Haresfield Hill, Gloucestershire

[SO 819 088]

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Introduction

The GCR site at Haresfield Hill, sometimes known as 'Haresfield Beacon' or 'Beacon Hill', lies on the crest of the Cotswold escarpment at 204 m OD, some 10 km south of Gloucester (Figure 4.16) and (Figure 4.21). The exposure consists of a line of crags that probably are largely natural and due to periglacial effects associated with the last (Devensian) glaciation. The uppermost beds of the Lias Group, consisting of the Bridport Sand Formation and the Cotswold Cephalopod Bed Member (Toarcian), and basal member of the Inferior oolite Group (Middle Jurassic) are well exposed (Figure 4.22).

The site contains an excellent section through a highly condensed representative of the Cotswold Cephalopod Bed Member underlain by sandy facies of the Bridport Sand Formation. In contrast to the other two equivalent GCR sites, at Wotton Hill and Coaley Wood, the Cotswold Cephalopod Bed Member and Bridport Sand Formation are incomplete both lithostratigraphically and in terms of the ammonite sequence, with several subzones not proved. This demonstrates the complexity of controls on condensed sedimentation in this area. The regional dip of the strata is low and to the south-east, though at the exposure itself some localized disturbance is evident.

The exposure was first described by Wright (1856), subsequently by S.S. Buckman (18871907) and later by Richardson (1904). Brief mention of the site was made by J. Buckman (1879), Richardson (1910a), and by Ager *et al.* (1973), while Davies (1969) figured a 2.7 m graphic log through part of the Bridport Sand Formation. Material from the site was figured and described in three monographs on brachiopods (Davidson, 1851–1852; Ager, 19561967, 1990). A sketch of the exposure, somewhat inaccurately labelled, was published by Dreghorn (1967).

Description

The Toarcian and Aalenian succession as described by Buckman (1887–1907) and Richardson (1904) is described below. The GCR site itself encompasses only the top part of the Bridport Sand Formation ('Cotteswold Sands'). The lithostratigraphy and biostratigraphy is summarized in (Figure 4.17).

	Thickness (m)
AALENIAN STAGE	
Birdlip Limestone Formation	
Leckhampton Member	
Scissum Zone	
8: **Scissum Beds**: Limestone, grey, micaceous, sandy, in several beds; oolitic or ferruginous at some levels. Poorly preserved *Lioceras ambiguum?* at about 1.3 m above base.	2.33
Opalinum Zone	
7: **Opaliniforme Bed**: Limestone, very hard, light greyish-yellow to dark-brown, containing very numerous very small dark-brown grains. *Lioceras opalinum* large and abundant, *Cypholioceras opalintforme*, *Lioceras comptumem*.	0.30
UPPER TOARCIAN SUBSTAGE	
Cotswold Cephalopod Bed Member	Total 0.55
Aalensis Zone	

6: **Aalensis Bed**: Hardish yellow rock, softer in lower part, with ferruginous grains; very closely attached to Opaliniforme 'beds' above. *Grammoceras aalense, Pleydellia aalensis, Thigonia ramseyi, Lytoceras wrighti* in bottom of bed.	0.10
Pseudoradiosa Zone, Pseudoradiosa Subzone	
Moorei Bed	
5: Marl, yellow, somewhat soft, easily broken, with dark-brown grains. *Homoeorhynchia cyanocephala, Dumortieria moorei, Lytoceras wrighti,* belemnites.	0.15
4: Marl, dark brown, full of *Homoeorhynchia cyanocephala, Furcirhynchia cotteswoldiae,* etc.'	0.05
Levesquei Subzone	
3: **Dumortieria Bed**: Marl, yellowish-brown, containing at the base a line of nodules at regular intervals. These nodules are of bluish-grey, hard, sandy, micaceous stone, with no ferruginous grains and are similar to the stone occurring in the sands below. *Lobothyris haresfieldensis* abundant throughout unit and *Homoeorhynchia cyanocephala. Grammoceras striatulum* occurs in fragments. *Galeropygus dumortieri* recorded by Paris (1908).	0.25
Bridport Sand Formation ('Cotteswold Sands')	
Bifrons and *Variabilis zones*	
2: Sands, yellow, micaceous, showing rough alternation of ripple-laminated and bioturbated units at 0.2–0.3 m intervals. A sandstone band containing fragments of a variety of *Hildoceras bifrons* occurs about 21 m below the top of the formation.	57.9
Whitby Mudstone Formation	
(No zonal data available)	
1: Mudstone.	39.6

