The geological section at Coombs Quarry, Buckinghamshire

Summary

The section at the disused Coombs Quarry was logged after a clean-up of the faces and showed a number of interesting features worthy of recording and interpretation. The eleven metre section represents part of the Bathonian age Great Oolite Group and basal Ancholme Group sediments. The subunits of these groups include the White Limestone (Ardley and Bladon Members), Forest Marble, Blisworth Clay, Lower Cornbrash and the basal Kellaways Clay Member. It is predominantly a sequence of oolitic and micritic limestones (wackestones and packestones) with subordinate marls and clays. The environment started as a calm shallow sea, with oolitic shoals close by, which gradually changed to a sheltered lagoon near land.

Location

The quarry is located near the hamlet of Coombs, Buckinghamshire, just outside the town of Buckingham at SP 733 327 (Figure 1). The site lies close to the circular pathway leading from the Thornborough Bridge picnic site which is a good for parking. The quarry is about 200 m from the Padbury Brook at the edge of its valley at a height of about 80 mOD. The Bathonian limestones have a thin, sinuous outcrop marking the valley edge, being surrounded by outcrops of the Kellaways Formation, Oxford Clay and then by a large area of drift which comprises mostly till with a variety of unconsolidated glacial sands and gravels.

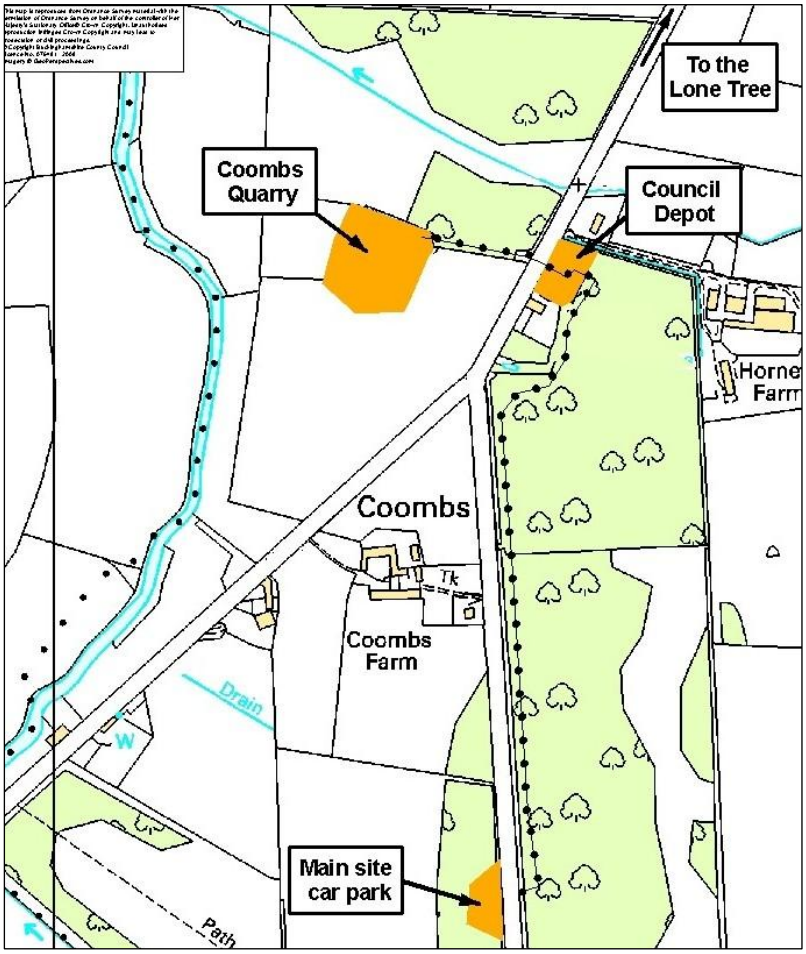

Figure 1 Location of Coombs Quarry

Lithological descriptions

The site is mapped on the 1:50 000 geological map Sheet 219 and is briefly discussed in Sumbler (2002). The sequence consists of Jurassic limestones with lesser amounts of marls and mudstones. There are no drift deposits in the immediate vicinity of the quarry. The beds are described below and shown in the photograph and geological log of Figures 2 and 3.

