Spikers Hill

[SE 980 863]

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Introduction

Spikers Hill Quarry is a large limestone quarry currently being operated by Marshall's Stone Company Ltd. It lies about 6 km west of Scarborough and 1.5 km north of the village of West Ayton (Figure 4.20). It occupies a narrow spur of rising ground separating Forge Valley from Yedmandale. The principal area of interest is in the most recently worked southern part of the quarry where there is a roughly E–W-trending vertical face, with stepped ledges above (Figure 4.22). Though the quarry is clearly marked on maps dated 1950 and earlier, the first description of this site was published by Wright (1972). The quarry figured prominently in the thesis of Lee (1971), and reference has been made to the section in Hemingway (1974) and Kent (1980b). A revised description was given by Rawson and Wright (1995). Several ammonites from the quarry were figured by Wright (1997), and see (Figure 4.5)J, K.

Description

The quarry, when first opened, revealed a small section in white, unfossiliferous oolite. However, when Wright and Lee visited the site in the late 1960s, the operations had expanded and deepened the pit considerably to expose a fine section through more than 19 m of Lower and Middle Oxfordian strata belonging to the Cordatum and Densiplicatum zones, and Wright (1972) published a measured section. The quarry has been extended and deepened further in recent years, revealing previously unexposed strata at both top and bottom of the section. The revised section given below is from Rawson and Wright (1995), these authors introducing Bed '0' to encompass the newly exposed lowest beds.

	Thickness (m)
Coralline Oolite Formation	
Malton Oolite Member, ?Maltonense Subzone	
7. White, flaggy oolite	seen to 1.0
6. Flaggy, shelly oolite, largely oosparite but passing into oomicrite. Contains many whole bivalves and gastropods, including *Gervillella aviculoides* (J. Sowerby), *Myophorella* sp., *Chlamys* sp., *Nanogyra nana* (J. Sowerby), *Pseudomelania beddingtonensis* (J. Sowerby), *Nucleolites scutatus* Lamarck and *Cardioceras* sp.	0.25
— erosion surface —	
Middle Calcareous Grit Member, Vertebrale Subzone	
5. Fine-grained, argillaceous sandstone, thick bedded below, becoming flaggy, calcareous and oolitic above. Occasional bivalve fragments present	1.17
Hambleton Oolite Member	
4. Flaggy, impure, sandy oomicrite with an abundant fauna: *Cardioceras* (*Cardioceras*) aff. *cordatiforme* (S. Buckman), *C.* (*Scoticardioceras*) *excavatum* (J. Sowerby) (common), *C.* (*Subvertebriceras*) *zenaidae* Ilovaisky (common), *C.* (*Vertebriceras*) ex gr. *vertebrale, C.* (*Plasmatoceras*) *popilianiense* Boden *and Aspidoceras* sp., with *Pleuromya uniformis* J. Sowerby, *Trichites ploti* (Lluyd), *Lopha gregarea* (J. Sowerby), *G. aviculoides, Isognomon sp., Camptonectes lens* (J. Sowerby) *, Cerithium* sp. and N. scutatus	0.15
3. White, micritic oolite containing small colonies of *Thamnasteria concinna* (Goldfuss)	0.9

2. Blue, unoxidized, non-oolitic limestone with algal pisoids (oncoids), abundant abraded shell fragments and occasional *Perisphinctes* (*Arisphinctes*) aff. *cotovui* Simionescu	2.45
Cordatum Subzone	
1B. Thick-bedded, white oolite, with two, minor, blue-grey bands at 4 m and 9.5 m. The fauna, apart from frequent *G. aviculoides,* is sporadic: *Thamnasteria* sp., *Cardioceras* sp. and *Goliathiceras* (*Pachycardioceras*) *nitidum* Arkell	12.7
Passage Beds Member, Costicardia Subzone	
1A. Fine-grained, very poorly sorted, shelly oolite containing '*Tentacrinus*'ossicles and *Perisphinctes* sp.	1.8
'0' Massive, bioclastic limestone in three beds separated by iron-rich bands. *Chlamys fibrosus* (J. Sowerby), *Liostrea* sp. and *G. aviculoides* are common. The limestone becomes increasingly coarse grained and shelly upwards, with nests of *N. nana*, and numerous abraded fragments of massive and solitary corals and sponges	seen to 2.1