Wright (1856) published a short list of fossils from the Cotswold Cephalopod Bed Member at this site, though interpretation is hindered by the taxonomy used, which has now been superseded. Several fossil species have been described from the Upper Toarcian sequence here, with the site particularly noted for its brachiopod fauna. Specimens of *Furcirhynchia cotteswoldlae* were figured and described from here and it is also the type locality for *Lobothyris haresfieldensis* (Alter, 1956–1967, 1990). *Homoeorhynchia cynocephala* is common, particularly in the marl band of Bed 4. This was commented upon by Wright (1856) and led to Lycett (1857) proposing the term '*Cynocephala* Stage' for all the strata that later became the Bridport Sand Formation and the Cotswold Cephalopod Bed Member. Paris (1908) described, as *Galeropygus dumortieri,* an irregular echinoid collected from here by Linsdall Richardson, stating that 'it has the characteristic ironshot matrix of the *Dumortieria*-Bed attached to it'. Haresfield Hill is one of very few Lower Jurassic sites in Britain to have yielded irregular echinoids.

Interpretation

In one of the earliest references to the Cotswold Cephalopod Bed Member at this site, Strickland (1850) considered it equivalent to the 'ironshot oolite' of Dundry Hill, just south of Bristol, though this is actually of Lower Bajocian Sauzei Zone age (Parsons, 1979). Wright (1856) challenged this view, recognizing that the fossils in the Cotswold Cephalopod Bed Member indicated a position near the top of the Upper Lias rather than within the Inferior Oolite.

Wright's (1856) description of the Cotswold Cephalopod Bed Member at Haresfield Hill is more accurate than his description of the succession at Wotton Hill. He noted the marl band (beds 4 and 5 of this account), with its abundant brachiopod fauna, but, judging from his statement that 'the entire bed measures from 2 ft to 2 ft 6 in. [0.62–0.77 m]', he did not differentiate the Opaliniforme Bed at the base of the Aalenian succession from the Cotswold Cephalopod Bed Member below. This, and the finer subdivision of the succession, only really became possible with further refinement of the ammonite biostratigraphy.

The thickness of the Cotswold Cephalopod Bed Member at Haresfield Hill is little more than two-thirds that at Coaley Wood and barely an eighth of that at Wotton Hill (Figure 4.17). Much of this attenuation can be attributed to a hiatus in the lower part of the succession. Buckman (1887–1907) described 'a line of nodules at regular intervals', with *Grammoceras striatulum* at the base of the Dumortieria Bed. Re-examination of the exposure suggests that they represent the dissected remnants of a cemented band projecting above an erosion surface developed on the less indurated sands beneath. It suggests that in this area the lower part of the Thouarsense Zone (= Striatulum Subzone) was developed in typical Bridport Sand Formation facies. The Dumortieria Bed here accounts for almost half the total thickness of the Cotswold Cephalopod Bed Member. The site may have been tectonically isolated to some extent from events that affected the two nearby GCR sites at Wotton Hill and Coaley Wood, which perhaps were located in an adjacent half-graben. Differences in the rate and timing of subsidence across different parts of the Severn Basin are known to have exerted a significant influence on sedimentation and facies patterns at various times during early and middle Jurassic times (Chidlaw, 1987; Chidlaw and Campbell, 1988; Simms, 1990a).

