Crickley Hill, Gloucestershire

[SO 924 161]–[SO 932 160]

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Introduction

The impressive exposures of the Birdlip Limestone Formation (Lower Inferior Oolite) on the Cotswold escarpment at Crickley Hill, near Birdlip in Gloucestershire (Figure 3.35), have attracted the attention of geologists since the early days of the science. They are of particular interest for the fine development of the famous 'Pea Grit', and have recently been designated as the type locality of the Crickley Member (= Lower Limestone plus Pea Grit of previous authors). The GCR site at Crickley Hill lies about 1.5 km north of the village of Birdlip, and extends for nearly 1 km. It encompasses the steep, cliff-like south face of the hill, together with an area of old quarries at the western end.

Description

The finest exposures occur on the south face, and accounts of the sections are given by numerous authors including Brodie (1851, 1853), Wright (1860), Witchell (1882b), Lucy (1890b), Woodward (1894) and Richardson (1904). All of these accounts differ in detail, but a useful generalized section (Figure 3.36), based on the exposures near the eastern end of the site [SO 930 160] where the Leckhampton Member (formerly Scissum Beds) is poorly exposed, is given by Ager (1969). The following section is largely based on Ager (1969), with revised lithostratigraphical classification and some additional detail by the present author.

	Thickness (m)
Birdlip Limestone Formation	
Cleeve Cloud Member	
Oolite, flaggy; shell debris, pentacrinoids, Liostrea, bryozoans	5.8
Calcilutite, rubbly; shell debris, brachiopods, bryozoans	1.9
Calcilutite, bioclastic, massive, bioturbated; bryozoans in life position	1.3
Oolite; ferruginous pisoids at base	1.2
Oolite	0.8
Crickley Member	
'*Pea Grit*'	
Pisolite, well bedded, with inter-bedded oolite; diverse fauna with many micromorphic forms including terebratulid brachiopods (notably *Zeilleria*), bivalves, echinoids and gastropods; other fossils locally abundant	3.3
'*Lower Limestone*'	
Oolite, massive, thick-bedded, locally bioturbated; *Pseudoglossothyris,* echinoids in life position, *Liostrea* and shell debris at base	8.4
Oolite, bioturbated; *Trichites,* echinoids in life position, *Pseudoglossothyris simplex* (J. Buckman) at base	4.0
Leckhampton Member	

Limestone, sandy and silty, yellowish-brown, ferruginous, somewhat argillaceous, strongly bioturbated; burrowing bivalves including *Pholadomya* in life position; brachiopods including *Homoeorhynchia cynocephala* (Richard) in lower part, and *Rhynchonelloidea subangulata* (Davidson) in upper part; bone bed at base	3.4
Lias Group	
Bridport [Cotteswold] Sand Formation	
Shale, black, fossiliferous	1.25
Silt, ferruginous, micaceous, thinly bedded; calcareous doggers near top	seen to 2.0

Interpretation

The steep, cliff-like scarp face of Crickley Hill can be viewed from across the valley at Barrow Wake [SO 931 154], Birdlip, from where it can be appreciated that the crags of Inferior Oolite Group originated as a natural landslip scar, resulting from failure of the underlying mudstones and siltstones of the Lias Group, but the outcrops of bare rock have since been greatly accentuated by quarrying. The exposures at Crickley Hill constitute the type locality of the Crickley Member of the Birdlip Limestone Formation, although the actual bed-numbered measured section on which it is based (Mudge, 1978b) lies on the north-west side of Crickley Hill [SO 929 163], just outside the GCR site.

The Leckhampton Member, the basal unit of the Inferior Oolite Group throughout the north and mid-Cotswolds, rests non-sequentially on the Lias Group; Ager's (1969) 'bone bed' at the base probably includes reworked and phos-phatized fossil material from the Bridport [Cotteswold] Sand Formation at the top of the Lias Group.

The upper part of the succeeding Crickley Member contains seams and beds of pisolite; this constitutes the 'Pea Grit' (or Crickley Oncolite of Mudge, 1978a), but the separation from the underlying 'Lower Limestone' (or Crickley Limestone of Mudge, 1978a) is rather indefinite as is evidenced by the variety of different thicknesses accorded to these units by different authors. It is for this reason that the units are now combined into the Crickley Member, which is dominated by well-bedded, medium- to coarse-grained, rather poorly sorted, ooidal and peloidal, bioturbated limestones (Barron *et al.,* 1997). The term 'Pea Grit Series' was used in the same sense by some authors (e.g. Arkell, 1933) although, as originally used by Wethered (1891), this term also included the beds of the Leckhampton Member.

