
Horsehay Quarry, Oxfordshire

(SP 456 277, 459 274)

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Introduction

The Horsehay Quarry GCR site comprises two quarry sections near Duns Tew, Oxfordshire, one traditionally known in the literature as 'Horsehay Quarry' [SP 459 274], the other as 'Cullimore's Quarry' [SP 456 277]. They exhibit a fine Middle Jurassic succession ranging from the Northampton Sand Formation up to the Taynton Limestone Formation ((Figure 3.63), (Figure 3.64) (Figure 3.65)). The quarries also provide the type section for the newly defined Horsehay Sand Formation (Sumbler, in press), formerly known as the 'White Sands', a unit that is only poorly exposed elsewhere in Oxfordshire. The lithologically varied Sharp's Hill Formation is also fully exposed in the two quarries. The sections were first described in detail by Sellwood and McKerrow (1974), and later by Horton *et al.* (1987).

Description

The strata exposed include sands, fossiliferous clays and ooidal limestones. Varying descriptions of the succession, recorded at different times (e.g. Sellwood and McKerrow, 1974; Horton *et al.*, 1987), reflect the marked variations in the succession that are revealed as quarrying progresses. For example, in the following description (based on Sellwood and McKerrow, 1974), thicknesses for the Sharp's Hill and Rutland formations are 6.7 m and 10.8 m respectively but as exposed in May 1997, they are 2.55 m and 2.45 m respectively.

	Thickness (m)
Taynton Limestone Formation	
Oolite, large-scale cross-bedded, containing disarticulated oyster-shells	0.7
Sharp's Hill Formation	
4: Clay, yellow, ooidal, with horizontal burrow-fills; <i>Eomiodon</i> , abundant <i>Liostrea</i> , <i>Pleuromya</i> , rhynchonellids and <i>Hemicidaris</i>	1.1
3: Oolite, strongly cross-bedded, with oystershell debris; foresets bear drapes of green clay; interburrowed contact at top	0.8
2: Oolite, shell-fragmental, with clay drapes on foresets and bipolar cross-bedding; load casts at base	2.3
1: Clay, greenish-grey, mottled, ooidal, calcareous, regularly bedded; <i>Eomiodon</i> , abundant <i>Liostrea</i> , <i>Modiolus</i> , pectinids, <i>Pholadomya</i> , <i>Pinna</i> , <i>Pleuromya</i> , rhynchonellids and corals; thin brown laminated sand at base; uneven, erosive base	2.5
Horsehay Sand Formation	
5: Sand, white, rippled, with rare clay-drapes	0.5
4: Sand, brown, rippled and planar-bedded, with drapes of plant debris	3.1
3: Sand, brown, flaser-bedded, with some persistent clay laminae and low-angle cross-bedding	0.4
2: Sand, yellowish-brown, low-angle cross-bedded and rippled	4.5

1: Sand, brown, trough cross-bedded and flat-laminated, with flaser-bedded and iron-stained sand and clay; fauna disarticulated; *Astarte*, *Liostrrea* and *Lucina* 2.3

Northampton Sand Formation

Ironstone, reddish-brown, sandy, pervasively limonitized with 'boxstone' structures (Figure 3.65) 3.0

A large channel, 30 m wide and 2 m deep, at the top of the Horsehay Sand Formation has been recorded in Cullimore's Quarry. It is filled with trough cross-bedded sand containing abundant shell-debris, intraformational clay-clast conglomerates and much fine plant-detritus draped on foresets.

Interpretation

A long interval of erosion and/or non-deposition separates the deposits of the Northampton Sand Formation from those of the overlying Horsehay Sand Formation, although this does not necessarily manifest itself in the section. Sellwood and McKerrow (1974) interpreted these sands as dominantly shallow-water, intertidal to subtidal, sand-flat sediments; the dominance of low-angle cross-bedding and ripple-lamination in the sands indicates high-energy conditions, rapid deposition and a mobile substrate. The low-diversity bivalve fauna in Bed 1 is probably a reflection of low-salinity conditions. Sporadic bi-polar cross-bedding suggests intermittent tidal activity. The mixed cross-bedded and flaser-bedded, ferruginous sands and clays of Bed 1 are indicative of a marginal marine, deltaic depositional environment. The large channel-fill at the top probably represents a transient tidal channel.