Ardley Member (White Limestone Formation), Beds 1 to 11

Bed 1: 37 cm + (seen). Packestone. A yellowish-beige, well cemented oolitic and fossiliferous limestone. There are abundant ooliths and some peloids many of which show iron staining (pale to mid-brown) and these are darker than the matrix surrounding them. There are sparry infills of vugs throughout. These voids represent either spaces between fossils or the gap resulting from dissolution of shells. Fossils are largely bivalves, both broken and whole, with fewer gastropods and occasional sea urchins (whole and separated spines).

Bed 2: 7 cm. Calcareous, unconsolidated, iron-stained sand. Olive to yellowish brown containing quartz, minor ooliths, peloids, and sparse shell fragments with some black spherical clasts resembling iron oxide ooliths (goethite ooliths being a suggestion).

Bed 3: 42 cm. Packestone. Yellowish-beige, very well cemented, oolitic, peloidal and fossiliferous limestone. Abundant solitary corals, many with cavities infilled with sparite. Numerous brachiopods and bivalves including oysters are present thoughout.

Bed 4: 20 cm. Packstone-wackestone. Pale yellowish-brown, well cemented oolitic limestone. Ooliths and other clasts are more abundant at the base (nearer to a packestone) and ooliths become sparser upwards (wackestone). No fossils were observed. There are some sparry overgrowths of secondary cementation.

Bed 5: 62 cm. Micritic limestone (mudstone). Cream coloured with patchy iron-staining, becoming noticeably mottled towards the top of the bed. Sparse ooliths occur at the bottom of the bed. Large cavities occur throughout the bed, up to 9 cm, are infilled with sparite. Numerous large, whole bivalves occur throughout.

Bed 6: 25 cm. Packestone. Yellowish beige-brown with patchy iron-staining. Oolitic with sparse broken shells.

Bed 7: 50 cm. Micritic limestone (mudstone). Cream-beige with tiny, sparse black specks. Rare bivalves, whole. Infill over erosional base.

Bed 8: 80 cm. Wackestone to packestone. Cream beige, well cemented, fine limestone. Bioturbation (horizontal branching burrows) occurs on the base of this bed, as seen in overhangs. Sparse ooliths at the base (wackestone) becoming more abundant upwards (packestone).

Bed 9: 15 cm. Calcareous sand. Light greenish-brown, unconsolidated but with abundant ooliths and peloids.

Bed 10: 35 cm. Packestone. Yellowish-beige, oolitic limestone with peloids and shell fragments. Some whole valves show dissolution with sparry infill of the void.

Bed 11: 50 cm. Packestone. Cream-beige, highly fossiliferous oolitic limestone. Numerous whole bivalves are obvious throughout, along with occasional solitary corals, and similar to Bed 10 the dissolved shell void is infilled with sparite.

Bladon Member (White Limestone Formation), Beds 12 and 13

Bed 12: 10 cm. Marl. Light olive-brown, calcareous clay. Very friable with abundant juvenile oysters, overlaying irregular eroded surface. ***Fimbriata-Waltoni* Bed**.

Bed 13: 100 cm. Wackestone and marl interbeds. Yellowish beige. Five well cemented limestone beds (of 10 to 20 cm thickness) are interbedded with thinner unconsolidated marls (2 to 3 cm thickness). The limestones are highly fossiliferous with a large variety of bivalves with minor gastropods, brachiopods, fish teeth and wood fragments. Fossil preservation (of the shelly fossils) is largely as internal and external moulds. There is some minor sparite infill of voids. The marls contain a low diversity fauna of oysters, largely juveniles and fish remains, ostracods plus the only Mesozoic mammal tooth came from the unconsolidated layers in this horizon.

