

LITTLEWORTH BRICK PIT

B.M. Cox

OS Grid Reference: SP588054

Introduction

Littleworth Brick Pit (sometimes known as 'Wheatley Brick Pit') at Wheatley, c. 3 km east of Oxford, is at the time of writing occupied by a mobile home park, and the section for which it has long been famous is presently obscured. It formerly exposed a small thickness of Lower Kimmeridge Clay overlain by Upper Kimmeridge Clay and then limestones and sandstones of Portlandian and Early Cretaceous age. A peculiarity of the Upper Kimmeridge Clay in this region is the widespread development within it of units of sand and silt (see also site report for Old Town, Swindon, this volume). The sequence was extensively worked for brick-making as the sands and silts helped to prevent the clays from shrinkage, and the beds could also be dug in conjunction with sand and limestone from the overlying Portland Formation. Littleworth Brick Pit was the last surviving working pit, showing a fuller section of the Kimmeridge Clay than any other exposure in the area (Arkell, 1947b). Wheatley gives its name to the Wheatley Sand, in the top part of the Upper Kimmeridge Clay of the area, and to the Wheatley Nodule Bed, a bed of cementstone nodules yielding well-preserved 'pectinatitid' ammonites described and figured by Neaverson (1925). These include *Pectinatites (Virgatosphinctoides) wheatleyensis* (Neaverson) (Figure 2.51) which gives its name to the Upper Kimmeridgian Wheatleyensis Zone (Cope, 1967).