The 'Pea Grit' is confined to a relatively small area of the Cotwolds near Cheltenham, stretching from a little south of Birdlip to Cleeve Hill. It is most impressively developed at Crickley Hill. The typical 'Pea Grit' is a pisoidal pack-stone, in which the pisoids ('pea-stones') are typically flattened ovoids of about 5–7 mm diameter (Figure 3.37). They comprise a shell-fragment nucleus surrounded by layers of micrite in which microscopic examination reveals tube structures, for example of carbonate-secreting algae or cyanobacteria such as *Girvanella* (Wethered, 1891). As such, the pisoids appear to be true oncoids, i.e. carbonate-coated grains formed largely as a result of microbial activity. The micrite layers are commonly assymmetrical about the nucleus, suggesting accretion on the upper surface of the grain, which was periodically flipped over, perhaps as a result of storm action. The combined presence in the 'Pea Grit' of a significant micromorphic fauna (Mudge, 1978a) and oncoids in a micrite matrix suggests accumulation in a shallow, generally quiet-water environment with a rich algal flora.

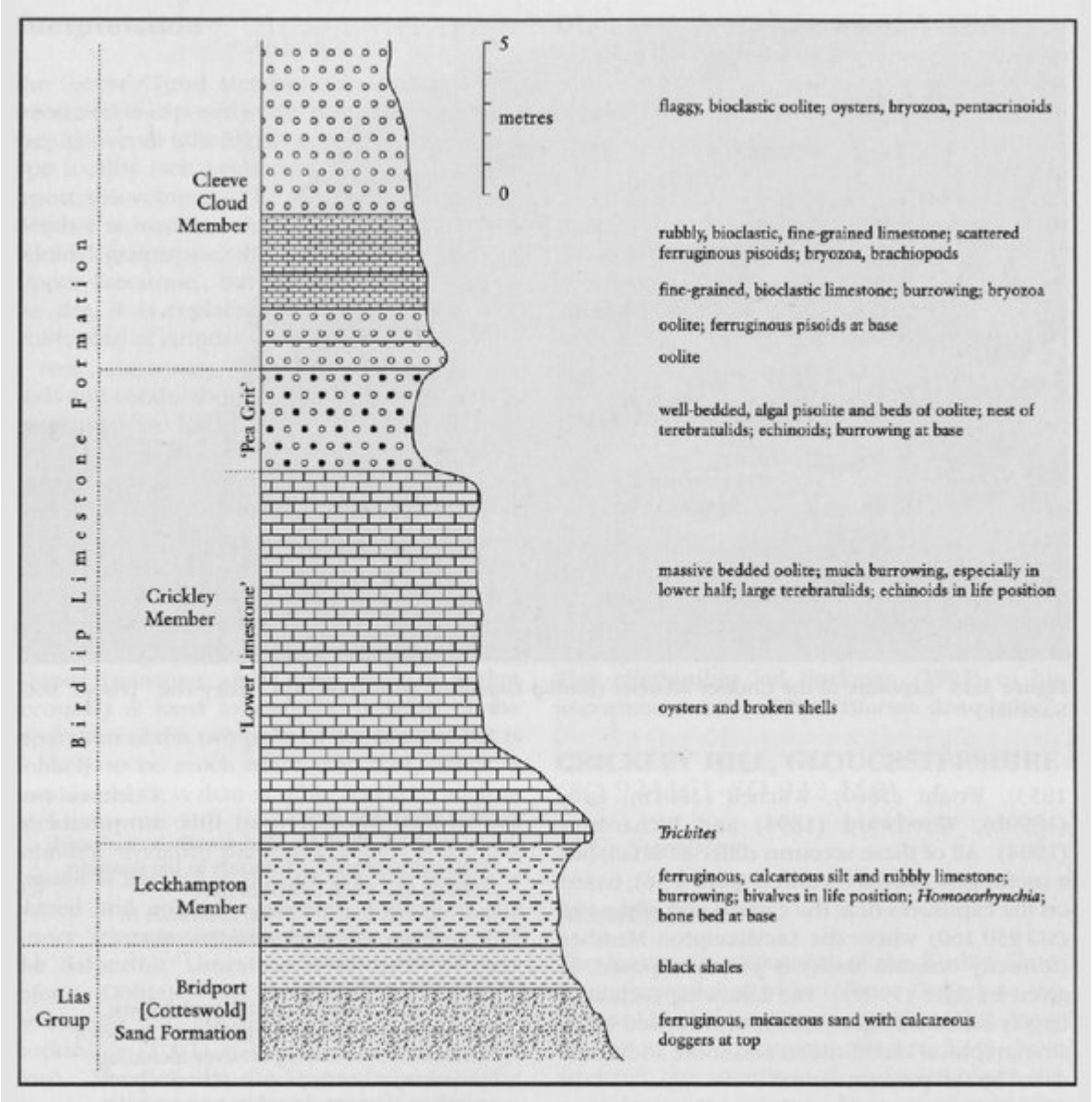
In general, the dominant lithology of the succeeding Cleeve Cloud Member (formerly Lower Freestone) is cross-bedded oolite grainstone, as at Leckhampton Hill (see GCR site report, this volume). However, at Crickley Hill, this lithology is interbedded with lower-energy peloidal packstones. Mudge (1978a) termed this mixed facies, well seen towards the western end of the GCR site, the 'Fiddler's Elbow Limestone'. The lower part includes the so-called 'Crickley Coral Bed' of Lucy (1890b); this is a 3.3 m-thick detrital limestone containing debris of reworked corals such as *Montlivaltia, Isastrea* and *Thamnasteria* (Tomes, 1886; 1890). These may have been reworked from localized reefs growing on top of the 'Pea Grit' such as are known at several other localities, for example at Fiddler's Elbow [SO 887 142], about 5 km to the south-west of Crickley Hill (Channon, 1950), and near Cockleford [SO 979 140], about the same distance to the south-east (Sumbler *et al.,* 2000).