Forest Marble Formation/Blisworth Clay Formation (Beds 14 to 17)

Bed 14: 10 cm. Forest Marble. Packestone. Yellowish-brown, flaggy, gritty limestone. The fine ‘silty’ character is due to a mass of tiny shell debris, with some peloids, fish scales and spines. A thin bed overlain by the upper beds of the Blisworth Clay Formation.

Bed 15: 90 cm. Blisworth Clay. Clay with minor marl-limestone beds. Grey, slightly calcareous in lower part. Not easily accessible in upper part for observations. Mostly unconsolidated. Poorly bedded, but with slightly harder marlstone horizons.

Bed 16: 35 cm. Packestone. Beige, well cemented, shell-fragmental with sparse ooliths. The topmost horizon of this bed showed therapod footprints in a trench near Thornborough.

Bed 17: 120 cm + (eroded and faulted out). Similar to Bed 15. Grey clay, unconsolidated, bedding not visible. Not accessible.

Lower Cornbrash

Bed 18: 205 cm. Packestone. Mid-yellowish-brown, mass of shell debris with ooliths and peloids. Fossils include numerous bivalve fragments with debris from brachiopods, ammonites and sea urchin spines.

Kellaways Formation, Clay Member

Bed 19: 200 cm + (eroded, top of section). Clay. Mid-grey silty clay, slightly sandy with shell debris at the base.