A log of the quarry face is given in (Figure 4.23). The Passage Beds (Bed '0' and Bed 1A) are very fossiliferous, with fragments of *Fungiastraea, Thecosmilia* and *Rhabdophyllia* recognizable among the coral debris, though the clasts rarely exceed 3 mm. Bed 1A is a poorly sorted, immature oolite, with scattered coral fragments and '*Tentacrinus*'ossicles, and is coarsely shelly at the base; it was grouped with the Passage Beds by Wright (1992). The 16 m thick Hambleton Oolite succession is largely represented by white, thickly bedded oolite lithologies (Figure 4.22). Bed 2, 16.5 m above the base of the quarry, is a distinctive 2.4 m thick algal pisolite or oncolite (the 'Blue Course' of Lee, 1971). It is clearly seen in (Figure 4.22). The highest Hambleton Oolite, Bed 3 and Bed 4, marks a return to ooid sedimentation. Bed 4 has yielded most of the significant ammonites collected from the quarry. The Middle Calcareous Grit rests conformably on the Hambleton Oolite. It is unusually thinly developed, and poorly fossiliferous. Extended working of the upper levels of the quarry has exposed the lowest 1.25 m of fossiliferous Malton Oolite, resting with a bored erosion surface on Middle Calcareous Grit.

Interpretation

The Passage Beds at Spikers Hill are present in a facies marginal to the Hackness coral reef which was situated to the north (see (Figure 4.19) and site report for Hackness Head, this volume). Large amounts of coral, sponge, echinoid and bivalve debris were washed off the reef and accumulated as a fringing mass of bioclastic sand that runs through the Tabular Hills from Giverndale to Scarborough, a distance of 15 km (Figure 4.19).

Bed 1A is believed to represent the *Pentacrinus* biosparite (Subdivision 4 of the Passage Beds) of Wright (1992). A common feature of almost all specimens from this unit is that they are very poorly sorted, forming a chaotic jumble of shell fragments, coral clasts and '*Pentacrinus*' ossicles both abraded and unbroken, with ooids and oncoids of all sizes. The constituents that make up this sediment came into existence in a variety of separate environments. '*Pentacrinus*' attached itself to a hardground with clasping cirri as part of the fixosessile benthos. The ooids formed on turbulent

beaches or in tidal channels, and the oncoids in gently agitated, shallow-water conditions. The bivalves would have lived both here and on the stable shelf away from the surf zone. The coral fragments and clasts formed in the surf zone fringing relict masses of reef rock.

Elements from all these varying facies have been brought together to rest upon the hardground that forms the top of the Coral–Sponge Bed and surrounding sediments. The bringing together of all these disparate elements into one ill-sorted bed can best be explained as the result of a major storm sweeping together this mass of clasts and bioclasts into one storm deposit or tempestite. Such beds are best recognized by their internal structures, seen particularly well at Spikers Hill. Typical grading is present, with coarse, shelly oolite overlain by finer-grained oolite. Infiltration fabrics in the shelly oolite show sparry calcite infilling voids beneath upturned bivalve shells, a very typical tempestite feature (Kreisa and Bambach, 1982).

The pure, white oolite of the Hambleton Oolite contrasts with the 10.5 m equivalent sequence at Filey Brigg, which is markedly arenaceous there due to the incursion of the Birdsall Calcareous Grit. There is no indication of this sandy facies at Spikers Hill. A small amount of cross-bedding suggests the presence of nearby intertidal ooid shoals.

The oncolite or 'Blue Course' (Lee, 1971, Bed 2) is not only laterally persistent within the quarry, but also maintains the same stratigraphical position (basal Vertebrale Subzone) over a distance of 40 km across the Corallian outcrop from Helmsley in the west to Spikers Hill in the east (Hemingway and Tkvombley, 1964; Wright, 1972). The unit represents an excellent marker band, and is considerably thicker at this site than elsewhere. The fine-grained nature of the matrix of this bed has led some authors to propose a lagoonal origin for such oncolites. However, the frequent occurrence of ammonites implies a good connection to open marine conditions.

