BETTON FARM

J.K. Wright

OS Grid Reference: TA00208565and TA00158555

Introduction

The Betton Farm site comprises two adjacent disused quarries situated either side of the A170, approximately 1 km north-east of East Ayton (Figure 4.20). The exposures occur at the south-eastern extremity of the Tabular Hills, and were first described byBlake and Hudleston (1877) and Hudleston (1878). The site has been visited twice during Geologists' Association field meetings (Wilson, 1934, 1954) and is listed in a field guide bySylvester-Bradley (1953). These exposures figure conspicuously in the valuable thesis ofLee (1971) concerning the 'Coralline Oolite Formation east of Newtondale', and are discussed in the overall review of Corallian stratigraphy in Yorkshire by Wright (1972). Brief mention of the exposures also occurs in Hemingway (1974) and Kent (1980b), and descriptions of one of the sections were given by Rawson and Wright (1995, 2000).

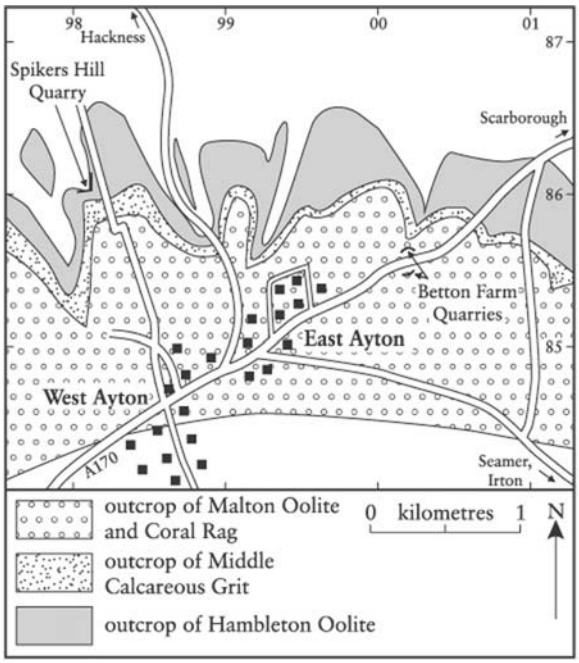

Figure 4.20: Locality map of the Betton Farm and Spikers Hill GCR sites. Geological outcrops from BGS Sheet 54 (Scarborough) (1998).

Description

The quarry north of the road has recently been cleaned up, while that south of the road remains overgrown at the time of writing. This account is thus largely based on the exposures in the northern quarry. The following section is taken fromRawson and Wright (2000).

		Thickness (m)
Coralline Oolite Formation, ?Maltonense Subzone		
Malton Oolite Member		
2	Shelly oomicrite containing fragmentary corals, echinoid spines, bivalves and gastropods, and with large isolated masses of *Thamnasteria* up to 1 m across (= Betton Farm Rag, Figure 4.3)	1.5
1	Well-bedded to massive, very poorly sorted oolite containing *Bourguetia striata* (J. Sowerby)	2.2

The chief interest of the exposure is in Bed 2 (Figure4.21), which is extremely variable in nature. Around the outside of the masses of *Thamnasteria* is a densely packed oolite–coral–shell sand with abundant abraded fragments of massive corals. In between the coral stacks is a shelly, coralliferous oomicrite with abundant delicate coral fragments including *Rhabdophyllia*, together with delicate bivalves, and abraded coral fragments. The oomicrite of Bed 2 is thinly bedded, and is seen to pass laterally into massive coral, which was growing as the sediment around it accumulated. The coral masses are then overlain by poorly sorted oosparite that infills borings and crevices in the top surface of the corals.Wilson (1934) recorded from this quarry *Thamnasteria concinna* (Goldfuss), *Lithophaga inclusa* (Phillips), *Chlamys nattheimensis* (de Loriol), *Nanogyra nana* (J. Sowerby), *Bourguetia striata* and '*Cidaris' smithi* Wright.

