Wotton Hill, Gloucestershire

[ST 754 940]

N. Chidlaw

Introduction

The Wotton Hill GCR Site is located on the crest of the Cotswold escarpment, at about 180 m OD, overlooking the north-western outskirts of Wotton-under-Edge (Figure 4.18). It comprises two disused quarries, which together expose an almost continuous section through the uppermost formations of the Lias Group to within the highest formations of the Inferior Oolite Group. The larger of the two quarries, on the plateau crest, lies entirely within the Inferior Oolite Group and is not discussed further here. The smaller, lower quarry exposes the boundary beds of the Lower and Middle Jurassic successions.

The section is well exposed (Figure 4.19), and contains the greatest measured thickness of the Cotswold Cephalopod Bed Member, a locally developed condensed sequence within the Bridport Sand Formation, which is one of the richest sources of late Toarcian ammonites in Britain, and has yielded a more complete Upper Toarcian ammonite sequence than any other in the Severn Basin. The regional dip of the strata is less than 1° to the south-east (Cave, 1977). The expanded development of the Cotswold Cephalopod Bed Member here contrasts with that seen at two adjacent GCR sites, Coaley Wood and Haresfield Hill; together these localities are of critical importance for understanding the late Toarcian history of the Severn Basin.

The site was first described by Wright (1856), who gave a short faunal list for each of the main units included on his log. The lower quarry was described in detail by Richardson (1910b), a summary of his section being reproduced by Reynolds (1921), Ager (1955) and Ager *et al.* (1973). Murray and Hancock (in Savage, 1977) also described the section, and Doyle (1990–1992) provided a summary lithostratigraphical log to accompany his work on Toarcian belemnites.

Description

The succession as recorded by Richardson (1910b) is described, with slight modifications, below. The section in the lower quarry was re-logged in August 1999 and is reproduced in graphic form in (Figure 4.17). Biostratigraphical units are included to allow comparison between the description and (Figure 4.17). There are no major differences in terms of unit thicknesses and succession between the description of Richardson (1910b) and (Figure 4.17); the main discrepancies lie in details of facies identification and interpretation. In particular the 'limestone' of Richardson has been re-identified as calcite-cemented sandstone, while the terms 'ironshot' or 'iron speckled' refer to the presence of limonitic superficial ooids and peloids.

	Thickness (m)
AALENIAN STAGE	
Birdlip Limestone Formation	
Leckhampton Member **('Scissum Beds')**	
Scissum Zone	
13: Limestones, rather sandy, in several beds.	1.40 (seen)
Opalinum Zone	
12: **Opaliniforme Bed**: Limestone, hard, slightly iron-speckled.	0.30
UPPER TOARCIAN SUBSTAGE	
Bridport Sand Formation	
Cotswold Cephalopod Bed Member	Total 4.11
Aalensis Zone	

Aalensis Bed	
11: Marl, ironshot, dirty-grey, indurated, with iron-peloidal limestone clasts lithologically similar to the overlying Opaliniforme Bed; very ferruginous at top.	0.15
10: Clay, dark brown. *Homoeorhynchia cynocephala.*	0.05
Pseudoradiosa Zone, Pseudoradiosa Subzone	
Moorei Bed	
9: Marl, ironshot, grey and brown. *Zellleria?* sp. near top.	0.46
8: Marl, ironshot, grey and brown, indurated. *Homoeorhynchia cynocephala.*	to 0.41
Levesquei Subzone	
Dumortieria Bed	
7: Marl, ironshot, brown and grey-dappled, with thin and impersistent indurated bands. *Dumortieria novata, Dumortieria* sp., *Catulloceras leesbergi, Hudlestonia seriddens. Lobothyris haresfieldensis* in lower part.	0.91
6: Marl, sparsely ironshot, grey, indurated, very ferruginous in places.	0.20
Dispansum Zone	
5: **Dispansum Bed**: Limestone, coarsely but not richly ironshot, with marl parting. *Phlyseogrammoceras dispansum, Acrocoelites quenstedti, Brevibelus breviformis.*	0.76
Thouarsense Zone, ?Fascigerum–Fallaciosum subzones (*part*)	
4: **Struckmani Bed**: Limestone, coarsely but not richly ironshot, in two beds with marl parting.	0.51
3: Pedicum Bed ('Linseed Bed'): Marl, coarsely ironshot, dark. *Pseudogrammoceras saemanni, Acrocoelites tricissus.*	0.30
?Bingmanni–Stratulum subzones	
2: **Striatulum Bed**: Limestone, ironshot, massive. *Grammoceras striatulum, G. thouarsense.*	0.36
Bridport Sand Formation ('Cotteswold Sands')	
Variabilis Zone	
1: Sands, yellow, fine grained, micaceous; indurated near top.	5.83 (seen)