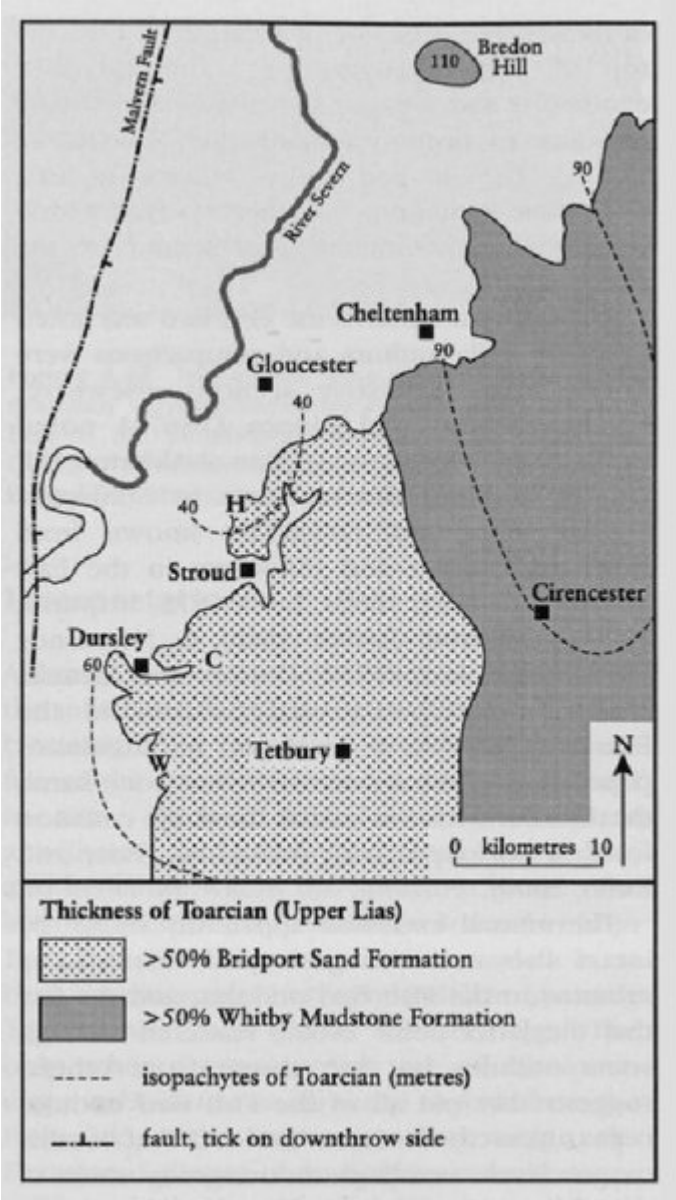
Above the Cotswold Cephalopod Bed Member, the Leckhampton Member is of similar thickness at all three GCR sites. This suggests that subsidence patterns changed significantly between late Toarcian and early Aalenian times.

Davies (1969) considered the small-scale alternations within the Bridport Sand Formation at this site to indicate the early development of an emergent sand-bar in this region, with ripple-laminated sands, representing intertidal deposits, intercalated with bioturbated beach sands. There is little evidence to support this specific scenario and more probably it merely reflects variations in sedimentation rate and consequent differences in the time of exposure of the substrate to bioturbation.