The Middle Calcareous Grit is more thickly developed between Helmsley and Pickering in the west, where it consists of 12–14 m of largely decalcified sandstone with an ooidal bed, the Newbridge Trigonia Bed (Coe, 1995), near the top. The member is thinly developed throughout the Yedmandale and Forge Valley areas, consisting of 1.2 m of yellow sandstone both at Spikers Hill and at White Quarry, 1 km ESE of Spikers Hill (Wright, 1972). The Irton Borehole, 4 km to the south-east, revealed only 0.3 m of sandstone between the Hambleton Oolite and the Malton Oolite (Wilson, 1931). The bored surface below the Malton Oolite at Spikers Hill suggests that the reduction in thickness of the Middle Calcareous Grit eastwards from Pickering is due to erosion beneath the Malton Oolite, and not to lateral facies change as was previously thought (Wright, 1972).

Ammonites are rare in the lower beds, but the *Goliathiceras nitidum* from Bed 1B is characteristic of the Cordatum Subzone. Bed 2 has yielded two valuable perisphinctids, and these, together with a specimen of *Cardioceras* (*Subvertebriceras*) *denstplicatum* Boden, the lowest Boreal Middle Oxfordian zonal index, found at nearby Wykeham Quarry (Wright, 1972), firmly date Bed 2 as Vertebrale Subzone.

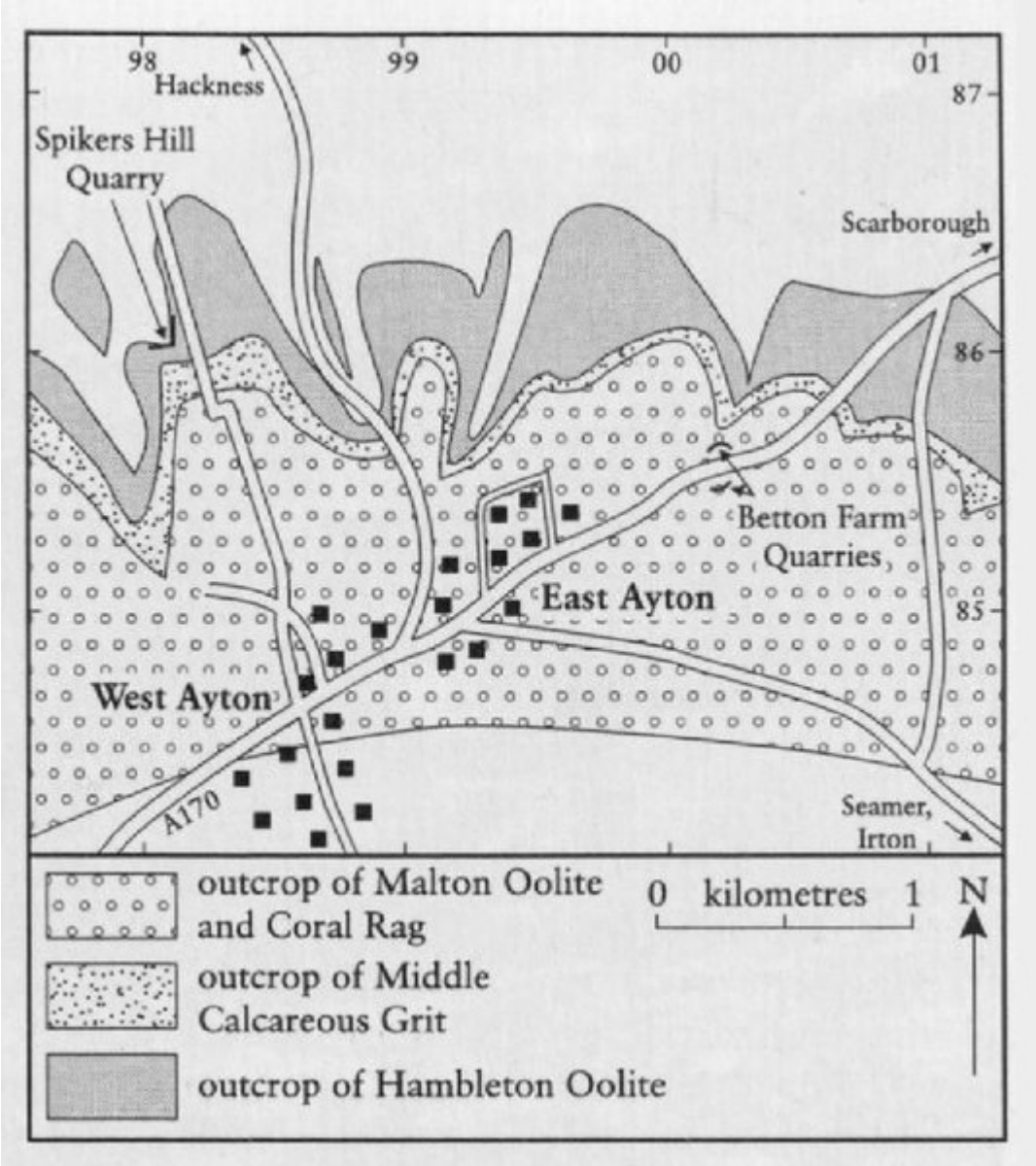
Bed 4 has yielded an excellent cardioceratid fauna ((Figure 4.5)J, K), with only one perisphinctid, and marks a revival of the Cardioceratidae. This bed also lies within the early Vertebrale Subzone, however, because the cardioceratids predominate: in the later Vertebrale Subzone of the Oxford area (see site report for Dry Sandford, this volume), perisphinctids and cardioceratids are roughly equal in number. At Pickering, the highest Middle Calcareous Grit (Newbridge Trigonia Bed) has yielded an Antecedens (Maltonense) Subzone fauna (Wright, 1972). The basal Malton Oolite also belongs to this subzone and at Spikers Hill comes above a non-sequence omitting early Maltonense Subzone Middle Calcareous Grit.