In the absence of chronostratigraphically significant macrofossils, the age and correlation of the beds now termed the 'Horsehay Sand Formation' has proved controversial. Sellwood and McKerrow (1974) termed them the 'Swerford Member', which, following Richardson (1911a), Arkell *et al.* (1933) and Arkell (1947b), they treated as part of the Bathonian Chipping Norton Limestone Formation. However, Horton (1977) and Horton *et al.* (1987) argued that they represent the Aalenian 'Lower Estuarine Series' (i.e. the Grantham Formation of the East Midlands) and called them the 'White Sands', a name that derives from their development near Northampton (Sharp, 1870). As argued by Bradshaw (1978) on essentially circumstantial evidence, it is more likely that all of the supposed Grantham Formation or 'White Sands' from near Peterborough to near Chipping Norton equate with the lower part of the younger Rutland Formation farther north. This view was supported by Fenton *et al.* (1994, 1995) on the basis of a palaeoflora of dinoflagellate cysts. Whilst a sample from Horsehay Quarry proved to be barren, samples from near the base of the sands at New Duston (SP 15 627), Northampton and Swalcliffe [SP 680 3585] to the north-west of Horsehay Quarry, yielded an assemblage of late Bajocian to Bathonian dinoflagellate cysts similar to that of the Chipping Norton Limestone Formation of Oxfordshire and the Rutland Formation of Lincolnshire; rare, poorly preserved Aalenian cysts are probably derived from the subjacent beds. As previous names are unsatisfactory for several reasons, the strata are now termed the 'Horsehay Sand Formation' (Sumbler, in press), of which the present section is the stratotype.

A sedimentary break at the base of the overlying Sharp's Hill Formation is indicated by its erosive basal contact, and was particularly obvious in the section exposed in May 1997 when the topmost 0.7 m of the Horsehay Sand Formation was seen to be leached and rootleted, indicating possible emergence. The varied clay-oolite succession indicates rapidly changing depositional conditions. The ooidal clays reflect influxes of terrigenous mud and relatively low-energy conditions, and their varied fauna of marine, burrowing bivalves suggests a stable substrate. Corals in Bed 1 probably represent patch reefs, which are present elsewhere in the Sharp's Hill Formation. Ooids in the clays were probably derived from areas of carbonate sand deposition nearby. The cross-bedded, shell-fragmental ooidal limestones indicate much more turbulent waters, in which fine-grained terrigenous sediment was confined to clay drapes on foresets. The interburrowed top of Bed 3 probably represents a break in sedimentation when burrowing organisms established themselves before clay deposition resumed. The Sharp's Hill Formation has nowhere yielded age-diagnostic fossils; however, its stratigraphical position implies the Lower Bathonian *Tenuiplicatus* Zone.

The highest bed in the Horsehay Quarry section is assigned to the Taynton Limestone Formation, comprising cross-bedded, shell-fragmental limestones that witness a change to high-energy, current-dominated depositional conditions in slightly deeper water. It can be assigned to the Middle Bathonian *Progracilis* Zone by comparison with the

