Watton Cliff, Dorset

[SY 453 908]

Introduction

Watton Cliff (also known as 'Ware Cliff' or 'West Cliff') preserves a mixed fauna containing marine and non-marine elements of late Bathonian age. The fauna is diverse and includes various fishes, amphibians, mammals and mammal-like reptiles. The cliff-top exposure forms the most complete section of the Forest Marble Formation from Dorset.

During the spring of 1970 several blocks of limestone were found on the shore below Watton Cliff (Figure 2.15). These blocks came from the Forest Marble Formation and were found to contain a variety of fossil materials, including the crinoid *Apiocrinites,* teeth of the shark *Asteracanthus* and rare remains of the crocodilian *Teleosaurus.* More recently, the site was excavated by a team from University College London (Dineley and Metcalf, 1999). At Watton Cliff the Forest Marble Formation occurs within the *Clydoniceras hollandi* Zone and is late Bathonian in age (Freeman, 1976b).

Description

The section shown in (Table 2.3) is taken from Dineley and Metcalf (1999), which was based on a variety of earlier sources.

At Watton Cliff the Forest Marble Formation is composed of flaggy, cross-bedded limestones that contain many fragments of shells (Freeman, 1976b). The Forest Marble Formation has been divided into three lithological units. The oldest unit is composed of thick green-brown manly clay that is interbedded with thin, discontinuous shelly limestones, silts and sandstones (Holloway, 1983). The overlying facies is a thick (3–5 m), coarse, bioclastic limestone, the 'calcirudite bed' of Holloway (1983). It has been suggested that this bed forms the lateral equivalent of the *Digona* Bed that crops out in the Weymouth region (Torrens, 1969). The uppermost unit comprises laminated manly clays interbedded with very fine sandstones and silts.

The microvertebrates (including the mammalian remains) were recovered from the 'calcirudite bed' by bulk sampling and acid etching (Freeman, 1976b; Kermack *et al.,* 1987; Kermack, 1988). This bed is composed of impersistent sheets and lenses of planar and cross-bedded shelly and oolitic limestones, interbedded with manly drapes (Dineley and Metcalf, 1999).

Invertebrates from this bed include fragments of the oyster *Praeexogyra hebridica* and complete pectinids. Rare taxa include rhynchonellids and bivalves. Plant fossils also are common and range in size from small fragments to large logs (Dineley and Metcalf, 1999).

(Table 2.3) Section of the Watton Cliff GCR site

	Thickness (m)
Forest Marble Formation	
10. Flaggy blue limestone, showing ripple-marks, and clays or shales, with 'race'; the limestone preponderating	3.04
9. Clays with 'race', shaley limestone, thin shelly limestone and thin leaves of sandy limestone, ferruginous in places; the clay preponderating	6.10

8. (= 'calcirudite' of Holloway = *?Digona* Bed of Torrens = 'Mammal Bed' of Freeman). Cross-bedded shelly limestones, sandy and oolitic in places, with irregular clay seams, many ochreous galls, lignite; and with the bivalves *Camptonectes, Plagiostoma, Praeexogyra* and fragments of the crinoid *Apiocrinus*	3.00–4.60
7. Grey clay (impersistent)	0–0.90
6. Hard, white or grey marl, with thin seams of bluish shelly limestone	0.15
5. Blue, flaggy argillaceous limestones, and blue and yellow clays, with thin layers of calcareous grit	9.15
4. (= Boueti Bed). Hard, sandy marl stained reddish-brown; *Rhynchonella'* bed, with the bivalve *Chlamys vagans* and the brachiopods *Goniorhynchia boueti, Avonothyris langtonensis, Ornithella digona,* crinoid (*Apiocrinus*) ossicles and serpulids Fuller's Earth	0.30
3. Bluish-yellow marl, with impersistent band of hard white marl	2.74
2. Hard, fissile white marl	0.84
1. Grey marls	seen 25.00

The microvertebrate fauna is composed of two well-defined components. The first is composed of well-preserved marine fish remains. The second contains the reworked tetrapod fauna. The bones generally are abraded, indicating transport into the offshore environment of deposition (Evans and Milner, 1994).