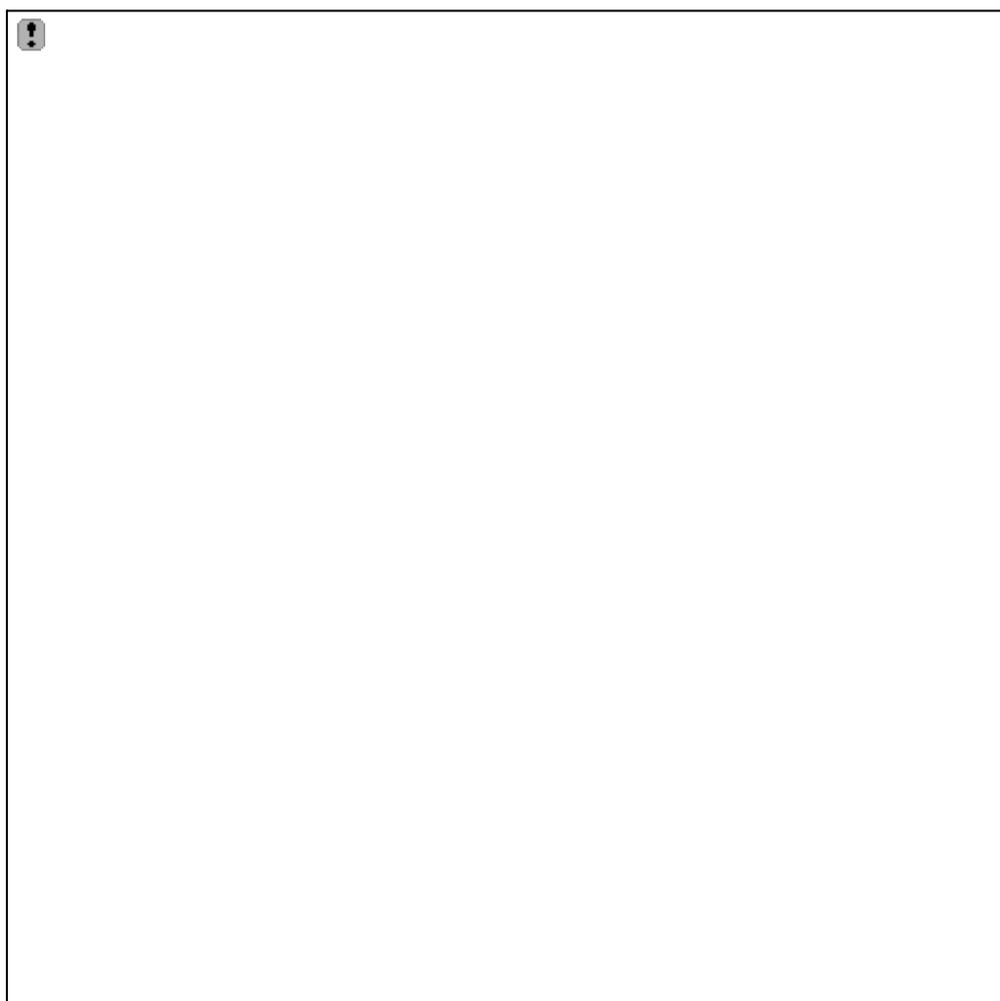


Figure 2.51: The type specimen of *Pectinatites (Virgatosphinctoides) wheatleyensis* (Neaverson) as figured by Neaverson (1925, pl. 1, fig. 1). Natural size.

Description

The following description of the Kimmeridgian strata is based on earlier accounts by Pringle (1926), Arkell (1933, 1942, 1947b), McKerrow and Kennedy (1973), and Horton *et al.* (1995). Bed numbers are those of Pringle (1926); after the time of Pringle's description, the brick pit was extended into the hill and joined up with the sand pit below the windmill (Arkell, 1942). The stratigraphical classification follows Horton *et al.* (1995).

		Thickness (m)
<i>Kimmeridge Clay Formation</i>		
<i>Wheatley Sand Member</i>		
	Sand, sharp, buff to grey; very poorly fossiliferous; small-scale sedimentary structures	up to 3.7
<i>Swindon Clay Member</i>		
8	Clay, grey; small brown nodules containing fragments of <i>Pavlovia</i> ; other fossils including <i>Modiolus</i> and <i>Thracia</i>	3.0–3.7
<i>Pectinatus Sand Member</i>		
7	Sandstone, brown, soft, friable, discontinuous; crowded with fossils including many large 'pectinatitid' ammonites, bivalves including ' <i>Astarte</i> ' <i>saemanni</i> de Loriol, <i>Camptonectes auritus</i> (Schlotheim), <i>Entolium nitescens</i> (Phillips), <i>Hartwellia hartwellensis</i> (J. de C. Sowerby), <i>H. swindonensis</i> (Blake), <i>Liostrea expansa</i> (J. Sowerby), ' <i>Lucina</i> ' <i>substriata</i> Roemer, <i>Mactromya verioti</i> (Buvignier), <i>Myoconcha saemanni</i> Dollfus, <i>Myophorella swindonensis</i> (Blake), ' <i>Perna</i> ' <i>listeri</i> (Fleming), <i>Pleuromya</i> sp., <i>Protocardia morinica</i> (de Loriol) and <i>Pseudolimea alternicosta</i> (Buvignier), and the gastropod <i>Bathrotomaria rugata</i> (Benett)	1.2
6	Clay, sandy, lilac and greenish brown; <i>Musculus autissiodorensis</i> (Cotteau), <i>Pseudorhytidopilus latissima</i> (J. Sowerby) and <i>Dicroloma</i> in lower part	1.7
5	Clay, sandy, greenish brown, unfossiliferous	0.4
4	Clay, sandy, dark with scattered isolated nodules near top	1.4
3	Clay, dark grey; scattered crushed ammonites	1.1
2	Clay, dark grey; thin shaly bands and many layers of crushed ammonites; large cementstone nodules; 'pectinatitid' ammonites preserved in cementstone; <i>Isocyprina minuscula</i> (Blake) and <i>Musculus autissiodorensis</i>	2.7
1	Clay, dark, shaly with <i>Nanogyra virgula</i> (Defrance), <i>Laevaptychus</i> and <i>Aulacostephanus</i> ; occasional hard lumps of earthy limestone crowded with <i>N. virgula</i> ; <i>Aspidoceras</i> near base	seen to 2.4

The Wheatley Sand is overlain by the Upper Lydite Bed, a thin (0.03 m) seam of greenish grey, clayey, highly glauconitic silt with scattered lydite pebbles. This marks the unconformity at the base of the Portlandian succession, the lower part of which here comprises greenish-grey, sandy, glauconitic limestone and calcareous sandstone with scattered shell debris and abundant bivalves and ammonites (Horton *et al.*, 1995).