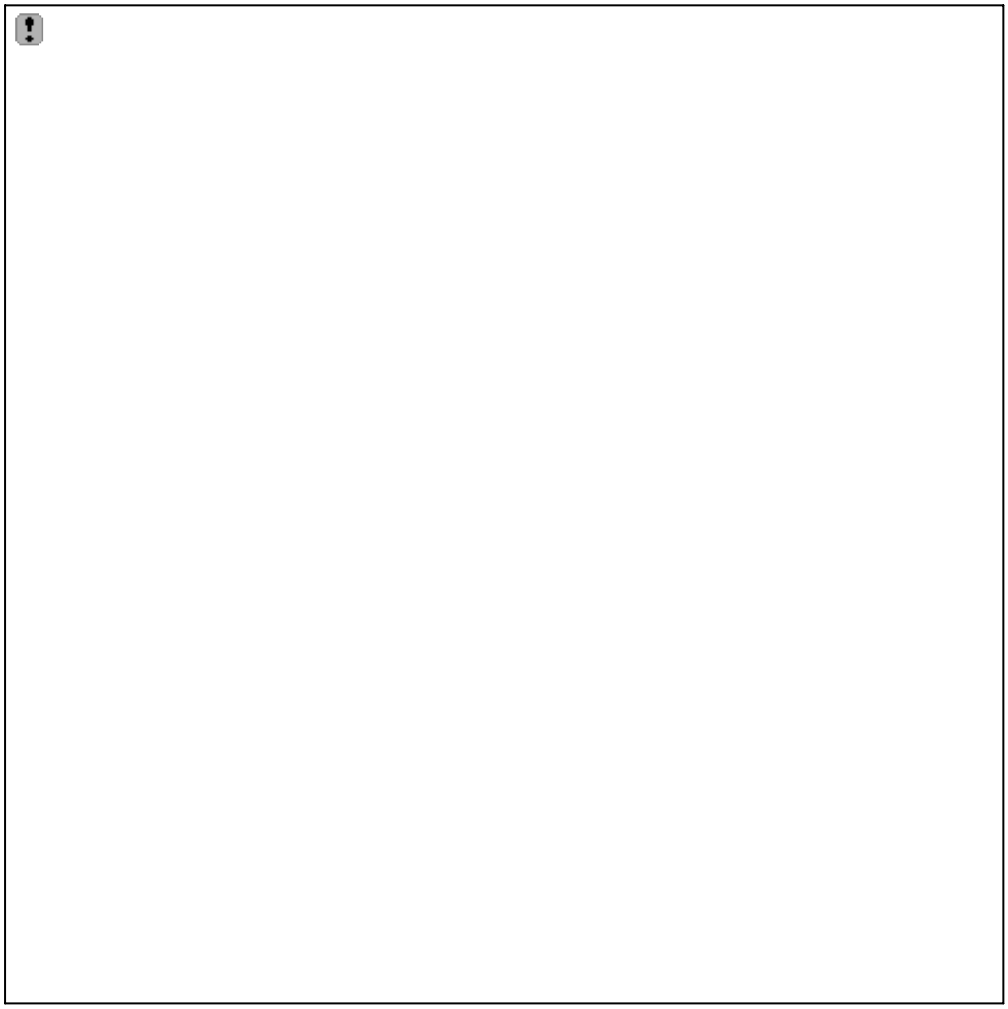

Figure 4.21: View of Betton Farm Quarry (north) showing rounded masses of Thamnasterian reef coral above the hammer (30 cm) resting on oolite (Malton Oolite). (Photo: J.K. Wright.)

Coralliferous facies very similar to that of the shelly limestones surrounding the coral stacks at Betton Farm can be traced from Seamer to Brompton, and have been envisaged as filling a 'channel' (Wilson, 1934; Kent, 1980b). Blake and Hudleston (1877) gave a comprehensive faunal list from the half dozen or so quarries that formerly exposed this bed, including Betton Farm. An updated version of this list is as follows:

Bivalvia:

Liostrea sp. *Nanogyra nana Lopha gregarea* (J. Sowerby)

Chlamys nattheimensis Camptonectes lens (J. Sowerby)

Velata anglica Arkell

Lima rigida (J. Sowerby)

Isognomon promytiloides Arkell

Navicula quadrisulcata (J. de C. Sowerby)

Barbatia pectinata (Phillips)

Cucullea contracta Phillips

Astarte subdepressa Blake and Hudleston

Astarte ovata Smith

Myochoncha texta (Buvignier)

Pseudomonotis ovalis (Phillips)

Lithophaga lycetti (Whiteaves) (holotype)

Lithophaga inclusa

Gastropoda:

'Natica' arguta Phillips

Cerithium inornatum Buvignier *Cerithium limaeformis* Roemer

Cerithium humbertinum Buvignier *Nerinea fusiformis* d'Orbigny

Nerinea fasciata Voltz *Nerinea visurgis* auct. *non* Roemer

'Littorina' muricata (J. Sowerby)

Turbo funiculatus Phillips

Pseudofissurella corallensis (Buvignier)

Trochus aytonensis Blake and Hudleston

Bourguetia saemanni Ditremaria tornatilis (Phillips)

Pseudomelania heddingtonensis (J. Sowerby)

Brachiopoda:

'Terebratula' kingsdownensis auctt

Echinodermata:

'Cidaris' smithi Hemicidaris intermedia (Fleming)

Anthozoa:

Thamnasteria concinna Rhabdophyllia phillipsi Edwards and Haime

Interpretation

It has been a matter of contention for 120 years whether the Betton Farm section lies within the Malton Oolite, or whether it represents the true Coral Rag. Stratigraphically, all that can be

said of the exposure is that it occurs somewhere in the upper part of the Coralline Oolite Formation, between the Middle and Upper Calcareous Grits, neither of which is exposed in the vicinity. The Betton Farm Rag must be correlated with exposures elsewhere by means of its fauna and lithology. Hudleston (1878) was the first to compare critically the faunas and lithologies at Betton Farm with those seen in the Coral Rag throughout the Cleveland Basin. The arguments can be presented as follows.

