Hook Norton, Oxfordshire

[SP 358 316], [SP 359 321]

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Introduction

The Hook Norton GCR site comprises two abandoned railway cuttings, about 1 km south of Hook Norton, Oxfordshire, which expose a complete section of the Chipping Norton Limestone Formation (Figure 3.61). The cuttings have long been regarded as the type section of the Hook Norton Member, which forms the lower part of the formation. The sections were first described by Beesley (1877); later, Walford (1883) provided a more detailed description of the northern cutting, which was reproduced by Richardson (1911a). Subsequent references to this section have largely been based on their work (e.g. Arkell, 1947b; Horton *et al.,* 1987; Fenton *et al.,* 1980).

Description

The most complete and detailed description of the stratigraphical succession at Hook Norton is that of Richardson (1911a). This succession, based on the northern cutting [SP 359 321], is summarized below (bed numbers are those of Richardson). Lithostratigraphical classification is updated from Horton *et al.* (1987).

	Thickness (m)
Sharp's Hill Formation	
1: Soil containing corals and fragments of shelly limestone	0.15
Chipping Norton Limestone Formation	
2: Limestone, white-weathering, ooidal, flaggy, with rare cross-bedding	0.61
3–11: Sand and sandy limestone; top surface of Bed 10 waterworn, bored and oyster-encrusted	3.12
Hook Norton Member	
12: Limestone, brown, sandy, hard; top surface waterworn and oyster-encrusted; pebbly towards base (*Signata Bed*)	0.38
13–17: Interbedded sand, clay and shelly limestone	0.99
18–19: Limestone, brown, blue-hearted, sandy, hard; fragments of lignite abundant in Bed 19	0.41
20–21: Limestone, brown, shaly, and marl; clay parting at top	0.69
Clypeus Grit Formation	
22a: Limestone, very hard, ferruginous, with '*Astarte*' *cotswoldensis* Cox and Arkell, *Trigonia* and *Acanthothiris;* uneven base	0.15
22b: Conglomerate; pebbles bored by *Lithophaga* and encrusted with oysters and serpulids, in a sandy marl matrix; locally, a coral bed at base; common *Rhynchonella* cf. *subtetrahedra* Davidson, *Cucullaea, Gresslya* and *Pholadomya*	0.13
23–24: Limestone, hard, iron-speckled in lower part; irregular erosive base	0.23
Northampton Sand Formation	
25–27: Limestones	2.13
Lias Group	

28–29: Clays	12.19

Richardson (1911a) noted that beds 22–24 vary considerably; in the southern cutting [SP 358 316], they rest directly on the Lias Group (Figure 3.62) as recorded in the following section modified from Horton *et al.* (1987).

	Thickness (m)
Clypeus Grit Formation	
Limestone, brownish-grey, sandy, ooidal, rather flaggy, with some small black limestone pebbles; outer layers of ooids ferruginous and limonitized; much shell-debris; large wood fragments	0.25
Marl, mauve-coloured, sandy, passing upwards into brown clay; bands of white shell-fragments including *Cucullaea* sp., *Praeexogyra* cf. *hebridica* (Forbes), *Vaugonia* (*Orthotrigonia*) *gemmata* (Lycett), *Plicatula* sp	0.18
Limestone, bluish-grey- to brown-weathering, with small black limestone pebbles; *Dimorpharea defranciana* (Michelin), *Chlamys viminea* (J. de C. Sowerby), *Cucullaea* sp., oysters including *Praeexogyra* aff. *acuminata* (J. Sowerby), *Procerithium vetustusmajus* (Hudleston)	0.10–0.15
Limestone, brown, weathering grey, with black limestone pebbles up to 25 mm diameter; large flattened compound corals; highly fossiliferous with *Montlivaltia trochoides* Edwards and Haime, *Thamnasteria* sp., *Burbatia pulchra* (J. de C. Sowerby), *Chlamys* cf. *viminea, Praeexogyra* cf. *hebridica, Pseudolimea* sp	0.10–0.15
Limestone, brownish-grey, and marly clay with black limestone pebbles; much shell-debris; fossils including *Montlivaltia trochoides, Thamnasteria* sp., *Chlamys viminea,* oysters and *Modiolus* sp.	0.08–0.10
Lias Group	
Mudstone	seen to 1.2

Interpretation

The bored encrusted pebbles and the abraded shell-fragments in the conglomeratic limestones of the Clypeus Grit Formation indicate slow, minimal deposition and some contemporaneous erosion of a cemented sea-floor nearby. These basal beds probably represent the initial coarse lag deposit of a Late Bajocian transgression.

