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# Nibley Knoll, Gloucestershire

[ST 745 957]

M.G. Sumbler

## Introduction

The GCR site at Nibley Knoll, Gloucestershire, comprises sections in the sides of an incised lane leading from the village of North Nibley, together with disused quarries at the top of the hill. The fine sections of the Bridport (or Cotteswold) Sand Formation (Lias Group) seen in the lane cutting and adjoining slopes are of Early Jurassic (Toarcian) age and will not be described further here. Middle Jurassic rocks, comprising the Birdlip Limestone and Salperton Limestone formations of the Inferior Oolite Group, form the plateau-like hilltop, and are seen in section in the large abandoned quarry [ST 745 957] 200 m north-east of the Tynedale Monument. The sections there were first described by Buckman (1888, 1889a) and his records were summarized by Woodward (1894). Additional information was given by Richardson (1910), and the locality was also described briefly by Ager and Donovan (1973) and by Murray and Hancock (1977).

## Description

The Cephalopod Bed, at the top of the Early Jurassic Lias Group, was formerly exposed in the lane about 50 m from the quarry entrance (Murray and Hancock, 1977) but neither it nor the succeeding Leckhampton Member of the Inferior Oolite Group are now well exposed. Signs of brown, sandy limestone belonging to the latter member can be found in the lane near the entrance to the quarry [ST 7444 9578]. It is probably about 3 m in total thickness here (Buckman, 1888, beds 4 to 7). In the main quarry, there is excellent exposure of the higher part of the Inferior Oolite Group ((Figure 3.17) and (Figure 3.18)). The following measured section is based mainly on Richardson (1910).

	Thickness (m)
<b>Salperton Limestone Formation</b>	
<b><i>Clypeus Grit Member</i></b>	
1: Limestone, whitish-grey, with small, soft, pisoid-like spherules weathering out to give rock pitted appearance; rare fossils including <i>Pleuromya subelongata</i> (d'Orbigny), <i>Entolium demissum</i> (Phillips), <i>Ceratomya striata</i> (J. Sowerby), serpulids, <i>Terebratula globata</i> (of authors <i>non</i> J. de C. Sowerby)	1.83
2: ' <i>Upper Coral Bed</i> ': Limestone, rubbly, whitish, coated with lime; <i>Terebratula subsphaeroidalis</i> Upton, <i>Clypeus hugii</i> Agassiz, <i>Acrosalenia pustulata</i> Forbes, <i>Ctenostreon pectiniforme</i> (Schlotheim), <i>Limatula gibbosa</i> (J. de C. Sowerby), <i>Plagiostoma bellulum</i> (Morris and Lycett), <i>Entolium demissum</i> (Phillips), <i>Chlamys articulata</i> (of authors), <i>Isastrea</i> sp	0.10
<b><i>Upper Trigonina Grit Member</i></b>	

3: Ragstone, very shelly; typical shelly fauna dominated by large bivalves including trioniids; *Ctenostreon*, *Oxytoma inequivalve* (J. Sowerby), and *Pleuromya* cf. *uniformis* (J. Sowerby); and the brachiopods *Acanthothiris spinosa* (Linnaeus) (very abundant 0.10 m above base), *Aulacothyris* sp., *Rhactorhynchia* cf. *brevis* S.S. Buckman, *R. subtetrahedra* (Davidson), *R. cf. turgidula* S.S. Buckman, *Stiphrothyris tumida* (Davidson), and *Zeilleria* cf. *waltoni* (Davidson); *Acanthothiris spinosa* (Linnaeus) (very abundant 0.10 m above base) recorded by Cave (1977)

### Birdlip Limestone Formation

#### **Crickley Member**

4: Limestone, well-developed hardground at top with borings extending downwards for up to 0.3 m; oysters and other epifauna encrusting upper surface	3.96
5: Rubbly layer; belemnites	0–0.15
6: Limestone; <i>Propeamusium</i> ( <i>P.</i> ) <i>pumilum</i> (Lamarck)	3.05
7: Rubbly layer; belemnites	0.13
8: Limestone, more massive; common <i>P. (P.) pumilum</i>	seen to 2.43