Interpretation

The lowest strata exposed belong to the Lower Kimmeridgian Eudoxus Zone. Evidence from Bed 1 suggests the presence of two well-established marker horizons of that zone. Pringle's (1926) record of 'hard lumps of earthy limestone crowded with the shells of *Exogyra* [*Nanogyra*] *virgula*' indicates the Virgula Limestone, and specimens in the BGS collections of *Aspidoceras* in solid preservation suggest the Crussoliceras Band (= the *Propectinatites*-rich band of Cox and Gallois, 1981). As elsewhere in the Oxfordshire–

Buckinghamshire area, there is almost certainly a non-sequence at the base of the Upper Kimmeridge Clay (base Bed 2) here, with the Autissiodorensis Zone reduced or absent altogether (Cox *et al.*, 1994).

Although the Upper Kimmeridgian succession is attenuated here compared with the type sections on the Dorset coast (c. 16 m compared with over 270 m) (Cox *et al.*, 1991), it includes ammonite faunas that are much better preserved than those from equivalent levels in Dorset and, in the past, they have attracted considerably more attention. For instance, Neaverson's (1925) zonal scheme for the Upper Kimmeridge Clay was largely based on ammonite data obtained from the Oxford area (Cope, 1967). Cementstone nodules yielded the well-preserved 'pectinatitid' ammonites of the Wheatley Nodule Bed including, at Littleworth, the type specimens of *Pectinatites* (*Virgatosphinctoides*) *wheatleyensis* (Neaverson), *P. (V.) wheatleyensis delicatulus* (Neaverson) and *Sphinctoceras crassum* Neaverson (Neaverson, 1925; Arkell, 1933; Cope, 1967). Most authors have assumed that the ammonites came from the large cementstone nodules ('crackers') in Bed 2 but work by Oates (1991) at Aylesbury showed that they came from smaller, less conspicuous septarian nodules a little higher in the succession, albeit still within Pringle's Bed 2. The large 'crackers' occur in all sections that have yielded the typical ammonite fauna of the Wheatley Nodule Bed, possibly as far west as Chawley, 5 km west of Oxford (Horton *et al.*, 1995). The detailed classification and correlation of this lower part of the Upper Kimmeridge Clay remains somewhat problematic in this area because the succession is much thinner and less complete than both the type succession on the Dorset coast (see above) and that in eastern England, which is well known from boreholes. It contains many minor non-sequences marked by burrowed horizons and phosphatization; ammonites are commonly infilled with cream- or buff-coloured phosphate (Cox *et al.*, 1994). Although the ammonite fauna of the Wheatley Nodule Bed has long been considered to be a classic assemblage of the Wheatleyensis Zone, data from other local sections (Figure 2.52) suggest that the bed lies within KC44 of the standard bed-numbered Kimmeridge Clay sequence and therefore in the Hudlestoni Zone. More work is needed to resolve this apparent paradox (Cox *et al.*, 1994). The bed of large nodules with which the Wheatley Nodule Bed has been confused (see above) appears to be the sole representative of KC40 in the Wheatleyensis Zone, although elsewhere in southern England a cementstone somewhat lower in the sequence (in KC37), and equivalent to the Yellow Ledge Stone Band of Dorset, has been thought to be the more persistent marker (Cox *et al.*, 1994).