Since the time of Walford (1883), the Chipping Norton Limestone Formation of this area has been divided into two units (the lower now known as the 'Hook Norton Member'), using the Signata Bed (named after the bivalve *Myophorella signata* (Agassiz)) as a lithostratigraphical marker horizon. Although Walford did not actually recognize this bed at Hook Norton, Richardson (1911a) and subsequent authors have taken Walford's Bed 12 with its oyster-encrusted hardground to be it, and to define the upper limit of the Hook Norton Member. However, Horton *et al.* (1987) found no evidence whilst mapping the district to substantiate Walford's and Richardson's belief that the Signata Bed is a discrete, traceable horizon. It also has to be noted that a further hardground was recorded by Richardson (1911a), 0.30 m above the top of the Signata Bed. Although the validity of the Hook Norton Member as a lithostratigraphical unit has been questioned, the cuttings nevertheless remain as its type locality (Bradshaw, 1978).

The succession at Hook Norton lies close to the eastern limit of the Chipping Norton Limestone Formation where, at first, the upper part passes laterally into the very sandy, shell-detrital limestones of the Swerford Member, and then, within 2 km, the whole formation has passed into the 'White Sand' facies of the Horsehay Sand Formation (see Horsehay Quarry GCR site report, this volume).

The sandy, flaggy, mainly planar-bedded limestones of the Chipping Norton Limestone Formation, which yield only a few unbroken, thick-shelled bivalves, probably formed in the shallow, turbulent waters of a carbonate shelf-sea in which the substrate was mobile. The quartz sand content of the limestones relates to the eastward passage into the Horsehay Sand Formation. Deposition of these sands occasionally extended farther west, accounting for the interbedded sands in the cuttings. Clays in the Hook Norton Member reflect quiet-water episodes when terrigenous mud accumulated. The abundance of lignitic plant-debris in beds 18 and 19 also suggests the influence of the land to the east.