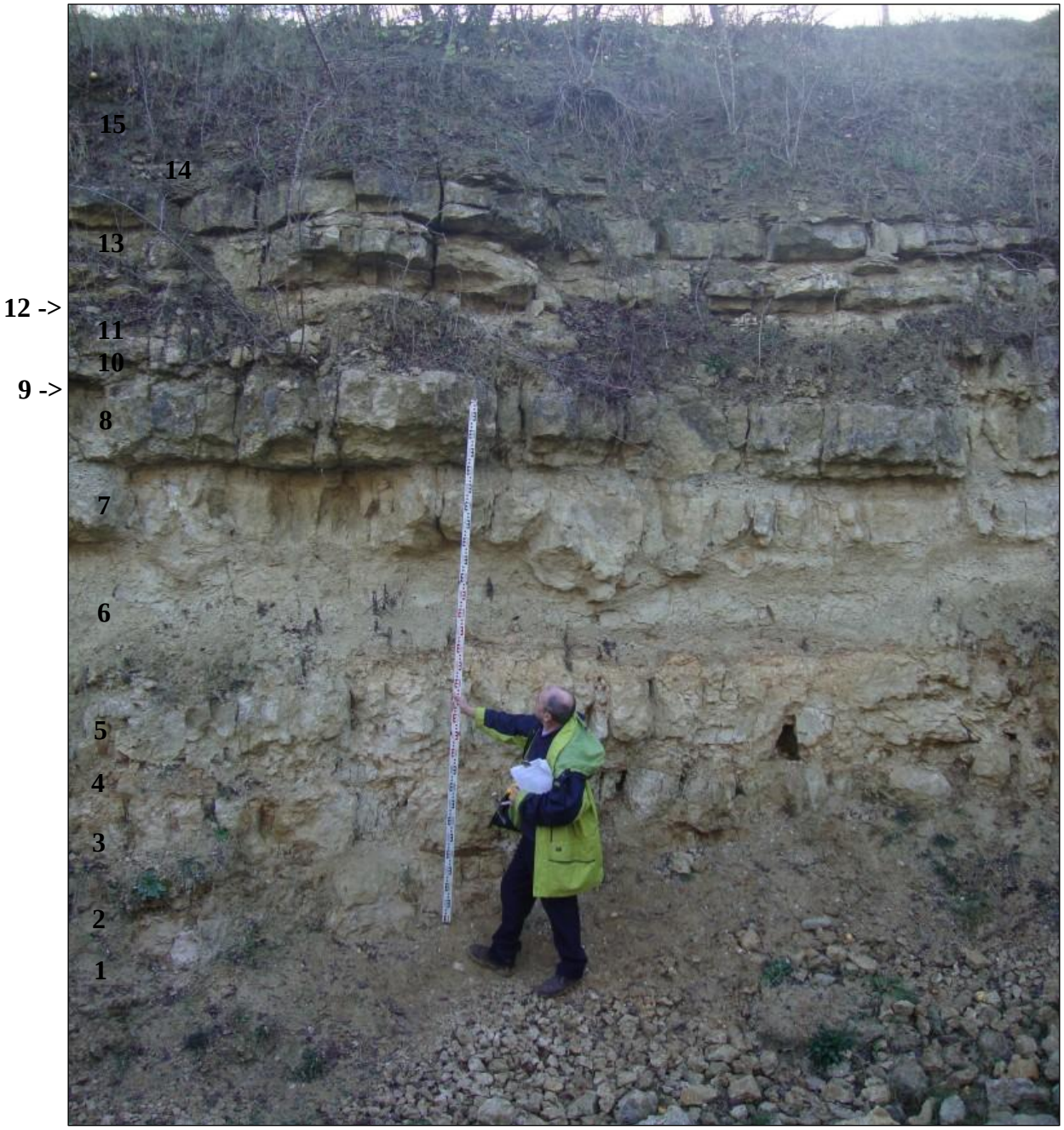

Figure 2 The south face Coombs Quarry showing the White Limestone beds (the Forest Marble Formation is at the top of the section obscured with vegetation and slip). Note that the hardness and hence weathering of the beds, does not match major lithological breaks, and reflects differences in cementation.