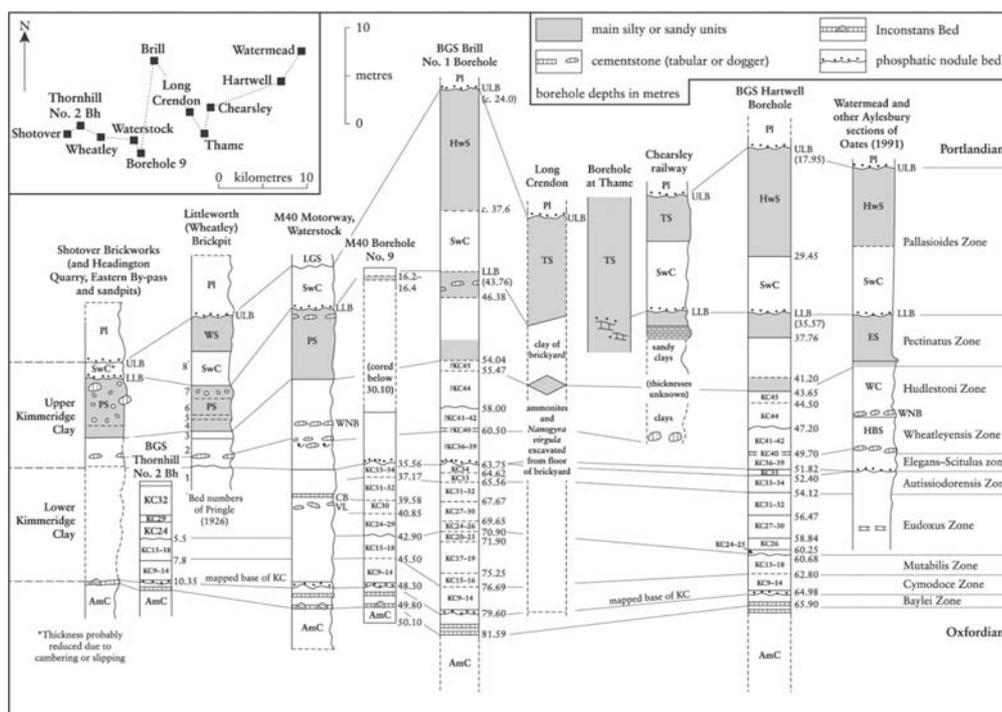


Figure 2.52: Graphic sections showing the Kimmeridgian stratigraphy at the Littleworth Brick Pit and other sections in Oxfordshire and Buckinghamshire, after Horton *et al.* (1995, fig. 17). AmC, Amphill Clay; CB, Crussolliceras Band; ES, Elmhurst Silt; HwS, Holman's Bridge Shale; KC, Kimmeridge Clay; LGS, Lower Greensand; LLB, Lower Lydite Bed; PI, Portland Formation; PS, Pectinatus Sand; SwC, Swindon Clay; TS, Thame Sand; ULB, Upper Lydite Bed; WC, Watermead Clay; WNB, Wheatley Nodule Bed; WS, Wheatley Sand; VL, Virgula Limestone.

The sand and silt units in the Upper Kimmeridge Clay of this region indicate the availability of coarser material and suggest the proximity of land in Late Kimmeridgian times. In the past, these units have attracted a variety of local names because stratigraphical relationships were uncertain but it now appears that there are only two main arenaceous horizons, corresponding with Oates' (1991) Elmhurst Silt and Hartwell Silt members of Aylesbury. Further west, near Oxford, these silts are replaced by clean, fine-grained sands which, following Horton *et al.* (1995), are termed respectively the 'Pectinatus Sand' and 'Wheatley Sand' based on earlier usages of these terms or their variants by Buckman (1922–1923), Pringle (1926) and Arkell (1942, 1947b). The Littleworth Brick Pit provided a type section for the Wheatley Sand and, together with the pit at Shotover Hill, a little nearer to Oxford, a reference section, within its type area, for the Pectinatus Sand.

