Hylton Castle Cutting

[NZ 3594 5862]–[NZ 3611 5888]

Highlights

This small road cutting provides the best and most readily accessible exposure of the lower core of the shelf-edge reef of the Ford Formation. The rock is almost entirely of dolomite and comprises an apparently haphazard crudely-bedded assemblage of masses of hard reef-rock separated and surrounded by shelly rubble; ?algal encrustations are widespread in the hard reef-rock, and steeply dipping ?algal sheets occur in a number of places.

Introduction

The cutting accommodates Rotherfield Road near Hylton Castle, in the north-western outskirts of Sunderland, and was dug in 1955; it exposes about 15 m of exceptionally varied reef dolomite of the Ford Formation, mainly of the lower reef-core facies, and was recorded in detail by the writer (Smith, unpublished Geological Survey fieldnotes, 1955). Preliminary excavations below the floor of the cutting and nearby sewer trenches revealed that the reef-rocks in the cutting were underlain by a typical highly fossiliferous basal coquina.

Large collections from the excavations and cutting led to long fossil lists by Pattison (unpublished Geological Survey report, 1966). More recently, additional collections from the cutting by Hollingworth (1987, table 4) were used (with other data) in his reconstruction of the lower reef-core palaeocommunity (1987, fig. 6.12) which was reproduced by Hollingworth and Pettigrew (1988, fig. 8) in a palaeontological account of the cutting (their locality 1, pp. 40–44). This reconstruction was also reproduced by Hollingworth and Tucker (1987, fig. 5).

The GCR site is at the side of a public highway and great care should be taken both to minimize the risk of personal injury and to avoid causing inconvenience or danger to passing traffic.

Description

The position of the site and of its geological features (including some that are now no longer visible) is shown in (Figure 3.21). The rock face in the cutting is about 120 m long and up to 6 m high and its base rises north-eastwards by about 15 m; in conjunction with former excavations below road level, a section about 20 m thick was exposed, and further information was gained from a number of deep manhole shafts.

The present exposures are mainly in the north wall of the cutting and comprise an extremely varied complex of masses of autochthonous dolomite boundstone, many draped by laminar (?algal) sheets, separated by lenses and pockets of shelly, rubbly reef debris; from a distance the rock has a crude, low-dipping bedded appearance of a type generally found in the reef-flat sub-facies high in the reef and uncommon at this low level in the reef. The boundstone masses are irregular to compressed subspherical in shape (though many are poorly defined) and are commonly 0.5–1 m across (exceptionally 2.5 m); some are concentric; they are composed of dense, hard, cream-buff, finely crystalline dolomite with a sparse bryozoan–brachiopod fauna and widespread (but patchy) concentric ?algal encrustations which in places make up most of the rock. The laminar dolomite sheets are up to 0.3 m thick and some are vertical for 1 m or more; most appear to be contemporaneous coatings of boundstone masses, but some have hints of a bilateral structure and could be fissure-fill. The rubbly pockets between the boundstone masses make up a small to large proportion of the reef according to locality and comprise cream-buff, dolomitized shell debris and fine bryozoan boundstone detritus; concentric ?algal coatings are uncommon.

Hollingworth (1987) made large collections of fossils from a patch of 'laminated boundstone' near the middle of the exposure [NZ 3600 5885] and from 'shelly dolomicrite' (?rubble) near the northeastern end [NZ 3610 5887] and found striking differences in the faunal assemblages. The fauna of the boundstone (Hollingworth, 1987, pp. 198–201, table 4A;

Hollingworth and Pettigrew, 1988, p. 41 and fig. 7) comprised only seven genera dominated by a framework of encrusted fenestrate bryozoans (*Synocladia, Acanthocladia* and *Fenestella,* together comprise 70% of the fauna) with an interstitial fauna of small bivalves and brachiopods. In contrast, the shelly rubble contained 15 genera, with conical *Fenestella* (24%) dominating the fenestrate bryozoans (total 36%) and with abundant brachiopods and bivalves (Hollingworth, 1987, pp. 201–202, table 4B; Hollingworth and Pettigrew, 1988, pp. 41–44 and fig. 7). These were the data used, in combination with information from Humbledon Hill and the Tunstall Hills site, in Hollingworth's (fig. 6.12) reconstruction of the lower reef-core palaeocommunity.