Other than the ammonites and other fossils referred to in the description above, little attention has been given to other elements of the fauna at this site. Doyle (1990–1992) identified four species of belemnite from the site and figured a specimen of *Acrocoelites* (*Toarcibelus*) *quenstedti.* All but one species, *Acrocoelites bobeti,* were confined to the Dispansum, Dumortieria and Moorei beds. Ager (1956–1967) referred to examples of *Homoeorhynchta cyanocephala* from this site.

A similar succession through the complete Cotswold Cephalopod Bed Member and a substantial thickness of the underlying Bridport Sand Formation is exposed in the side of a sunken lane at Nibley Knoll [ST 744 957] and was described in detail by Buckman (1887–1907, 1889). Richardson (1910b) stated that 'the sequence of the component layers of the Cephalopod Bed is so essentially the same as at Wotton Hill that it is unnecessary to detail it here'. The site was also mentioned by Cave (1977), but he did not provide any new information.

Wright (1856) recognized three units between the Bridport Sand Formation and what he regarded as Inferior Oolite for which the combined thickness was about 5.1 m (16 ft 6 in.). However, from his description of the basal bed of the Inferior Oolite as a 'loose rubbly oolite' it is probable that he included the Opaliniforme Bed within the Upper Lias, partly accounting for this exaggerated thickness. Nonetheless, he recognized that the affinities of this part of the succesion lay with the Upper Lias rather than the Inferior Oolite, contesting the earlier view of Strickland (1850) that the Cotswold Cephalopod Bed Member was the equivalent of the 'Dundry Ammonite Bed' of Bajocian age.