Conclusions

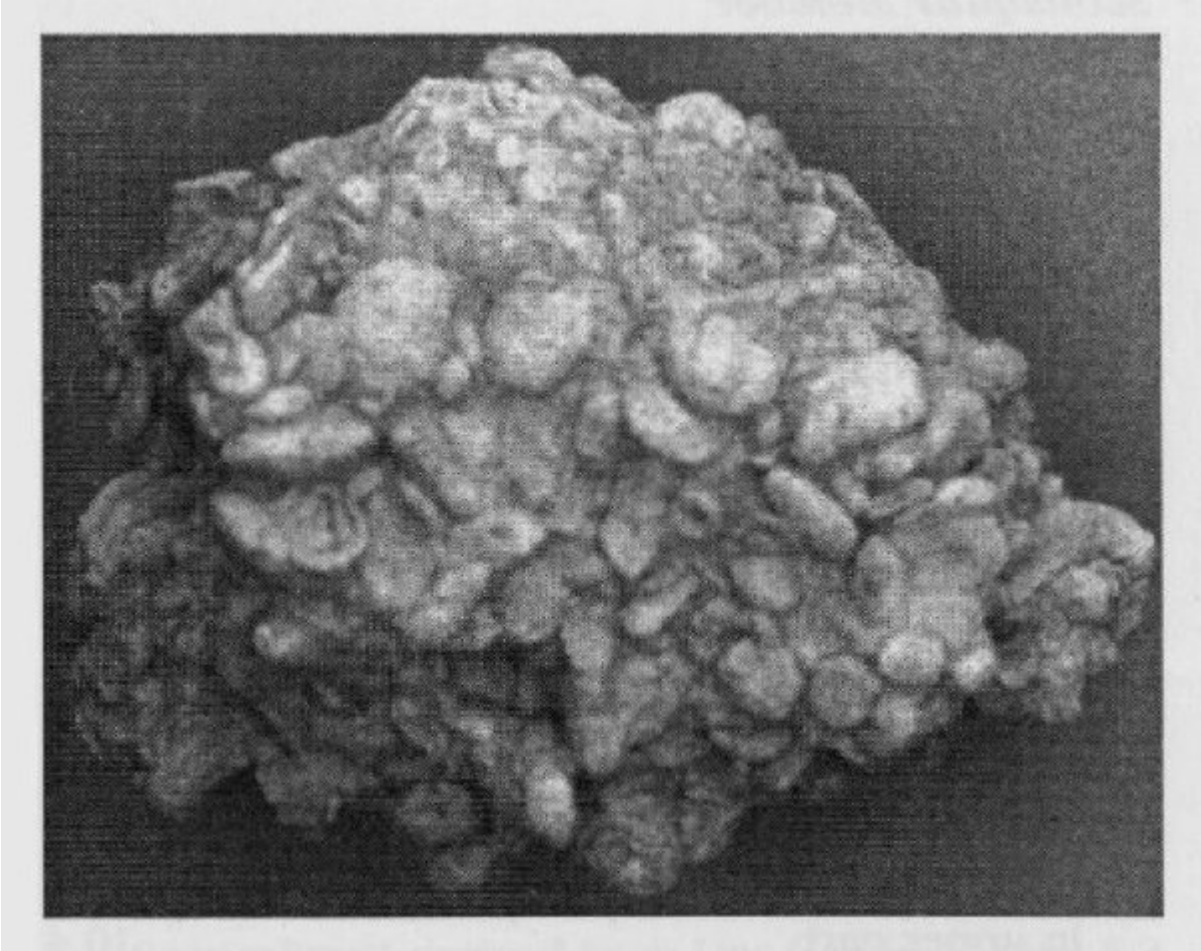
Crickley Hill exposes one of the best and most impressive sections of the lower part of the Birdlip Limestone Formation (Lower Inferior Oolite) in the Cotswolds, and is one of the few places where the base of the Inferior Oolite Group has been exposed. It is the type locality of the Crickley Member (Tower Limestone' and 'Pea Grit' of previous authors). It is also noteworthy for the fine development of the 'Pea Grit', in the upper part of the member.

References

(Figure 3.35) Exposure of the Crickley Member (Birdlip Limestone Formation) at Crickley Hill. (Photo: M.G. Sumbler.))



(Figure 3.36) Graphic section of the strata exposed at Crickley Hill. (After Ager, 1969, fig. B14.) See text for detailed lithological description.)



(Figure 3.37) Specimen of the pisoidal packstone known as 'Pea Grit'. (Photo: M.G. Sumbler.) (90% natural size.))