In the western, southern and eastern parts of the Cleveland Basin, the true Coral Rag consists of a framework of massive and phaceloid corals preserved in a shelly, micritic matrix. This reef facies frequently rests on a coral–shell bed, and this on Malton Oolite (see site report forWath Quarry, this volume). There was no return to oolitic facies, and Upper Calcareous Grit rests on a bored, erosive surface of Coral Rag at several localities (see site report forNewbridge, this volume). The principal developments of corals in Yorkshire are in the Coral Rag and in the Hackness Coral–Sponge Bed. Frequently during deposition of the Hambleton and Malton Oolites, however, there was a localized development of coralliferous horizons resulting in masses of *Thamnasteria* up to 1 m across being preserved in oolite. One such structure in the Hambleton Oolite is described by Rawson and Wright (2000, pp. 86, 87). In these beds the fauna other than corals is reduced compared with the true Coral Rag. In particular, spines of the echinoid *Paracidaris florigemma* (Phillips) are absent. These are so common in the true Coral Rag that Hudleston (1878) used the term *florigemma*-Rag, and proposed a zone of *Cidaris florigemma*. *Paracidaris florigemma* has not been recorded at Betton Farm, leading to the conclusion that the 'Coral Rag' at Betton Farm does not represent the true Coral Rag, but is simply a coralliferous facies of the Malton Oolite.

The idea, first put forward by Hudleston (1878), that the Antecedens Subzone Malton Oolite passes into coralliferous facies in the Seamer–Ayton–Brompton area now seems firmly established. Wright (1972) suggested on ammonite evidence that the Betton Farm Rag was older than Coral Rag elsewhere. Evidence from the Betton Farm section supports this view, in particular the fact that oolite overlies the coral masses. True Coral Rag should be sought higher up (Figure 4.3), and, in fact, 6 m of massive thamnasterian reef were recorded byWilson (1931) from the Irton Borehole only 1.5 km away. This lay immediately beneath the Upper Calcareous Grit, and was clearly the Coral Rag *sensu stricto*, coming in at a horizon some distance above the present section.

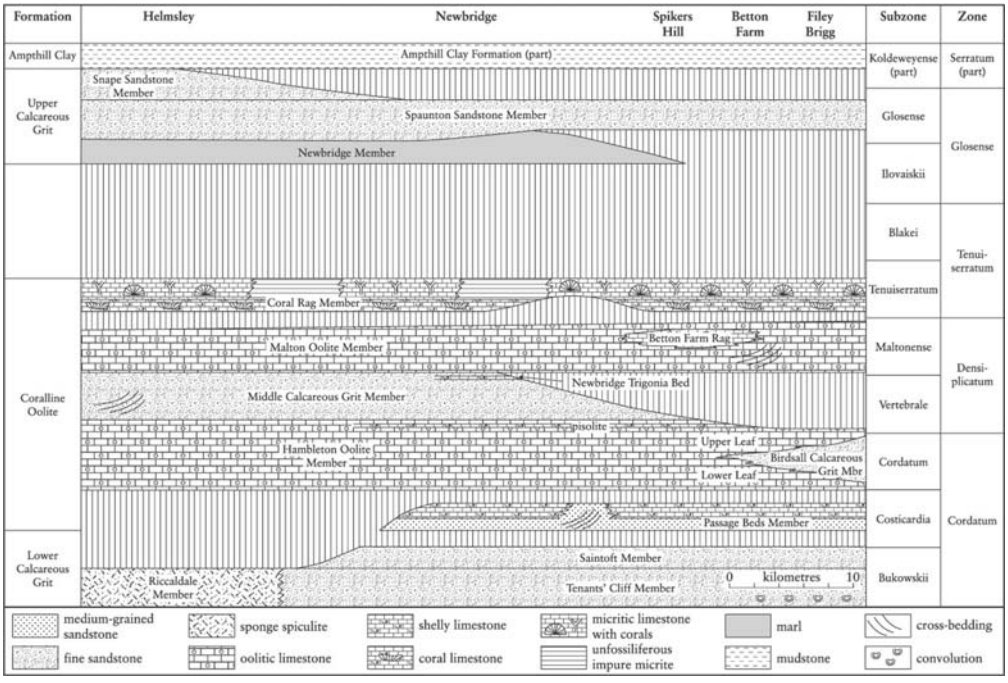

Figure 4.3: Stratigraphical cross-section of the Yorkshire Corallian Group on the north side of the Vale of Pickering from Helmsley to Filey (after Rawson and Wright, 1995, fig. 15).

Conclusions

The Betton Farm quarries show the best example of *Thamnasteria* patch reefs in the Yorkshire Corallian, with a rich associated molluscan fauna, notably gastropods, occurring both in and around the reefs. This is an important palaeoecological locality in the classic Yorkshire Corallian.

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