The total thickness of the Crickley Member is about 10.7 m (Buckman, 1888, beds 2 and 3). In 1996, about 4.8 m were visible in the main quarry, and c. 2 m of similar beds at a somewhat lower level were seen in a small exposure immediately to the north-east of the main quarry entrance. The strata comprise massive to flaggy and cross-bedded, coarse- to very coarse-grained, rather poorly sorted, shell-fragmental, ooidal grainstones, with some indefinite lenses of more rubbly, very coarse-grained peloidal limestone with rounded intraclasts, like beds 5 and 7 of the section given above. In 1996, only about 0.6 m of the Clypeus Grit Member was exposed within the subsoil rubble at the top of the section.

A number of minor faults can be seen in the western side of the quarry, and Ager and Donovan (1973) also described a number of 'gulls' (widened joints or fissures) infilled with limestone rubble and travertine.

### Interpretation

Beds 5 to 7 of the section recorded by Buckman (1888; see also Woodward, 1894) are c. 0.8 m of hard, 'iron-shot' limestones that constitute the Opaliniforme Bed of Aalenian age (Richardson, 1910). This bed is lithologically distinct from the underlying Toarcian part of the Cephalopod Bed (Buckman, 1888, beds 8–15) and, according to Richardson (1910), is separated from it by an erosional non-sequence. Consequently, it is now excluded from the Cephalopod Bed and Lias Group, and is regarded as the basal unit of the Inferior Oolite Group, being included in the Leckhampton Member (formerly Scissum Beds) of the Birdlip Limestone Formation (Barron *et al.*, 1997). From the median marly part (Bed 6), Buckman (1888) reported the ammonite *Leioceras opalinum* (Reinecke), the zonal index taxon of the lower Aalenian Opalinum Zone.

Richardson (1910) tentatively equated beds 5 to 7 of his own section (see above) with the 'Pea Grit' (see Crickley Hill GCR site report, this volume), and classified the remainder of the section accordingly, with Bed 8 assigned to the Lower Limestone and Bed 4 to the Lower Freestone. However, these rubbly lenses (cf. beds 5 and 7) occur at various levels within the succession, and there seems to be no firm basis for Richardson's subdivision; certainly, there seems to be no obvious non-sequence within the succession such as is thought to occur beneath the Lower Freestone (= Cleeve Cloud Member) elsewhere in the south Cotswolds (see Hawkesbury Quarry GCR site report, this volume). More probably, the whole of the succession should be assigned to the Frocester Hill Oolite within the Crickley Member — see Mudge's (1978a) classification of the section at nearby Wotton Hill [ST 754 938]. Younger parts of the Birdlip Limestone Formation are absent owing to overstep by the Salperton Limestone Formation (Upper Inferior Oolite) and, as elsewhere in the south Cotswolds, the Aston Limestone Formation (Middle Inferior Oolite) is also absent at this locality. The non-sequence

is indicated by the well-developed hardground at the top of the Birdlip Limestone Formation that marks the so-called 'Bajocian denudation' of Buckman (1901).