Interpretation

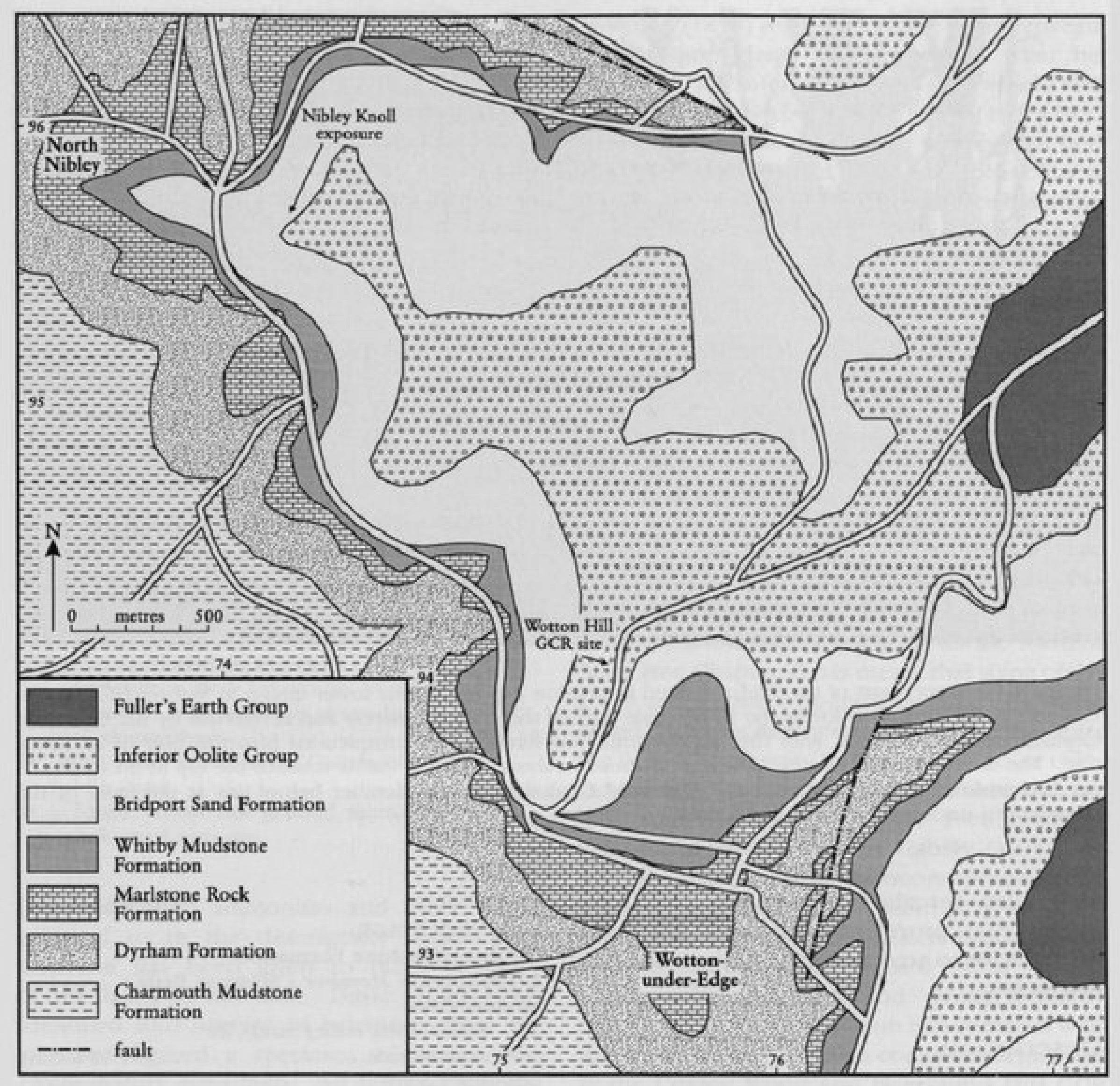
The ammonite fauna from this site is well documented and as a consequence the succession is stratigraphically well-constrained. Recent revision of the zonal and subzonal scheme for the Toarcian Stage (see Chapter 1) has meant that some of the zonal and subzonal boundaries at this and associated GCR sites may need revision. For example, the Moorei Bed was formerly regarded as coincident with the Moorei Subzone. This subzone has been superseded by the Pseudoradlosa Subzone (Figure 4.17), but Gabilly (1976) has reported that *Dumortieria moorei* occurs in the Mactra Subzone of the Aalensis Zone. Reexamination of accurately collected material will be necessary to resolve this, and similar issues.

The relatively thick and stratigraphically complete sucession at Wotton Hill contrasts with the much thinner, and less complete, sequences at the Coaley Wood and Haresfield Hill GCR sites (Figure 4.17). It indicates that subsidence was significantly greater here than farther east, in accordance with the site's putative position close to the hanging-wall of the half-graben fault. The succession is condensed, indicating that sedimentation rates in this mid-Cotswold region were very low towards the close of the Toarcian Stage. However, the biostratigraphical succession is relatively complete, suggesting that this area was less affected by the erosional events recorded by irregular boundaries at the other two sites. Deposition rates appear to have been reduced even further at the start of Middle Jurassic times, with the two ammonite zones of the Leckhampton Member represented by only 2.74 in of sediment compared with the 4.1 m for the Cotswold Cephalopod Bed Member beneath.

