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# Knap House Quarry, Gloucestershire

[SO 925 147]

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## Introduction

The small complex of disused workings known as 'Knap House Quarry' lies on the Cotswold Scarp just north of the village of Birdlip, Gloucestershire. It is sited approximately on the axis of the so-called 'Birdlip Anticline', a localized axis of relative uplift in the Bajocian Stage characterized by an incomplete Inferior Oolite Group succession. Sections at Birdlip illustrating this attenuated succession have been referred to by many authors (Ager, 1956, 1969; Ager and Mudge, 1973; Murray and Hancock, 1977; Baker, 1977, 1981); these relate chiefly to the road cutting [SO 925 144], now obscured, just to the south of the GCR site, where the succession is very similar.

## Description

The lower part of the succession is exposed in a precipitous quarry face adjoining the Cotswold Way footpath in the northern part of the site; the higher, and more important part of the succession can be seen in a smaller quarry at a higher level in the southern part (Figure 3.34). The following section is based on records by C.F. Parsons (English Nature files) and the present author (1997).

	Thickness (m)
<b>Salperton Limestone Formation</b>	
<b><i>Clypeus Grit Member</i></b>	
Limestone, brown, massive to rubbly, peloidal packstone, softer and marly for 0.75 m at base; <i>Clypeusploti</i> Salter, <i>Pleuromya uniforrnis</i> (J. Sowerby), <i>Stiphrothyris tumida</i> (Davidson)	2.80
<b><i>Upper Trigonina Grit Member</i></b>	
Limestone, brownish-grey, hard, massive, ooidal, peloidal and shell-fragmental packstone, very shelly in parts	1.40
<b>Birdlip Limestone Formation</b>	
<b><i>Scottsquar Member</i></b>	
Limestone, pale pinkish-grey to buff, massive to poorly bedded, coarse-grained, poorly sorted, ooidal, peloidal and variably shell-fragmental grainstone to packstone with sporadic micritic (wackestone) lenses in lower part; replaced by 'reef' of soft, cream-white, slightly argillaceous micrite and finely granular packstone in middle part of face; topmost 0.15 m grey, hardened and recrystallized with annelid borings and encrusting oysters	1.60
Obscured	
Limestone, yellowish-buff, massive, ooidal grainstone; sharp, planar base	1.50
<b><i>Cleeve Cloud Member</i></b>	
Limestone, pale-grey to buff, medium-grained, poorly sorted, ooidal grainstone with sporadic shell-detrital bands; well bedded with large-scale cross-bedding at some levels; planar top with sporadic encrusting oysters	c. 10

## Interpretation

The Cleeve Cloud Member (the former Lower Freestone) is exposed in the northern part of the site; its overall lithology is much like that at the type locality (see Leckhampton Hill GCR site report, this volume). The succeeding Scottsquar Member is mainly developed as an ooidal and peloidal grainstone, the facies of the so-called 'Upper Freestone', but in the southern part of the site, it is replaced by marly micrites, the Oolite Marl of authors. The latter material forms a 'reef', containing sporadic bivalves, brachiopods and corals, about 10 m in diameter (briefly mentioned by Baker, 1981); the surrounding grainstones interdigitate and drape over the reef. The obvious equivalence between the Upper Freestone and the Oolite Marl, well illustrated at this locality, is the main reason why the two units are now combined as a single lithostratigraphical entity, the Scottsquar Member (Mudge, 1978a; Barron *et al.*, 1997).

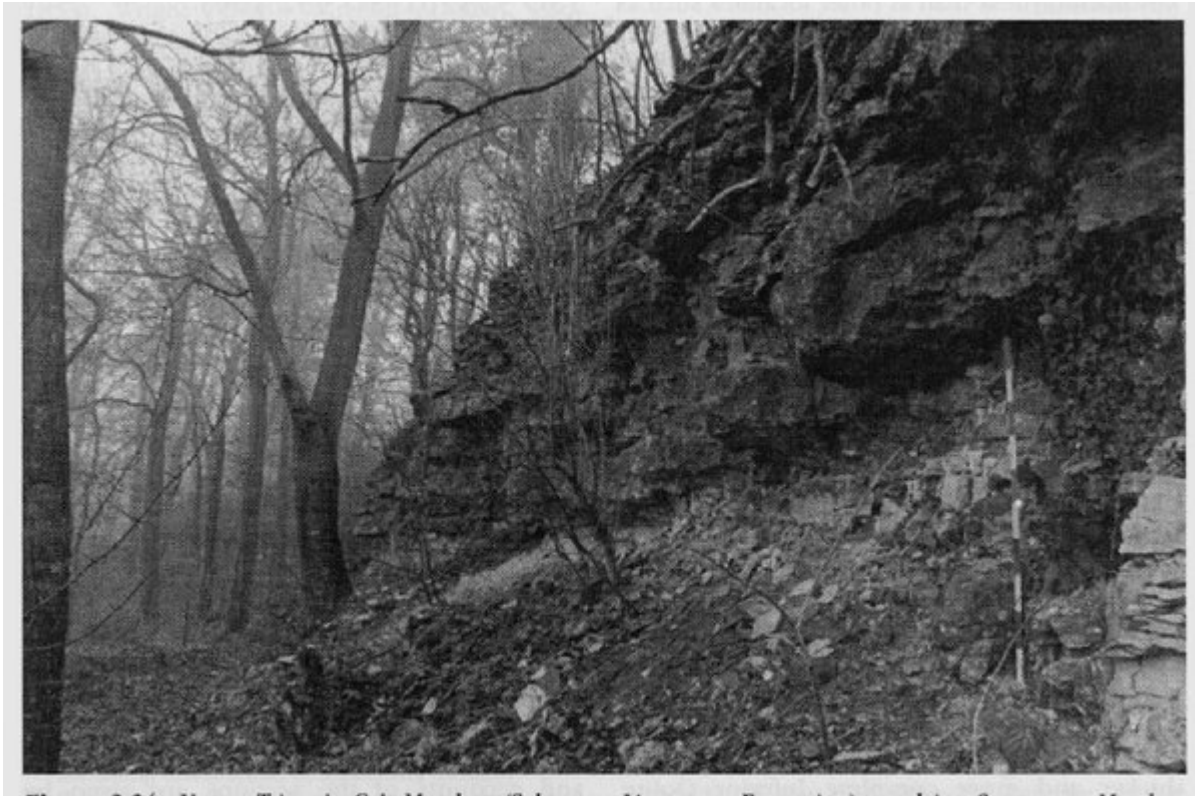
The total thickness of the Scottsquar Member (Upper Freestone and Oolite Marl of earlier accounts) is hard to estimate because of the separation of the two parts of the section, but is unlikely to be much more than 5 m, which is considerably less than at other localities such as Leckhampton Hill (see GCR site report, this volume). Evidently the youngest part of the succession is missing at Birdlip; the top surface is planed and eroded, and is succeeded by the Upper Trigonina Grit Member, the basal unit of the Salperton Limestone Formation (Upper Inferior Oolite). This erosion surface, marked by borings and encrusting oysters, represents Buckman's (1901) so-called 'Bajocian denudation'. The fact that the Upper Inferior Oolite (Upper Bajocian) rests directly on the Lower Inferior Oolite (Aalenian) at this locality, whereas only a short distance away (e.g. at Tuffley's Quarry SSSI [SO 932 159]; Richardson, 1904) Middle Inferior Oolite (Lower Bajocian) intervenes, led Buckman (building on a suggestion by Groom) to the idea that a phase of folding preceded the 'denudation'. The geographical distribution of the various units within the Inferior Oolite Group led him to recognize an axis of relative uplift (the 'Birdlip Anticline'), characterized by attenuated Lower and Middle Inferior Oolite successions, flanked by the Painswick and Cleeve Hill 'synclines', in which thicker and more complete Inferior Oolite Group successions occur (Buckman, 1901, pl. 6; Arkell, 1933, fig. 36; Barron *et al.*, 1997, fig. 4).