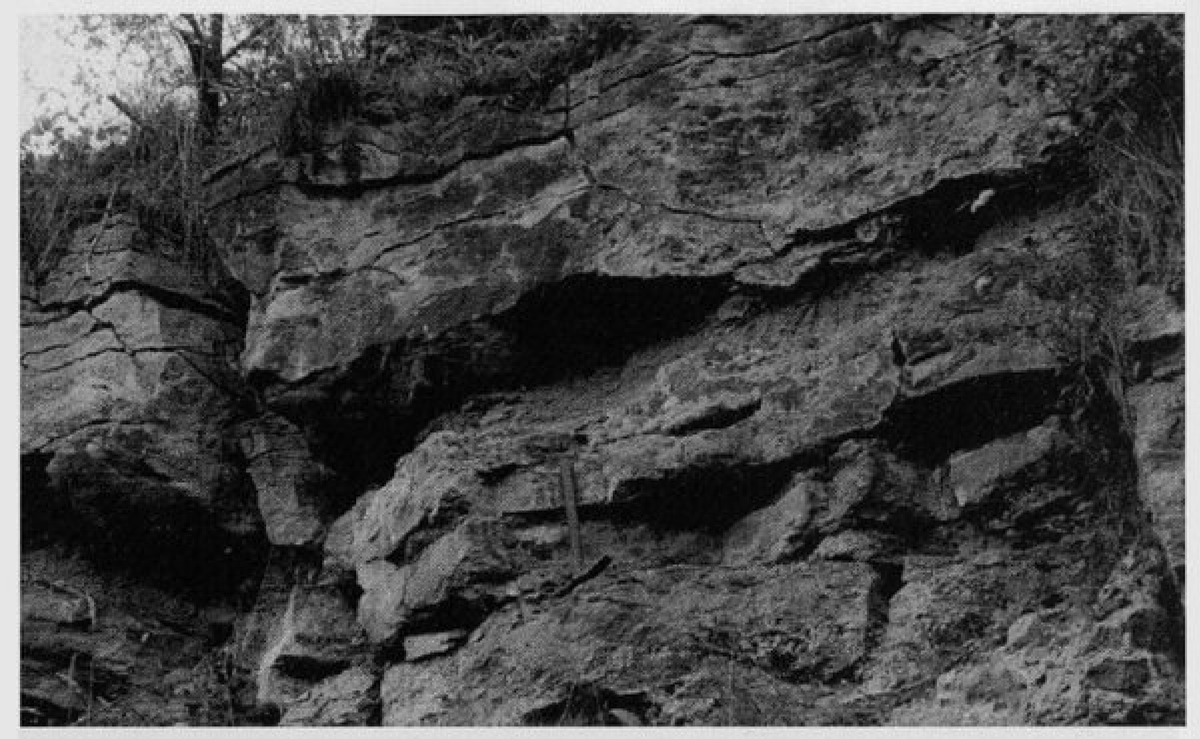
No ammonites have been collected from the cuttings, and dating of the succession therefore relies on evidence from the Hook Norton Member of the upper quarry at Chipping Norton Workhouse (Arkell, 1947b, 1956b). *Parkinsonia* (*Durotrigensia*) cf. *crassa* Nicolesco, figured by Arkell (1956b), is recorded from the lowest bed of the member there, suggesting that the Chipping Norton Limestone Formation extends down into the Upper Bajocian Parkinsoni Zone, Bomfordi Subzone. However, most of the known ammonites from the formation come from the Signata Bed at the top of the Hook Norton Member; they include *Parkinsonia* (*Gonolkites*) *subgaleata* S.S. Buckman, *P.* (*Durotrigensia*)*oxonica* Arkell and *Procerites subprocerus* (S.S. Buckman), which indicate the Lower Bathonian Zigzag Zone, Convergens Subzone (Arkell, 1947b; Torrens, 1969e). A single specimen of *Zigzagiceras* (*Procerozigzag*)*pseudoprocerus* (*S.S.* Buckman) from the Signata Bed confirms the presence of the next youngest Macrescens Subzone (Arkell, 1958a,b, wherein the locality is mistakenly referred to as 'Hook Norton Workhouse quarry'; W.M. Edmunds, pers. comm., 1963). Two poorly preserved specimens of *Oppelia* (*Oxycerites*), known from the Chipping Norton Limestone Formation at Oakham and Lower Swell (Richardson, 1911a, 1929b), suggest that the formation there extends up into the Yeovilensis Subzone (Torrens, 1969e). A possible non-sequence is inferred by Torrens (1980b) beneath beds of the latter subzone, corresponding with the top of the Hook Norton Member.

The ammonite zonation discussed above implies that the Hook Norton Member is coeval with much of the Clypeus Grit Member of districts to the west (Torrens, 1980b). It has now been established that the Chipping Norton Limestone Formation is broadly equivalent to the Horsehay Sand Formation (see Horsehay Quarry GCR site report, this volume) to the east (Fenton *et al.,* 1994, 1995). The palynological evidence also places the Bajocian–Bathonian boundary close to the base of the Chipping Norton Limestone Formation (Fenton *et al.,* 1980).