According to Arkell (1933), fossils fell out of the soft sandstone (Bed 7) of the Littleworth pit in perfect condition; from amongst these, Buckman (1922–1923, 1923–1925, 1925–1927) proposed eight new species of *Pectinatites*. Although this assemblage has not been comprehensively reassessed, it includes the species *P. (P.) cornutifer* (S.S. Buckman), *P. (P.) rarescens* (S.S. Buckman) and *P. (P.) tricostulatus* (S.S. Buckman), recognized by Cope (1967, 1978) in the Pectinatus Zone of Dorset. The type specimen of *P. (P.) pectinatus* (Phillips), which gives its name to the Pectinatus Zone, came from the pit at Shotover Hill.

Conclusions

The Littleworth Brick Pit (also known as 'Wheatley Brick Pit') showed the fullest exposed section of Kimmeridgian strata in the Oxford area. In this area, as elsewhere in the south and central Midlands (see also site report for Old Town, Swindon, this volume), the Upper Kimmeridge Clay includes units of sand and silt that are not seen in the formation's type sections on the Dorset coast or elsewhere in Britain. The younger of these units, the Wheatley Sand, takes its name from the locality. Although the succession is very much thinner than that in Dorset, the ammonite faunas of the Upper Kimmeridge Clay are much better preserved here, and they have played an important part in the development of an ammonite-based

zonation for the Upper Kimmeridgian. They include a number of type specimens notably from the Wheatley Nodule Bed, of which the pit is the type locality, and the Pectinatus Sand. Amongst those from the Wheatley Nodule Bed is *Pectinatites (Virgatosphinctoides) wheatleyensis* (Neaverson) which gives its name to the Wheatleyensis Zone (Figure 2.51).

Reference list

- Arkell, W.J. (1933) *The Jurassic System in Great Britain*, Clarendon Press, Oxford.
- Arkell, W.J. (1942) Stratigraphy and structures east of Oxford. *Quarterly Journal of the Geological Society of London*, **98**, 187–204.
- Arkell, W.J. (1947b) *The Geology of Oxford*, Clarendon Press, Oxford.
- (1922–1923) *Type Ammonites*, Volume 4. , London and Thame
- Cope, J.C.W. (1967) The palaeontology and stratigraphy of the lower part of the Upper Kimmeridge Clay. *Bulletin of the British Museum (Natural History), Geology*, **15** (1).
- Cope, J.C.W. (1978) The ammonite faunas and stratigraphy of the upper part of the Upper Kimmeridge Clay of Dorset. *Palaeontology*, **21**, 469–533.
- Cox, B.M. and Gallois, R.W. (1981) The stratigraphy of the Kimmeridge Clay of the Dorset type area and its correlation with some other Kimmeridgian sequences. *Report of the Institute of Geological Sciences*, **80/4**, 44 pp.
- Cox, B.M., Sumblar, M.G., Horton, A. and Ambrose, K. (1991) Thicknesses of Kimmeridge Clay in the Oxford area. *Proceedings of the Geologists' Association*, **102**, 145–8.
- Cox, B.M., Gallois, R.W. and Sumblar, M.G. (1994) The stratigraphy of the BGS Hartwell Borehole, near Aylesbury, Buckinghamshire. *Proceedings of the Geologists' Association*, **105**, 209–24.
- Horton, A., Sumblar, M.G., Cox, B.M. and Ambrose, K. (1995) *Geology of the Country around Thame*, Memoir of the British Geological Survey (England and Wales), Sheet 237
- McKerrow, W.S. and Kennedy, W.J. (1973) *Geology around the University Towns: the Oxford district*, 2nd edn, Geologists' Association Guide No. 3, Geologists' Association, London.
- Neaverson, E. (1925) Ammonites from the Upper Kimmeridge Clay. *Paper of the Geology Department of the University of Liverpool*, **1**, 1–52.
- Oates, M.J. (1991) Upper Kimmeridgian stratigraphy of Aylesbury, Bucks. *Proceedings of the Geologists' Association*, **102**, 185–99.
- Pringle, J. (1926) *The Geology of the Country around Oxford*, 2nd edn, Memoir of the Geological Survey of Great Britain (England and Wales), explanation of Special Oxford Sheet.