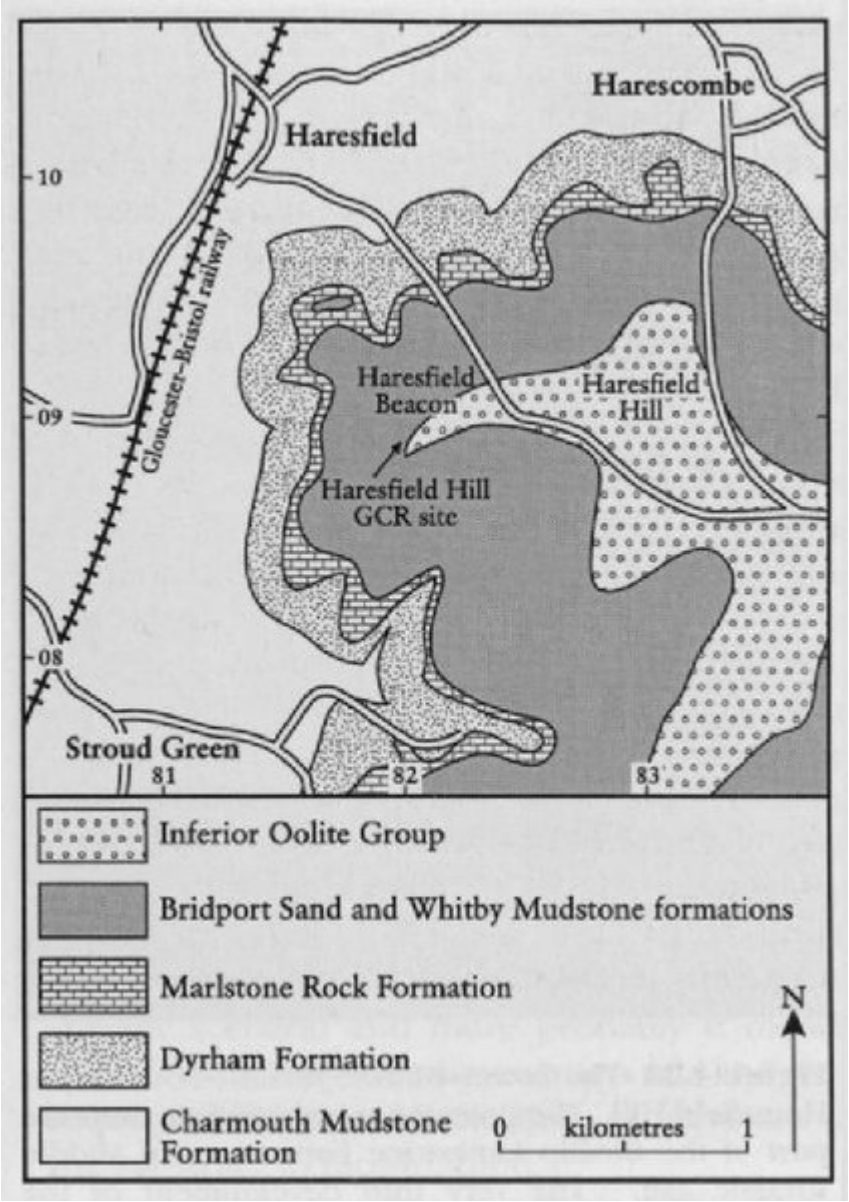
Conclusions

The Haresfield Hill GCR site is the only well-documented exposure of the Cotswold Cephalopod Bed Member north of Stroud, and hence close to its northern limit. The site exposes the top of the arenaceous part of the Bridport Sand Formation ('Cotteswold Sands') and the overlying Leckhampton Member of the Birdlip Limestone Formation. It provides an opportunity to examine the local lithostratigraphical units at the boundary of the Lower Jurassic Lias Group and Middle Jurassic Inferior Oolite Group. The Cotswold Cephalopod Bed Member here is very thin, and the ammonite sequence incomplete, indicating a significantly different subsidence and depositional history from the nearby GCR sites at Wotton Hill and Coaley Wood.