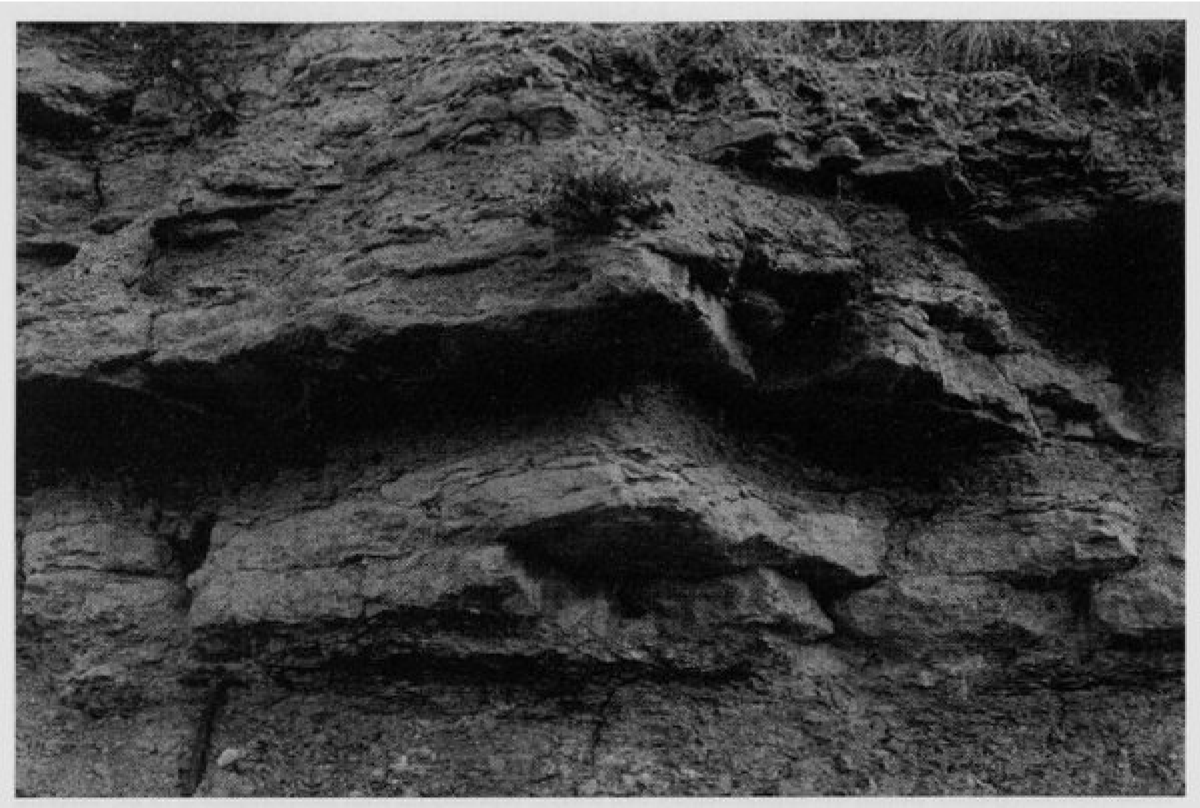
Conclusions

The railway cuttings at Hook Norton provide one of the most important sections of the Late Bajocian–Early Bathonian Chipping Norton Limestone Formation in its type area; they also serve as the type section of the Hook Norton Member, despite doubts as to the validity of this lithostratigraphical unit. The sections are significant in the interpretation of Middle Jurassic stratigraphy, particularly to an understanding of the lateral facies changes of the Chipping Norton Limestone Formation and corresponding beds. The sections occur in an area where the formation is transitional between an almost completely terrigenous, nearshore, brackish-water sand facies to the east, and a fully marine, carbonate sand facies to the west. Although no biostratigraphically significant macrofossils have been obtained from the sections, the succession can be adequately dated by reference to diagnostic ammonites collected from nearby sites. Palynological investigations have placed the Bajocian–Bathonian stage boundary close to the base of the Chipping Norton Limestone Formation.

References



(Figure 3.61) Exposure of the Chipping Norton Limestone Formation at the north end of the railway cutting at Hook Norton. (Photo: British Geological Survey, No. A9829; reproduced with the permission of the Director, British Geological Survey, © NERC, 1960.))



(Figure 3.62) Clypeus Grit Formation resting on clays of the Lias Group at Hook Norton. (Photo: British Geological Survey, No. A9820; reproduced with the permission of the Director, British Geological Survey, © NERC, 1960.))