Warboys Clay Pit

[TL 308 818]

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Introduction

Warboys Clay Pit lies 1.8 km north of Warboys village, and is a large pit currently owned by Fernside Waste Management Ltd and used for waste disposal. It was formerly operated by the London Brick Company, the plastic Weymouth Member (formerly the Upper Oxford Clay) being used extensively to manufacture bricks and extruded hollow clay blocks.

The Warboys exposure was already a 'large working pit (revealing) a fine section' when it was first described by Dixon (1937). Arkell (1937a, b, 1939b) made only passing reference to the locality when first examining the Cambridgeshire Oxfordian. However, the site figures prominently in his review of the general zonation of the English Lower Oxfordian (Arkell, 1941a). The first comprehensive description of the section was provided by Spath (1939). This work formed the basis of most studies of the site until the mid-1960s. Barnard (1952) undertook a systematic examination of foraminifera collected here, whilst Forbes (1960) led a field meeting at the site.

The Warboys section is discussed in the Geological Survey Memoir (Edmonds and Dinham, 1965), and figures prominently in the regional studies of Callomon (1968) and Torrens and Callomon (1968) (see also Hudson and Palframan, 1969; Horton and Horrell, 1971). The locality is discussed in the account of the Oxfordian stratigraphy of Fenland by Gallois and Cox (1977), and Wright (1980) devoted a single column of the Oxfordian Correlation Chart (Col 012) to the Warboys sequence.

Description

A detailed measured section at the pit was published by Callomon (1968), and this may be summarized, with amendments, as follows.

	Thickness (m)
Ampthill Clay Formation	
12. Weathered black clay with *Gryphaea*	seen to 1.5
West Walton Formation	
10, 11. *Warboys Rock:* argillaceous limestone and mudstone with *Perisphinctes* sp.	0.9–1.2
— non-sequence —	
9. Black clay with crushed *Cardioceras* spp. and bivalves	0.15
— major non-sequence —	
Oxford Clay Formation	
Weymouth Member	
1–8. Largely blue-grey calcareous clays with frequent variably persistent manly limestone bands lettered A to H. A prolific fauna of pyritized cardioceratids is present	24.5

A log of the section with lithologies and subzones taken from Callomon (1968) is given in (Figure 3.6). (Figure 3.7) shows the state of the exposure in 1998. The site has been renowned since the 1930s for the richness of its Weymouth Member ammonite fauna, which provides the zonal standard for much of the East Midlands Oxfordian (Callomon, 1968). The excellent state of preservation of the pyritized ammonites and other macrofauna has held the attention of numerous palaeontologists collecting from the Oxford Clay at this site. At least 23 ammonite species belonging to 12 genera have

been recorded here. These include the basal Oxfordian zonal index *Quenstedtoceras* (*Quenstedtoceras*) *mariae* (d'Orbigny) and subzonal indices *Cardioceras* (*Scarburgiceras*) *scarburgense* (Young and Bird), *C.* (*S.*) *praecordatum* Douvillé and *C.* (*S.*) *bukowskii* Maire, together with numerous perisphinctids and oppelids, and an important infaunal bivalve assemblage.

The highest level of the Oxford Clay is pale greenish-grey in colour, and clearly was well indurated before being eroded, as fragments of the green clay are incorporated into the basal West Walton Formation (Bed 9). Ammonites collected from Bed 9 include *Cardioceras* (*Plasmatoceras*) *popilianense* Boden, *C.* (*Scoticardioceras*) *excavatum* Sowerby), *C.* (*Subvertebriceras*) *densiplicatum* Boden, *C.* (*S.*) *sowerbyi* Arkell and *Perisphinctes* sp.. These are found in association with the bivalves *Cercomya* sp., *Chlamys* sp., *Grammatodon* sp., *Myophorella* sp., *Opis* sp., *Oxytoma* sp., *Pinna* sp., and ostreids.

Interpretation

The section in the pit combined with an adjacent Geological Survey boring (Callomon, 1968) indicates that the Weymouth Member here is attenuated when compared with the equivalent sections in southern England. In the early records it is often not possible to separate the Weymouth Member thickness from that of the whole Oxford Clay in southern England. What one can say is that the Oxford Clay as a whole retains a remarkably constant thickness of 150–160 m from Dorset to north-west Wiltshire (Woodward, 1895; Bristow *et al.,* 1995). Traced northward, the observed thicknesses decrease, and in the Cambridgeshire region, stratal attenuation is attributable not only to reduced sedimentation but also to erosion of the upper beds (Wright, 1980). Evidence for this is clear at Warboys, where the erosive contact of Bed 9 on Oxford Clay represents a pronounced non-sequence. A stratal break of varying significance at this horizon is an important feature of Lower–Middle Oxfordian stratigraphy not only in central and south Cambridgeshire but also in Buckinghamshire and Bedfordshire (Wright, 1980). The relative attenuation of the Cambridgeshire Weymouth Member coincides with an upswell in the underlying Palaeozoic platform on a ridge extending north from the London Platform.