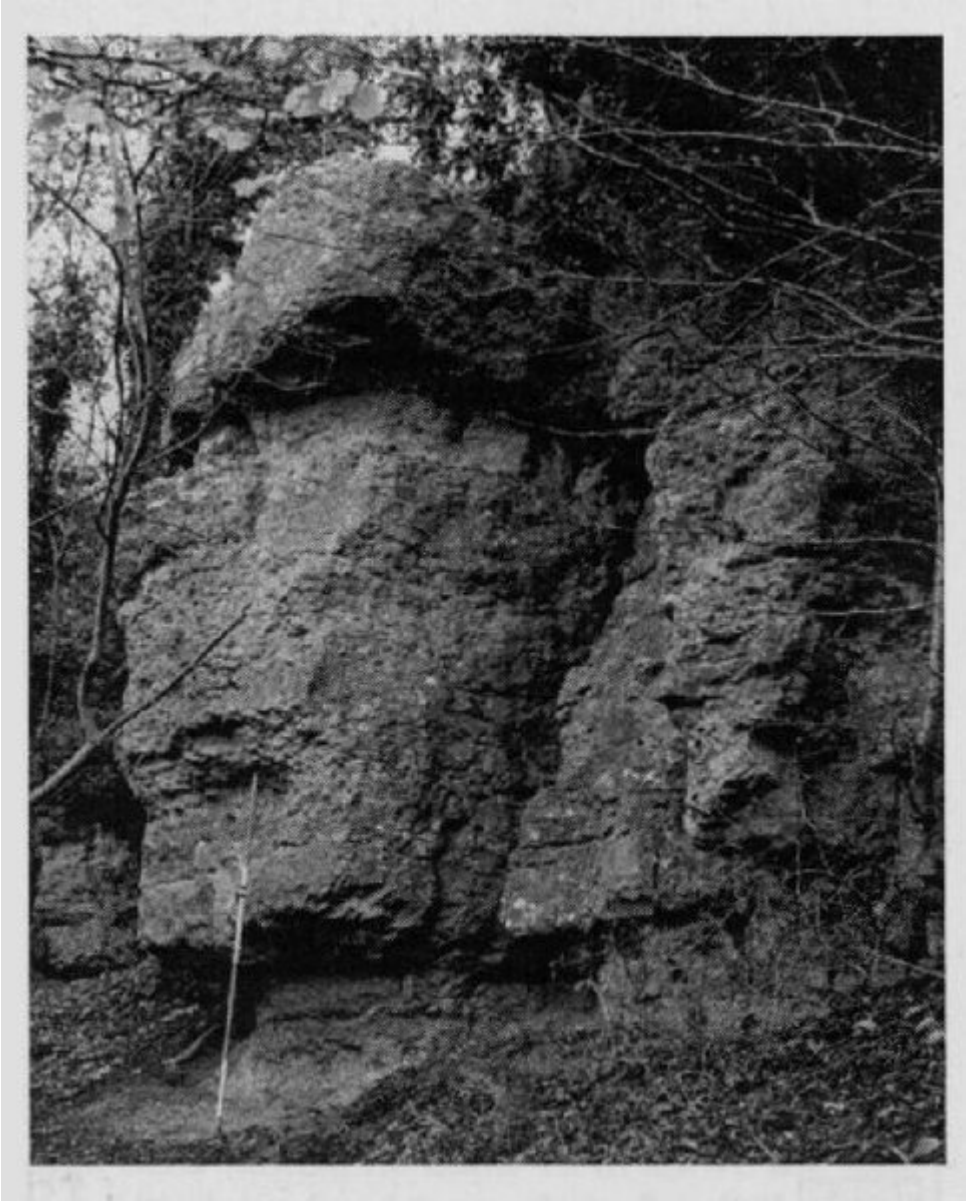
References



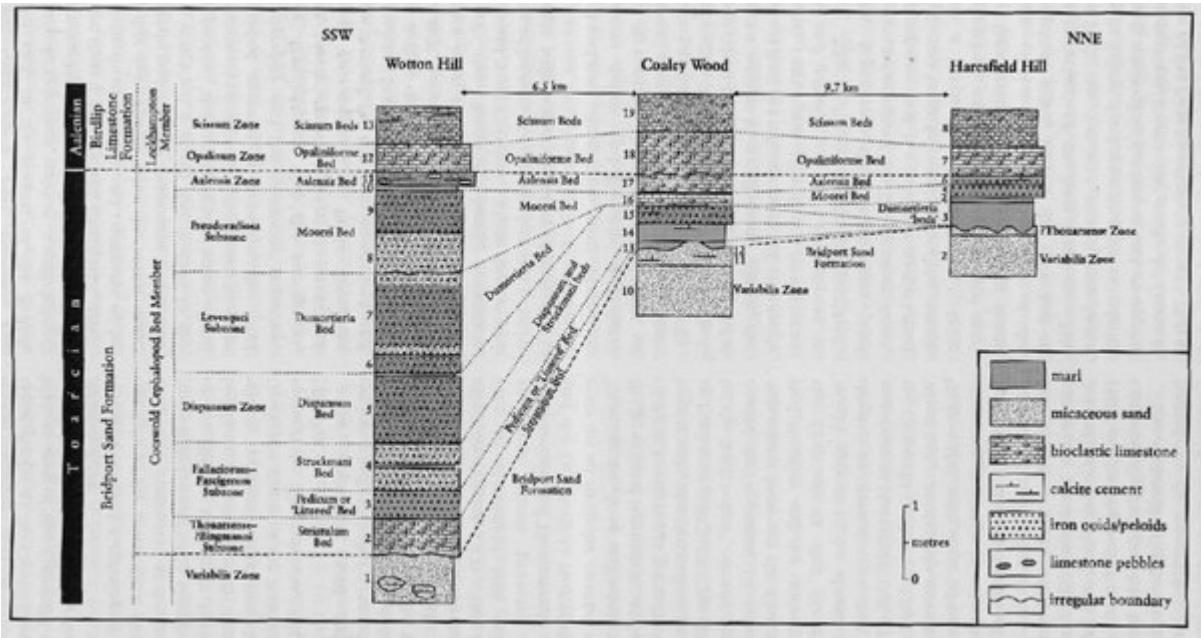
(Figure 4.16) Outcrop/subcrop map of Toarcian strata in the Severn Basin, showing the geographical distribution of sand-dominated (Bridport Sand Formation > Whitby Mudstone Formation) and clay-dominated successions. The location of the three Cotswold Cephalopod Bed Member GCR sites is indicated: W — Wotton Hill; C — Coaley Wood; H — Haresfield Hill. After Green (1992).



(Figure 4.21) Geology and location map for the Haresfield Hill GCR site.



(Figure 4.22) The Lower–Middle Jurassic boundary at Haresfield Hill. The prominent overhanging units are part of the Birdlip Limestone Formation, of Middle Jurassic age. The very thin development of the Cotswold Cephalopod Bed Member lies beneath the lower overhang and overlies an irregular erosion surface on the paler coloured sands of the Bridport Sand Formation. (Photo: K. Hitchings.)



(Figure 4.17) Lithostratigraphical and biostratigraphical correlation of named units within the Cotswold Cephalopod Bed Member (Bridport Sand Formation) at the GCR sites of Wotton Hill (from new observations by Chidlaw), Coaley Wood (after Richardson, 1910b) and Haresfield Hill (after Buckman, 1887–1907; and Richardson, 1904). Ammonite zonal stratigraphy revised by K.N. Page.