Conclusions

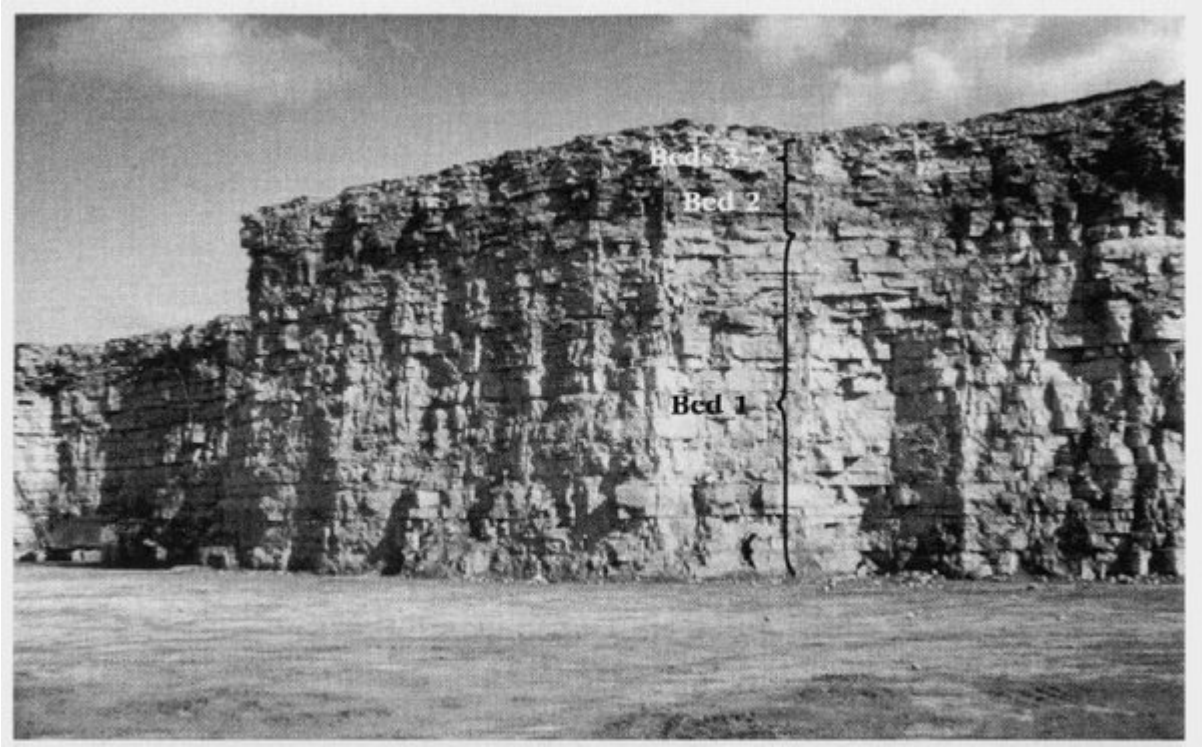
Spikers Hill is of key importance in elucidating the stratigraphy and palaeogeography of the Cleveland Basin in Early and Mid Oxfordian times. The quarry exposes the most comprehensive section through the Passage Beds–Hambleton Oolite–Middle Calcareous Grit–Malton Oolite sequence seen in inland northeast Yorkshire. Coral fragments eroded from the Hackness reef to the north are prolific. Valuable ammonite evidence for the position of the Cordatum–Vertebrale Subzone boundary (and thus the Lower–Middle Oxfordian boundary) has been obtained here. The quarry displays excellently a laterally persistent algal pisolite bed that is a stratigraphically important marker horizon over 40 km of