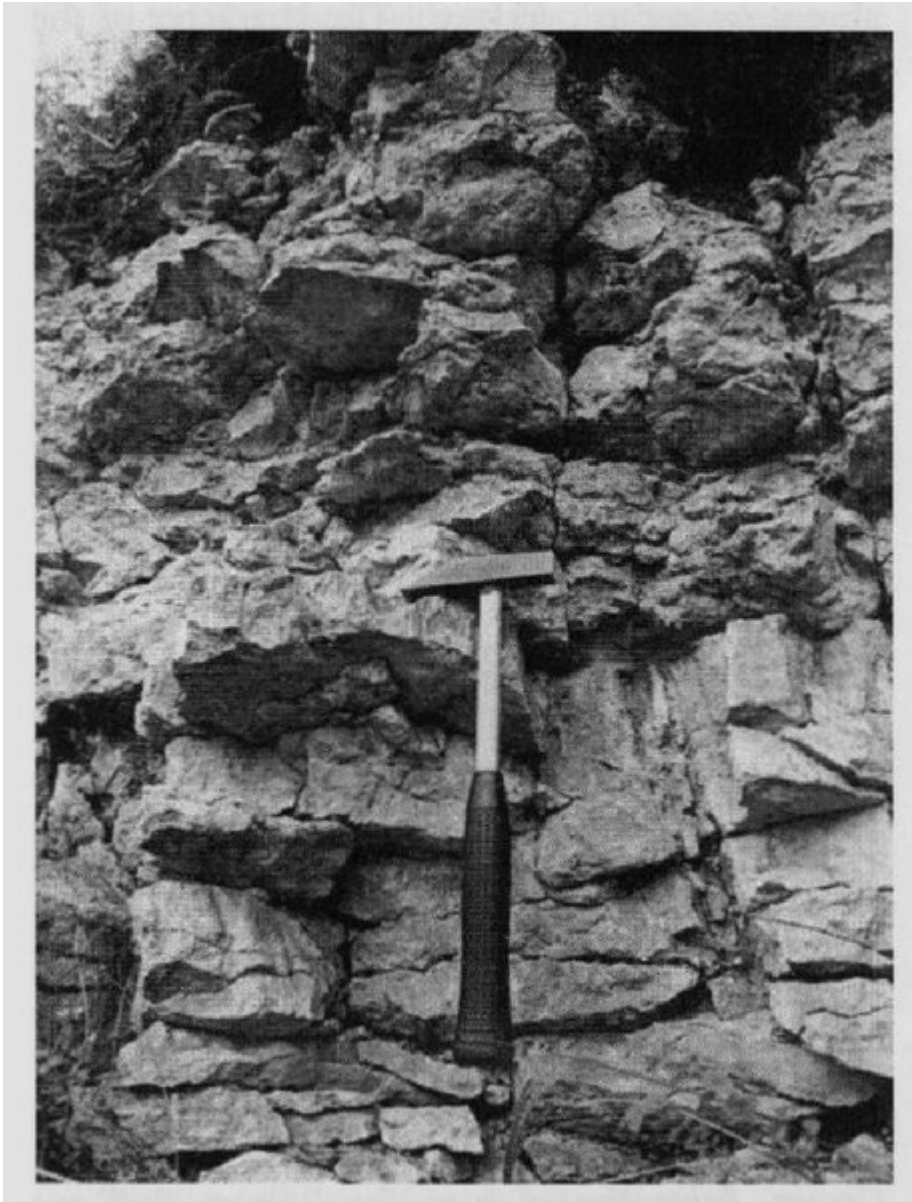
The nature of the contact between the Clypeus Grit Member and the underlying Upper Trigonina Grit Member, which is rather thin at this locality, could not be determined in the exposure seen in 1996 but, according to Richardson (1910) it was said to be a non-sequence. Partly for this reason, the so-called 'Upper Coral Bed' (Bed 2) recognized at various localities in the south Cotswolds (Richardson, 1910), is considered to be part of the Clypeus Grit Member. It contains sporadic corals such as *Isastrea*, but otherwise the fauna is not dissimilar to that of the Upper Trigonina Grit Member and perhaps on this basis was regarded as part of that unit by Cave (1977).

The superficial structures (minor faults and 'gulls') reported above are probably non-diastrophic features related to cambering, i.e. incipient landslipping around the margins of the hilltop plateau.

## **Conclusions**

The GCR site at Nibley Knoll includes a section that spans the Toarcian–Aalenian stage boundary, and shows an attenuated section of the Birdlip Limestone Formation (Lower Inferior Oolite). The hardground at the top of this formation is well displayed and represents the important 'Bajocian denudation' that removed much of the younger Aalenian and Lower Bajocian succession in the south Cotswolds. A highly fossiliferous exposure of the Upper Trigonina Grit Member occurs at the top of the section.

## **[References](#)**



*(Figure 3.17) Upper Trigonía Grit Member overlying Birdlip Limestone Formation at the quarry at Nibley Knoll. The hammer-head marks the bored hard-ground between the two. (Photo: M.G. Sumbler.)*



*(Figure 3.18) Exposure at the quarry at Nibley Knoll showing the Clypeus Grit and Upper Trigonía Grit members (c. 1 m) overlying the Birdlip Limestone Formation (c. 4.6 m). (Photo: M.G. Sumblér.)*