Whilst Buckman correctly interpreted the pattern of overlap of the Lower and Middle Inferior Oolite, the same relationships (shown with a vertical exaggeration of over 300 in (Figure 3.2)) could be merely a result of submarine erosion of the sediment pile during a sea-level low-stand without any folding being involved; it remains unclear to what extent the 'synclines' and 'anticlines' represent sedimentary troughs and highs, and how much they relate to differential erosion during the 'Bajocian denudation' (Barron *et al.*, 1997; Sumblar *et al.*, 2000).

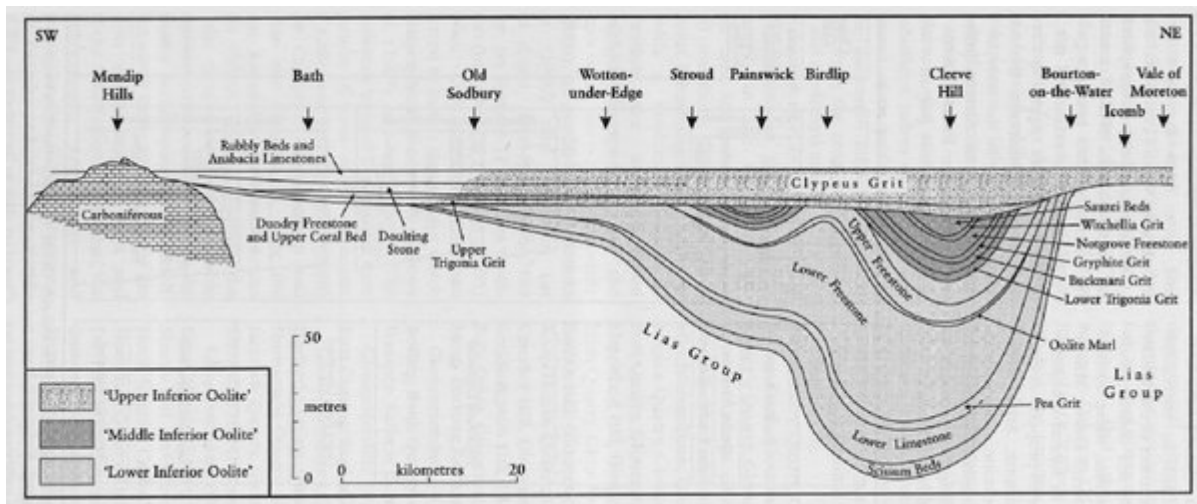
## Conclusions

Knap House Quarry, sited on the axis of the 'Birdlip Anticline', shows a section in which the Salperton Limestone Formation (Upper Inferior Oolite) rests directly on the Birdlip Limestone Formation (Lower Inferior Oolite), in contrast to other localities where the Aston Limestone Formation (Middle Inferior Oolite) intervenes. This relationship led Buckman (1901) to his important concept of the 'Bajocian denudation'.

## [References](#)



(Figure 3.34) Upper Trigonina Grit Member (Salperton Limestone Formation) overlying Scottsqwar Member (Birdlip Limestone Formation) at Knap House Quarry (Photo: M.G. Sumbler.)



(Figure 3.2) Diagrammatic cross-section through the Inferior Oolite Group showing the Painswick and Cleeve Hill 'synclines', and the intervening 'Birdlip Anticline'. (After Akell, 1933, fig. 35; see also Barron et al. (1997, fig. 5) which shows a similar section through the 'synclines' based on more recent data and with revised lithostratigraphy.)