Corallian outcrop. The thin development of Middle Calcareous Grit reveals evidence of an important erosive phase affecting Middle Oxfordian sediments at the eastern end of the Vale of Pickering.

References

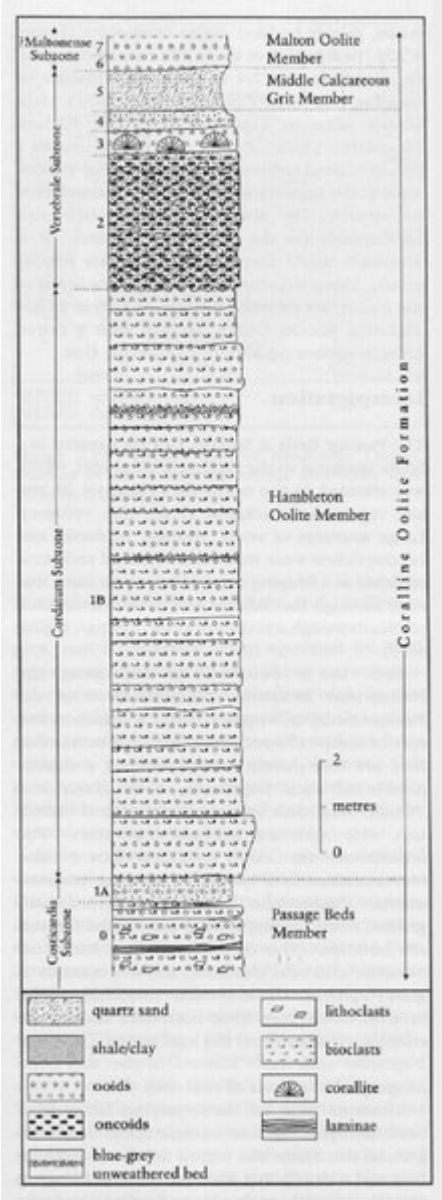


(Figure 4.20) Locality map of the Betton Farm and Spikers Hill GCR sites. Geological outcrops from BGS Sheet 54 (Scarborough) (1998).