The petrography of the reef-rock in the cutting has been examined by G. Aplin (pers. comm., 1990), who reports evidence of early marine botryoidal cements that have since been dolomitized, and hints of possible primary dolomite cements; Dr Aplin also notes local evidence of brecciation associated with patches of calcite-replaced dolomite, and some uplift-related calcite cements.

The great lateral and vertical variability of the reef dolomite in the cutting was also a feature of reef dolomite temporarily exposed in nearby sewer trenches (see (Figure 3.21) for location) which exposed up to 4 m of unpredictably mixed boundstone and shelly rubble (Smith, unpublished Geological Survey fieldnotes, 1955). As in the main cutting, algal encrustations and lamellar drapes were seen to be extremely patchy.

The basal reef coquina is no longer exposed in the Rotherfield Road Cutting, but was seen in 1955 in temporary excavations below road level at the junction of Rotherfield Road and Washington Road and also, at a slightly lower level, in a WNW–ESE sewer trench [NZ 3593 5879]– [NZ 3601 5875] on the opposite (south) side of Washington Road (Figure 3.21). The rock exposed in these excavations was a pale cream accumulation of well-preserved brachiopods and bivalves, with relatively few bryozoans and no recognizable algal encrustations (Pattison, unpublished Geological Survey report, 1966); it was only weakly cemented and contained relatively little bioclastic sand matrix. The coquina in the trench was underlain by bedded, finer-grained, sparingly shelly, cream dolomite, possibly of the Raisby Formation.

Interpretation

The importance of the reef exposure in the road cutting near Hylton Castle stems from its fossil content and its use by Hollingworth (1987, fig. 6.15) in his reconstruction of the lower reef-core palaeocommunity. The exposure is the most northerly of the GCR sites in the shelf-edge reef of the Ford Formation, the others being located at uneven intervals along the reef outcrop as far south as Horden Quarry. See the accounts of the Humbledon Hill, Tunstall Hills and Hawthorn sites for further discussion.

The most noteworthy and somewhat atypical feature of the reef-rocks here is their great variability, which is of a similar order throughout the length of the cutting and also in the nearby temporary trench exposures. The tendency of parts of the reef to be composed of small to medium-sized masses of encrusted algal-bryozoan boundstone separated and surrounded by shelly rubble has been noted at a number of exposures, especially in the road cutting adjoining the Humbledon Hill site, but is unusually clear here; the variability of the reef-rock is an expression of the varied ratio of boundstone to rubble, which appears to be random apart from the strong hint of roughly horizontal bedding. The abundance of ?algal encrustations on bryozoan and other frame elements is also unusual at this relatively low level in the reef, and prompts the question of whether a concentrated reef sequence might be present here; this in turn poses the question of whether the faunal assemblages here might not be fully representative of low-reef faunas as a whole.