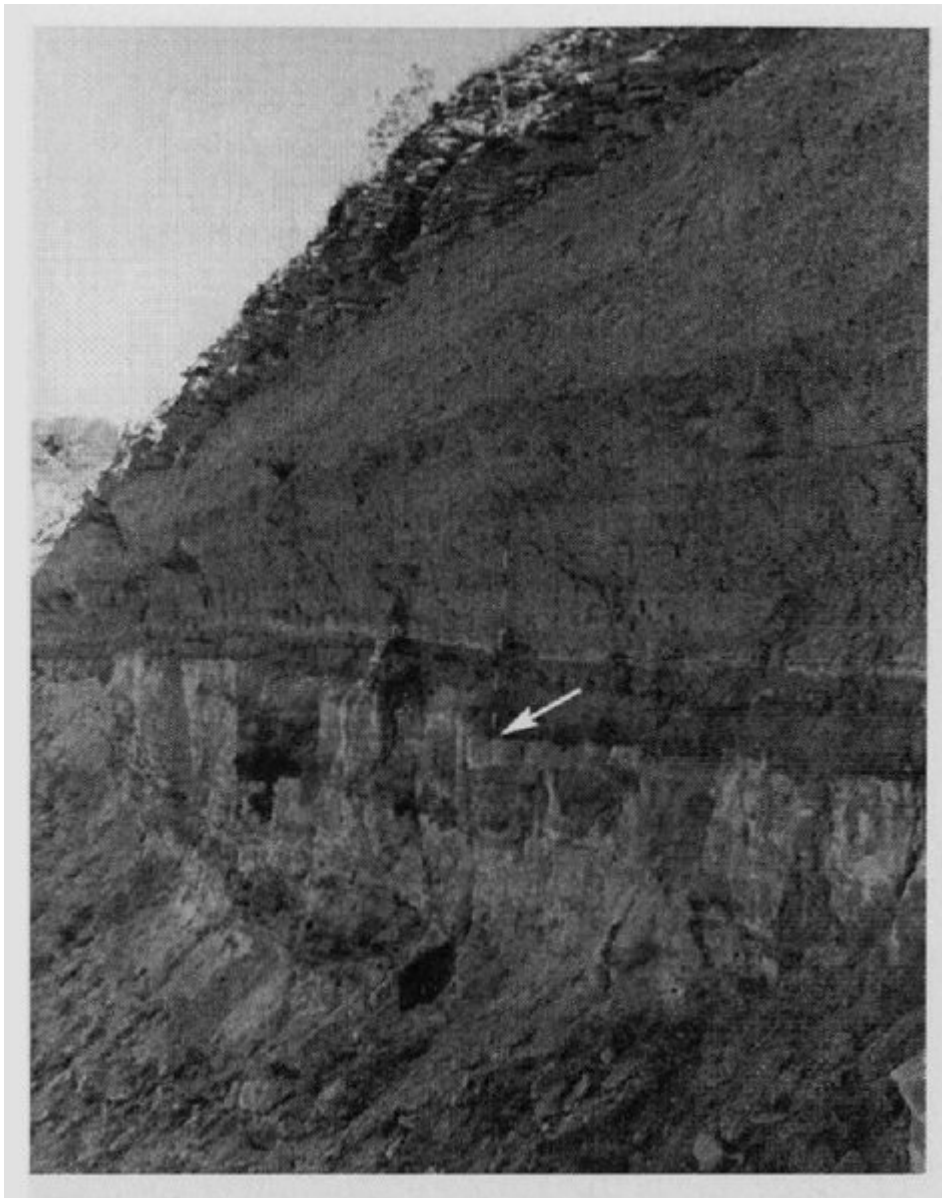
succession at Stonesfield (Boneham and Wyatt, 1993; see GCR site report, this volume).

Horsehay Quarry has special significance in interpreting the rapid and pronounced facies changes that affect the Horsehay Sand Formation and coeval strata in this district. To the west, within 5 km of the quarry, the upper part of the formation has passed laterally into sandy, ooidal limestones of the Chipping Norton Limestone Formation (for which the name Swerford Member may be appropriate), whilst the lower part has passed into the Hook Norton Member, consisting of less sandy limestones containing plant detritus (see Hook Norton GCR site report, this volume). To the north-east, it passes into the non-marine Stamford Member of the Rutland Formation (type locality Ketton Quarry, see GCR site report, this volume).