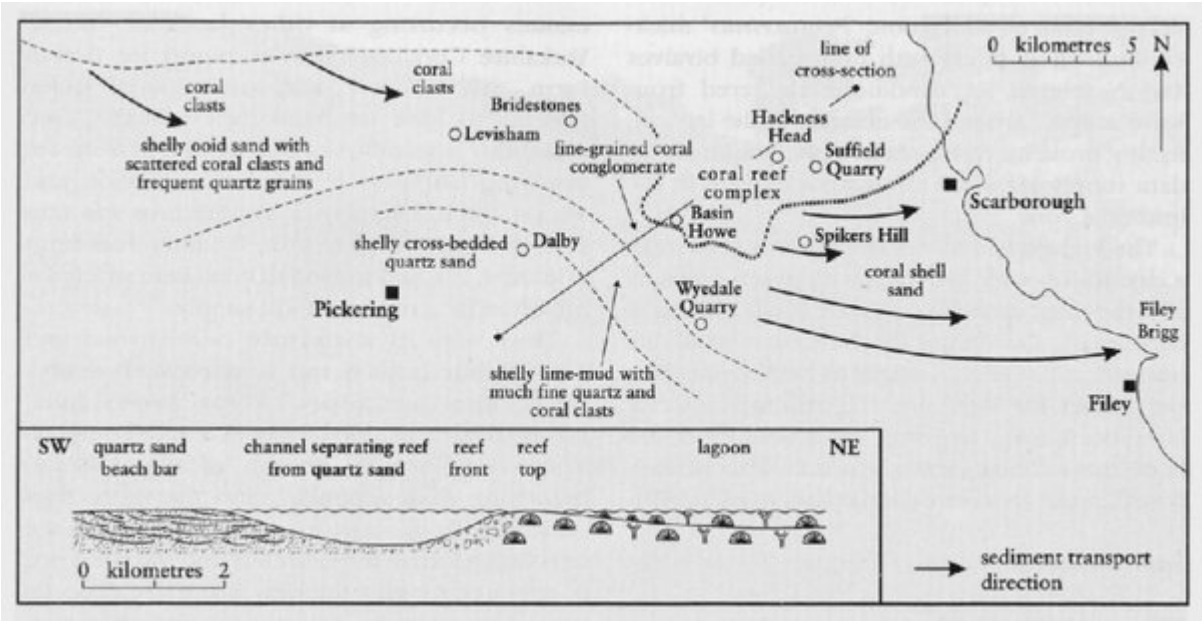


(Figure 4.22) The main east–west face in the Hambleton Oolite at Spikers Hill Quarry. The dark, pisoidal 'Blue Band' (Bed 2) is clearly seen towards the top of the quarry, overlain by beds 3 to 7, which are more thinly bedded than those below. Since this photo was taken, the quarry has been deepened to reveal part of the Passage Beds, Bed '0'. (Photo: J.K. Wright.)

(Figure 4.5) P Selection of ammonites from the Corallian Group of the Cleveland Basin. (A) Amoeboceras nunningtonense Wright (holotype), Spaunton Sandstone, Leysthorpe Quarry, m27, x 1. (B) A. glosense (Bigot and Brasil), Newbridge Member, Leysthorpe Quarry, U/1/14, x 1. (C) A. transitorium Spath, Newbridge Member, Leysthorpe Quarry, U/1/5, x 1. (D) A. ilovaiskii (M. Sokolov), Spaunton Sandstone, Newbridge Quarry, U/2/38, x1. (E) A. newbridgense Sykes and Callomon, Spaunton Sandstone, Newbridge Quarry, U/2/20, x 1. (F) Perisphinctes (Pseudarisphinctes) pachachii Arkell, Spaunton Sandstone, Spaunton Moor Quarry, U/3/63, x0.33. (G) P. (Dichotomosphinctes) sp. Newbridge Beds, Leysthorpe Quarry, U/1/103, x0.7. (H) Cardioceras (Cardioceras)persecans S. Buckman, Birdsall Calcareous Grit, Filey Brigg, YM1983/45F, x 1. (I) C. (C.) cordatum (J. Sowerby), Birdsall Calcareous Grit, Flassen Gill, YM1983/36F, x 1. (1) C. (Vertebriceras) aff. dorsale S. Buckman, Hambleton Oolite, Spikers Hill Quarry, C/2/17, x 1. (K) C. (Plasmatoceras)popilaniense Boden, Hambleton Oolite, Spikers Hill Quarry, C/2/59, x 1. (L) C. (Scarburgiceras) harmonicum Arkell, Tenants' Cliff Member, Tenants' Cliff, YM1983/17F, x 1. (M) C. (S.)reesidei Maire, Tenants' Cliff Member, Tenants' Cliff, YM1983/20F, x 1. (N) C. (Vertebriceras) aff. phillipsi Arkell, Tenants' Cliff Member, Tenants' Cliff, YM1983/23F, x 1. (O) C. (S.)praecordatum (Douvillé), Weymouth Member, Cayton Bay Waterworks, YM1983/9F, x 1. (P) C. (S.)scarburgense (Young and Bird), Weymouth Member, Cornelian Bay, YM1983/3F, x 1. (Photos: (A-E), (H, I), (L–P), J.K Wright; (F, G), K. D'Souza; (J, K) K. Denyer. Collections: Prefixes 'U', 'C', J.K. Wright Collection; 'YM', Yorkshire Museum Collection, York; 'm', Woodend Museum, Scarborough.)



(Figure 4.23) Log of the Corallian succession at Spikers Hill Quarry, as measured by J.K. Wright in 1991.



(Figure 4.19) Facies distribution across the central and eastern parts of the Cleveland Basin during deposition of the Hackness Coral–Sponge Bed (after Wright, 1992, fig. 10).