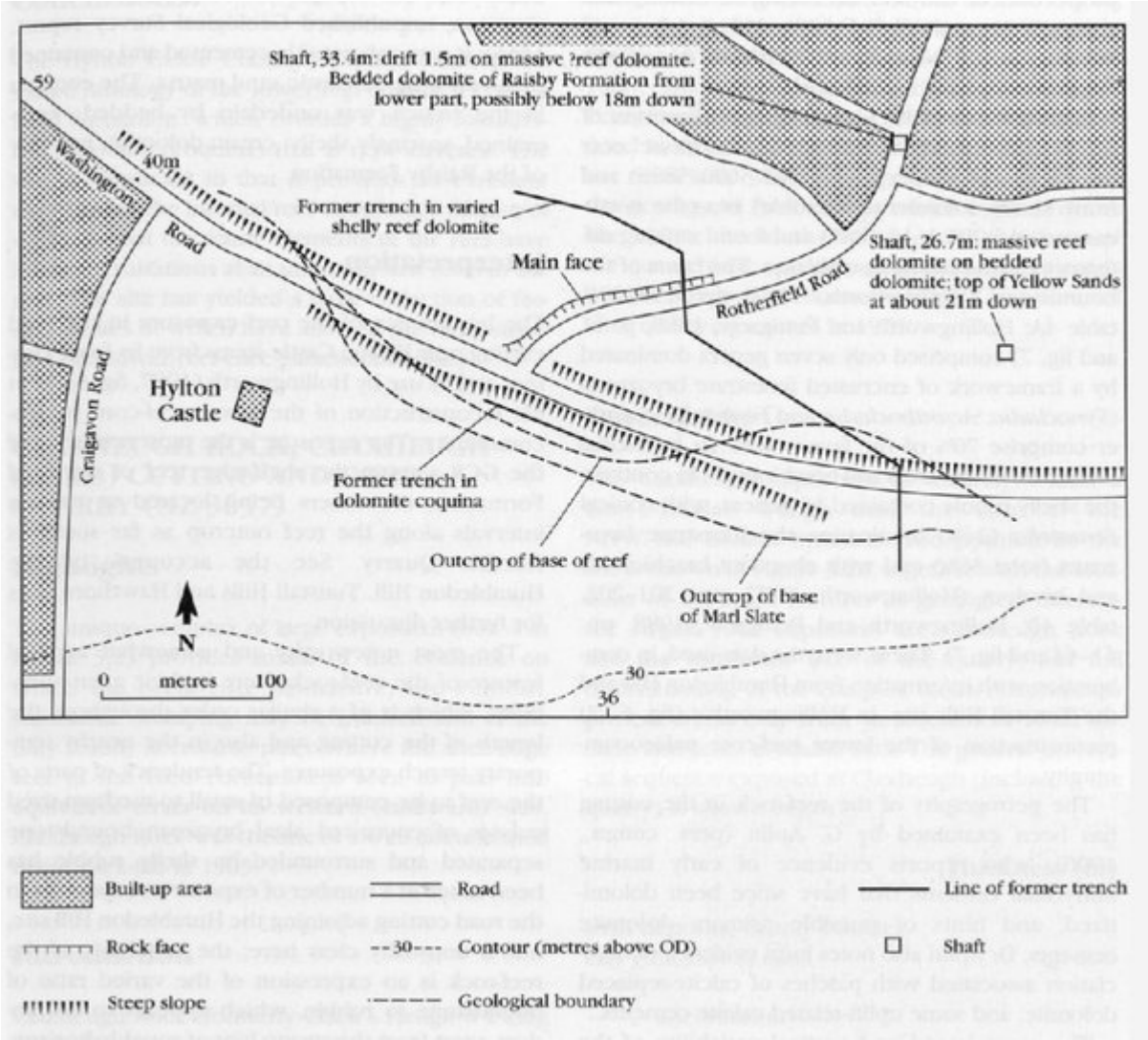
Future research

The Rotherfield Road Cutting, having been examined by Hollingworth (1987), appears to offer little immediate scope for further detailed research. It remains an excellent and convenient place where the internal structure of the shelf-edge reef may be examined, and from which the abundant and varied fauna may be collected.

Conclusions

The Hylton Castle Cutting GCR site exhibits the varied lithology of the lower reef-core facies of the Ford Formation, which overlies a highly fossiliferous dolomite (coquina) that is now covered. The site is significant in that it provides an excellent exposure of the internal reef structure, a feature of which is that the frame elements of the reef have ?algal encrustations at an unusually low level in the reef. The site has yielded a large collection of fossils, studies of which have allowed the reconstruction of a lower reef-core palaeocommunity.

References



(Figure 3.21) Hylton Castle (Rotherfield Road) Cutting and its immediate surroundings, showing the main features of geological interest.