Conclusions

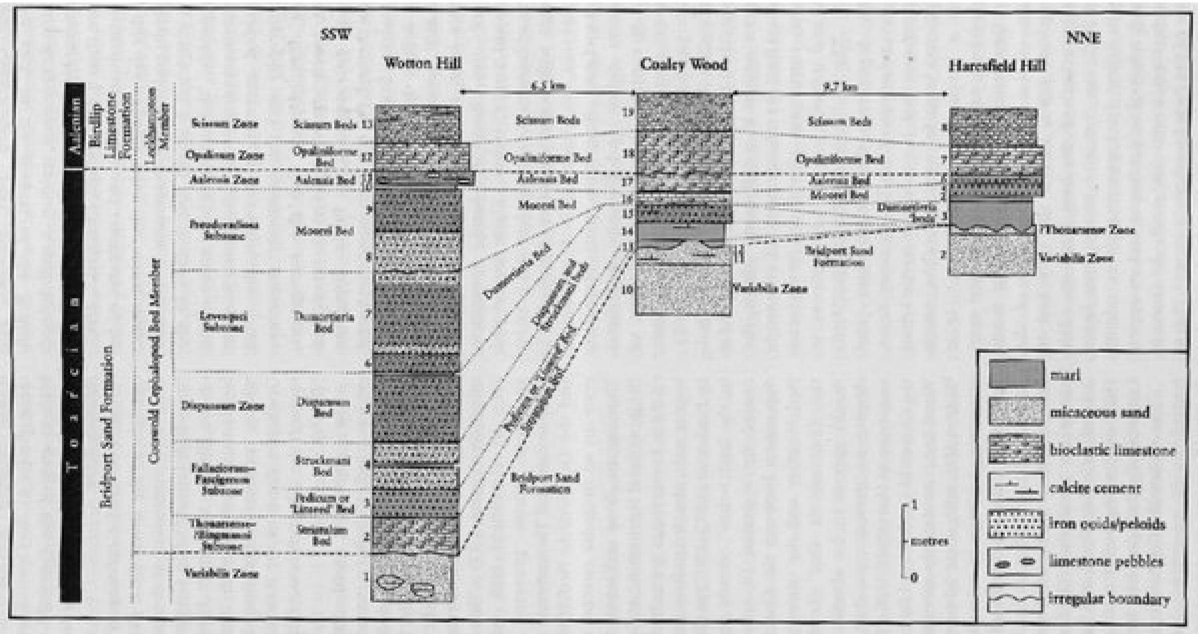
The lower quarry at the Wotton Hill GCR site is of exceptional importance because it exposes almost the fullest known development of the Cotswold Cephalopod Bed Member. It is a key site in any investigation of this local Upper Toarcian lithofacies and integral to interpreting the successions at the other two GCR sites of Haresfield Hill and Coaley Wood. Typical Bridport Sand Formation facies are exposed below the Cotteswold Cephalopod Bed Member, and most of the overlying Leckhampton Member (Scissum Beds) of the Birdlip Limestone Formation is exposed above. This provides an opportunity to examine the local lithostratigraphy at the boundary of the Early Jurassic Lias Group and Middle Jurassic Inferior Oolite Group. All the ammonite zones of this interval are represented, from the Variabilis Zone through to the Scissum Zone: they demonstrate extreme condensation of the upper part of the Toarcian Stage in this area. The quality of exposure is good, and this is maintained by a thick canopy of mature woodland, ensuring the limitation of undergrowth. The site makes a valuable contribution towards understanding early-middle Jurassic geological history, both locally and nationally.

References



(Figure 4.18) General geology and location map for the Wotton Hill GCR site and the Nibley Knoll exposure.

(Figure 4.19) Upper part of the Bridport Sand Formation exposed in the lower quarry at Wotton Hill. Typical Bridport Sand Formation forms the lower, pale part of the central buttress and is overlain by the Cotswold Cephalopod Bed Member, with the Struckmanni Bed forming the conspicuous bipartite unit in its lower part. The Middle Jurassic Birdlip Limestone Formation above is clearly visible towards the top of the quarry in the background; its junction with the Cotswold Cephalopod Bed Member below lies at the level of the conspicuous undercut. (Photo: M.J. Simms.)



(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.