-marine bivalves

The interval of shales ranging for 4 m above the Goyt's Seam has yielded numerous shells. They are mostly *Carbonicola fallax* Wright, *C. rectilinearis* Trueman and Weir, *C. pilleolum* Eagar and *Curvirimula* sp. (Eagar *in* Broadhurst *et al.,* 1970), and are very similar to the assemblage reported from the lower cycle at Honley. However, there is also a 25 cm silty mudstone band containing *C.* aff. *protea* Wright and *C.* aff. *discus* Eagar, which is unknown elsewhere at this particular stratigraphical level.

Immediately above the marine band, anthraconaioid shells predominate, but then give way to *Carbonicola artifex* Eagar and C. aff. *declinata* Eagar (Eagar *in* Broadhurst *et al.,* 1970). This thus follows the general sequence seen in the lower part of the middle cycle at Honley. About 3.5 m above the marine band, very slightly coarser-grained strata have yielded *Anthraconauta* sp. and is thought to be the *C. discus* Band recognized elsewhere in the middle cycle; *C. discus* Eagar itself does not occur here, however.

The strata between the unconformable sandstone and the Honley Marine Band has also yielded diverse bivalve assemblages, and the 2.5 m of shale immediately above the sandstone has been studied in particular detail by Eagar (1956). He was able to recognize three major groups, which probably represent distinct biological species, and which he referred to as *Carbonicola obliqua* Wright, C. sp. nov. cf. *bipennis* (Brown), and *C. artifex* Eagar. On the whole, individual bedding planes were found to only contain one or other of these groups, although they could be so closely spaced that a thickness of only 1 cm of shale might contain more than one group. *C. obliqua* and *C.* cf. *bipennis* assemblages occur in approximately equal proportions at the base of this interval, but the *C.* cf. *bipennis* progressively declines to only about 3% at the top. The smaller-shelled C *artifex* in contrast occur intermittently throughout the succession. The most noticeable change within the groups was in *C. obliqua,* which had a more curved ventral margin in the pyritous shales at the top and bottom of the interval.

Interpretation

This is an important exposure in the lower Langsettian of the Pennine Basin, being one of a set of sites used in Eagar's now classic studies on the palaeoenvironments of these strata, and their link with non-marine bivalve morphology and thus biostratigraphy. Although not as complete as that present at Honley Station Cutting, with part of the succession being cut out by unconformity, the exposure is significantly better at Goyt's Moss. It provides a useful adjunct to that site, confirming the widespread distribution of the lower and middle sedimentary and faunal cycles seen there. It also shows the cycle immediately underlying the Honley Marine Band, which is not visible at Honley Station Cutting. Although involving different species of bivalve, Eagar (1956) has been able to demonstrate similar trends in morphology in this higher cycle to those seen in the two cycles immediately overlying the Soft Bed–Bassy Mine. In particular, there seems to be a correlation between marine influence and the curvature of the ventral margin of the shells.

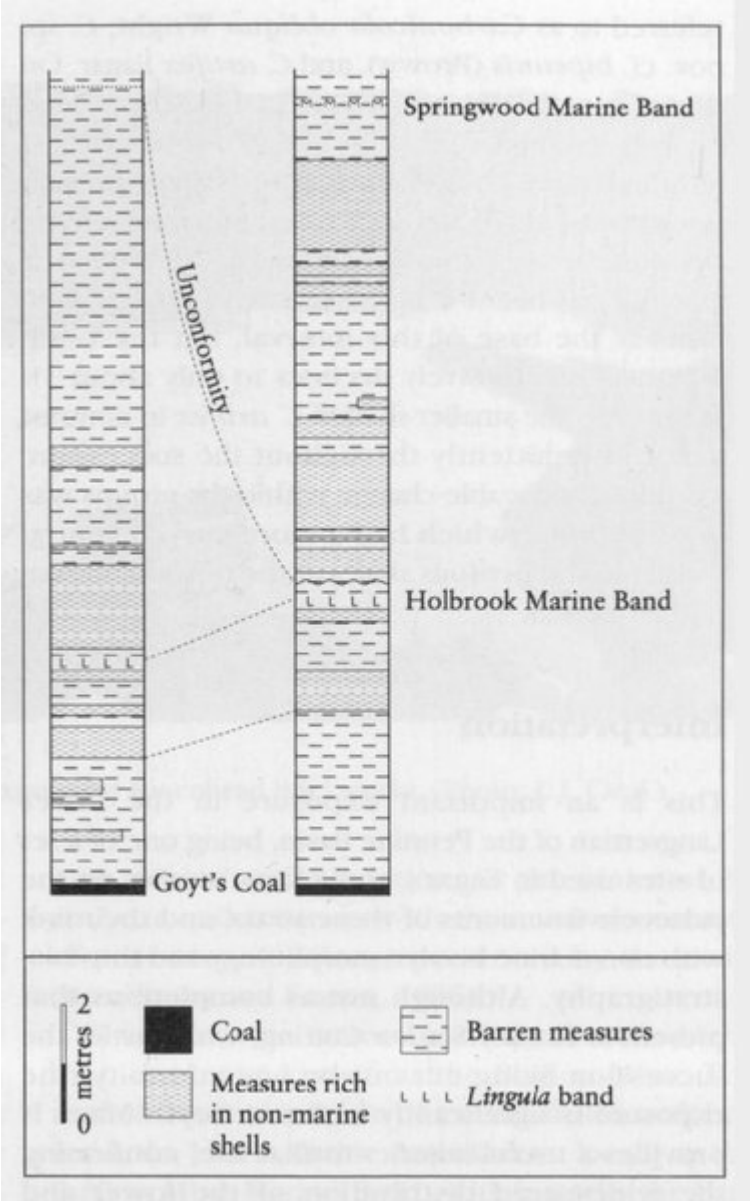
At many of the other sites showing the sequence immediately overlying the Soft Bed and Bassy Mine, it has been possible to correlate the changes in shell morphology with the grain size of the sediment. In the upper cycle at Goyt's Moss, however, the morphological changes observed in the upper cycle did not seem to be linked with any significant lithological change. It thus points to the potential of the non-marine bivalves for revealing environmental changes within the Productive Coal Formation which might not be recognizable using other means.

Conclusions

Goyt's Moss is an important exposure of Lower Coal Measures rocks in the Pennine Basin. They were deposited during what geologists call the Langsettian Age, about 310 million years ago, in the lower part of a river delta. The sequence consists of alternating marine and non-marine deposits, reflecting periodic floodings of this part of the delta, due to variations in sea-level. Evidence from here has proved to be of considerable importance for understanding the influence of these environmental changes on the freshwater bivalves that were living in the delta, and whose fossilized remains have proved to be of considerable importance to geologists for helping establish stratigraphical correlations.

References

(Figure 10.15) Lower Langsettian deposits exposed at Goyt's Moss. (Photo: C.J. Cleal.)



(Figure 10.16) Sections through strata immediately overlying the Goyt's Coal at Goyt's Moss. Based on Eagar and Broadhurst (1991, fig. 7).