J.H. Callomon assigned the fauna of Bed 9 to the basal Middle Oxfordian (Vertebrale Subzone) (Wright, 1980, p. 73). According to Callomon, the overlying Warboys Rock (beds 10 and 11) (Figure 3.7) has yielded a fauna of the high Parandieri Subzone, possibly equivalent to the Blakei rather than the Tenuiserratum Subzone of the Boreal scheme. A substantial non-sequence below it is thereby clearly indicated. However, Gallois and Cox (1977) believed that beds 10 and 11 belong to the low Tenuiserratum Zone, in which case a non-sequence would not exist at this level. However, evidence of age assignation is not provided by these authors, and herein the age of the Warboys Rock is left open.

The succession therefore has one, and possibly two, substantial non-sequences, the earliest of which omits strata of the Costicardia, Cordatum and lower Vertebrale subzones, while according to Callomon (1968), at least the Maltonense, Tenuiserratum and basal Blakei subzones are cut out at the upper discontinuity. The highest bed of clay at Warboys, Bed 12, is seen in the zone of weathering and has never been well exposed, nor has it yielded stratigraphically useful ammonites.

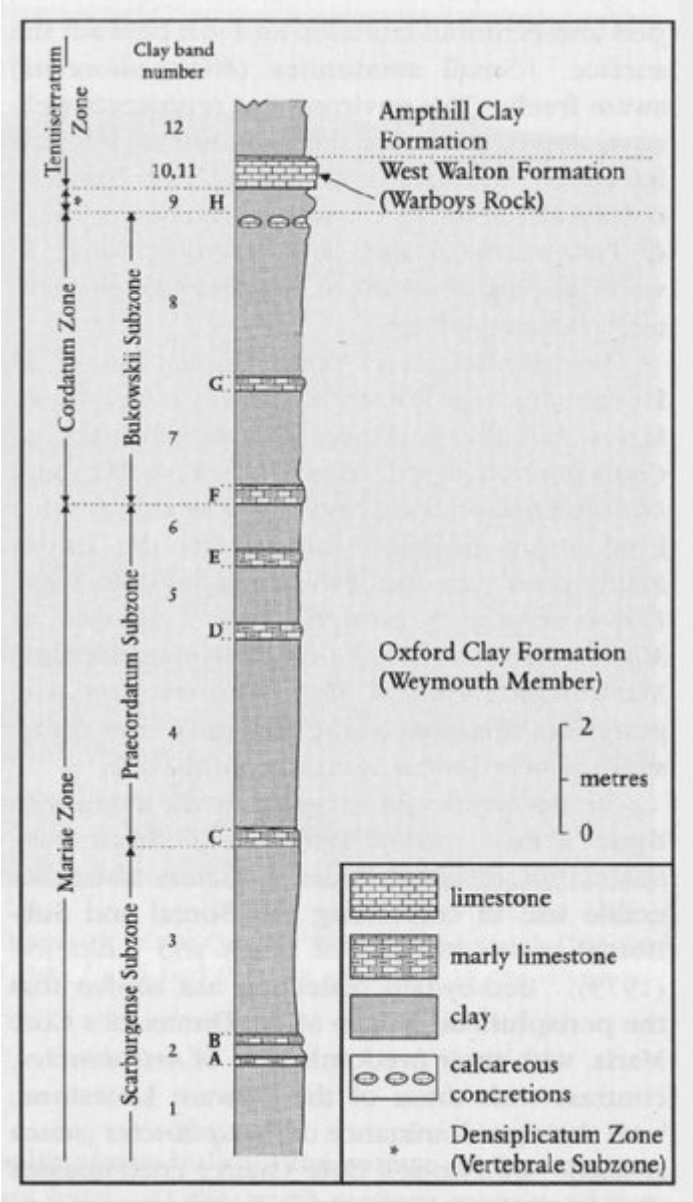
The widespread stratal breaks below and above Bed 9 point to probable tectonic instability in the basin of deposition. Considering the general irregularity of such features in Cambridgeshire and their localized distribution, it is likely that the principal cause was tectonic uplift rather than eustatic regression. As Torrens and Wright (1980, p. 14) point out, 'A broad, eustatic regression followed by a transgression might well lead to a non-sequence and overlap, but the removal of much of the underlying succession is certainly not an eustatic effect'.

The work of Gallois and Cox (1977) has been of great significance in interpreting the environments of deposition of these beds. During West Walton Formation and Ampthill Clay times, clays, silts and limestones were deposited in near-shore environments in a shallow shelf sea. Southwards along their outcrop, they pass laterally into predominantly arenaceous and calcareous marine sediments (the Corallian Group); to the east, they thin out in East Anglia; and to the north and north-west, into Lincolnshire, beneath much of the North Sea and off the west coast of Scotland, they continue as predominantly argillaceous sediments.

Conclusions

This locality constitutes one of the most important reference sections in the Jurassic of the East Midlands. It offers the opportunity to study at outcrop the Oxford Clay and West Walton formations, the former otherwise known only in Cambridgeshire in boreholes. Beautifully preserved specimens representing 23 ammonite species occur abundantly here in the Oxford Clay Formation, the representative faunas of the Scarburgense, Praecordatum and Bukowskii subzones. The sequence as a whole covers much of Oxfordian time but with significant phases of non-deposition or erosion.

References



(Figure 3.6) Log of the Oxford Clay succession in Warboys Pit (after Callomon, 1968).

(Figure 3.7) View of the upper part of Warboys Pit showing Cordatum Zone Oxford Clay overlain by West Walton Formation, beds 9–12, with the Warboys Rock', the distinctive pale band, close to the top of the section. (Photo: J.K. Wright.)