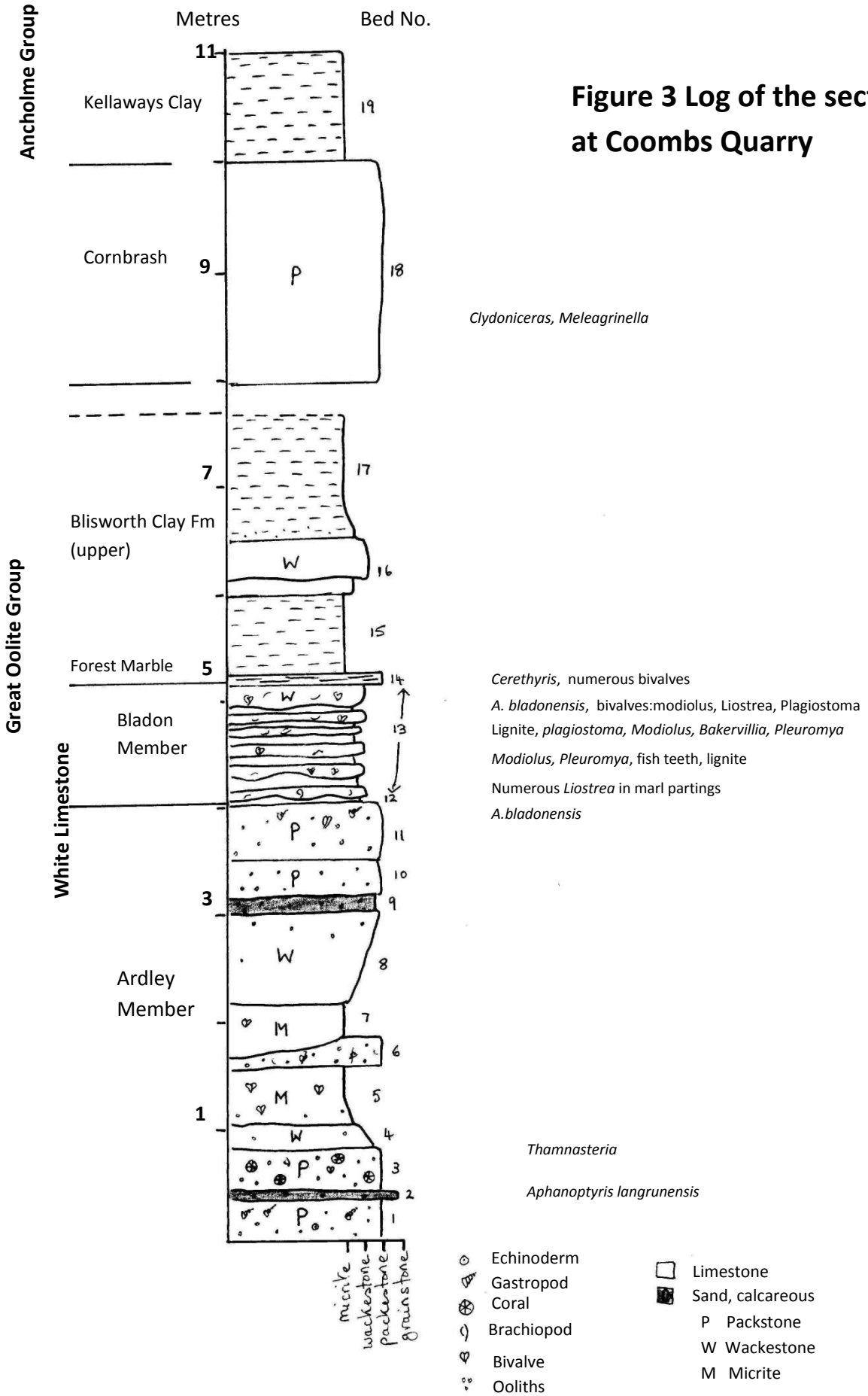

Figure 3 Log of the section at Coombs Quarry

Interpretation

Limestones of the Ardley Member (Beds 1 to 11) were deposited in a warm, nearshore, shallow marine environment. The fossil assemblage (echinoids, corals, and marine bivalves and gastropods) indicate normal marine salinity. The sandy layers of Beds 2 and 9 and several iron-stained horizons with tiny fragments of lignite show that land was not too distant. Shallow agitated waters produced oolitic shoals nearby and the packstones indicate gentle currents removing some of the micrite matrix or not allowing it to settle. The packstones are generally highly fossiliferous with whole fossils. The wackestones are generally less fossiliferous in terms of abundance and diversity of species, and often show a large proportion of oysters and few other species. This is interpreted as showing some ecological disturbance (perhaps intermittant salinity or temperature changes?) and hence a closer proximity to land. The greater proportion of micritic mud in the wackestones indicates a very calm, sheltered environment. As some of these beds higher up the sequence (the Bladon Member, Beds 12 and 13) show potential rootlets (Sumbler, 2002) along with more lignite and a very low diversity fauna in the marl horizons (predominantly juvenile oysters) then it is inferred that the wackestone to marl transition is one of shallow marine to littoral to sheltered lagoon. In such shallow waters slight relative changes in sea-level would result in subtle lithological and biological variations of the type seen here. The very thin Forest Marble limestone (Bed 14, with the mass of shell debris) indicates a rapid input of much higher energy conditions. Lagoonal conditions continue through Beds 15 to 17 which are abruptly halted with the high energy shoreline deposit of the Cornbrash. This supports the known palaeogeography of this area around 165 million years ago during the Bathonian which indicates an environment not dissimilar to the Florida Keys of the USA today with a number of islands surrounded by a warm shallow sea..

Bibliography

Sumbler, M. G. 2002. Geology of the Buckingham District – a brief explanation of the geological map. *Sheet explanation of the British Geological Survey*. 1:50 000 Sheet 219 Buckingham (England and Wales).

Acknowledgements

Prepared by Dr Jill Eyers with records from the logging team: Bev Fowlston, Philip Clapham, Pam Konieczny and Helen Durrant. Thanks also to Michael Oates who had recorded the section previously and had important observations and guidance, and to Diana Smith for proof-reading. This formed part of a training exercise on behalf of the Bucks Earth Heritage Group and funded by an HLF grant under the *Rocks and You* project.