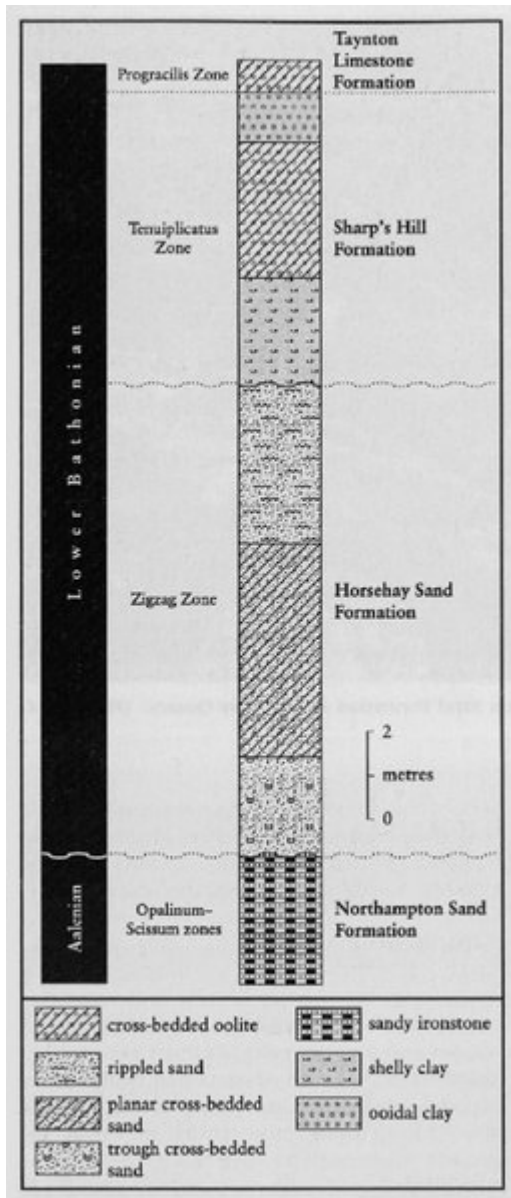
Conclusions

The Upper Bajocian to Middle Bathonian succession in the Horsehay Quarry GCR site is of special importance in elucidating regional correlation within a group of strata that exhibits considerable lateral thickness and facies changes. The 'White Sands', the dating of which has proved controversial, are now termed the 'Horsehay Sand Formation', and are thought to be of Late Bajocian–Early Bathonian age and to be coeval with the Chipping Norton Limestone Formation to the west. The complete Sharp's Hill Formation here demonstrates its characteristic variety of lithology and depositional environments, and includes fossiliferous beds in which an abundance of oysters is typical. Within the Taynton Limestone Formation, cross-bedded, ripple-laminated and flaser-bedded sedimentary structures are well displayed.

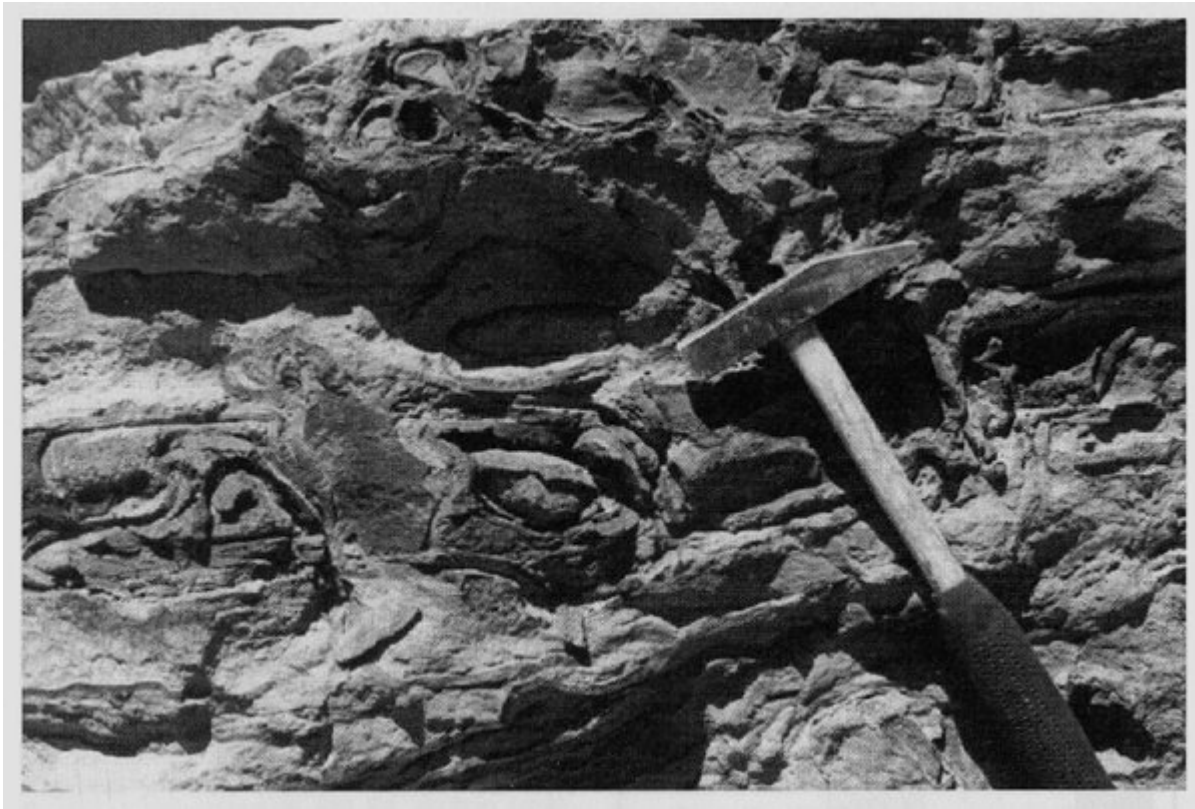
[References](#)



(Figure 3.63) Horsehay Sand Formation overlain by the Sharp's Hill Formation and the Taynton Limestone Formation at Horsehay Quarry. The base of the rule (arrowed) rests on top of the Horsehay Sand Formation. (Photo: M.G. Sumbler.)



(Figure 3.64) Graphic section of the succession at Horsehay Quarry.)



(Figure 3.65) 'Boxstone' weathering in the Northampton Sand Formation at Horsehay Quarry (Photo: M.G. Sumbler.)