Fauna

So far, only four mammalian species have been described from this site: the allotherian *Eleutherodon oxfordensis* Kermack, Kermack, Lees and Mills, 1998 (Freeman, 1976b; Clemens *et al.,* 1979), *Amphilestes broderipii* (Owen, 1845) (Freeman, 1979), *Borealestes serendipitus* Waldman and Savage, 1972 (Sigogneau-Russell, 2003a) and Trechnotheria indet. (Sigogneau-Russell, 2003b). The record of *E. oxfordensis* is based on two teeth that closely resemble the type series from Kirtlington. The record of *A. broderipii* ((Figure 2.12)c) is the first since the finding of the original specimens at Stonesfield in the 19th century. The record of *B. serendipitus* is a fragmentary molariform tooth, comparable with the original material from Loch Scavaig, and with newly reported specimens from Kirtlington. The trechnotherian is a rolled lower molar with some dryolestoid characters. (N.B. Trechnotheria is nearly synonymous with Holotheria).

A single tritylodont tooth, identified as *Stereognathus* sp., also has been described from this site (Ensom, 1977).

Interpretation

The 'calcirudite bed' has been interpreted as an offshore bank composed of shell fragments, deposited in shallow, moderate-energy waters. The shell debris is thought to be reworked from the underlying Forest Marble Formation. Individual beds may show ripple laminations; the bases of the beds generally are sharp. The terrestrial materials were deposited during storm events in cross-cutting channels (Holloway, 1983).

Comparison with other localities

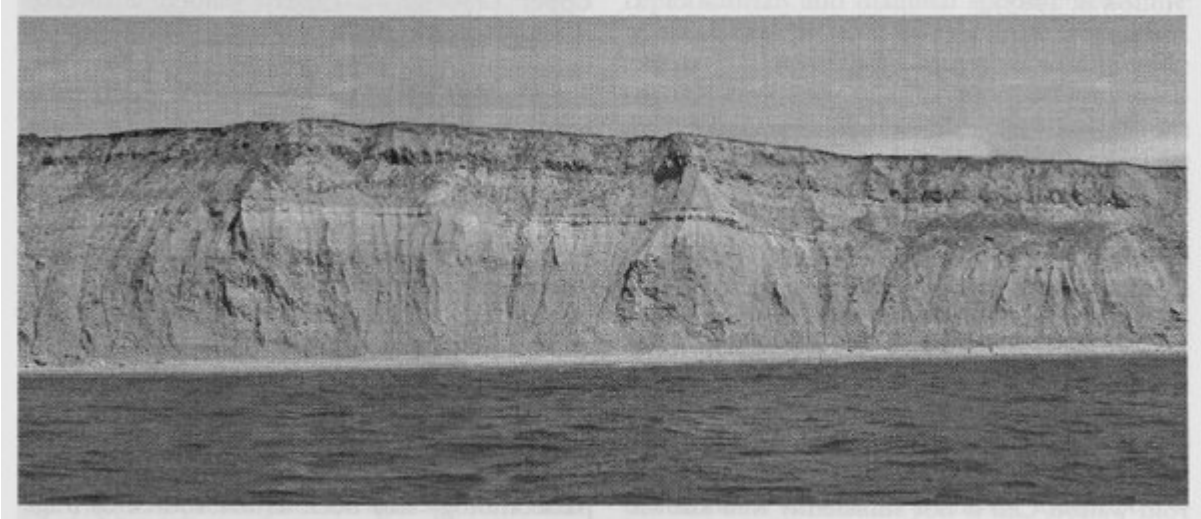
The Watton Cliff mammal bed is younger than the Stonesfield Slate. The mammal-bearing lens at Kirtlington Old Cement Works also has been dated as late Bathonian in age (Evans and Milner, 1994), so Watton Cliff may be roughly contemporaneous. However, the exact stratigraphical relationship of this site with the mammal bed from the Great Estuarine Group on Skye is uncertain (Freeman, 1976b).

The amphibian faunas from Watton Cliff and Kirtlington Old Cement Works are comparable. However, the tritylodont and mammalian fauna from Watton Cliff is not sufficiently well known for detailed comparisons to be made. Continued scientific study at the site may well remedy this.

Conclusions

Although so far only four mammalian species have been described from Watton Cliff and a fifth has now been found (Butler and Hooker in press); the cliff-top exposures will enable continued excavations of the mammal-bearing horizons. Future collecting undoubtedly will further extend our knowledge of the vertebrate faunas from this site. Watton Cliff is selected for the GCR as one of the small number of such sites in Britain and as a site with potential for further excavation in the future. The importance of the site, as for the other British Middle Jurassic mammal sites, is that locations of this age are almost unknown elsewhere in the world.

References



(Figure 2.15) View to landward (looking towards the north-east) of part of the Watton Cliff GCR site, Dorset, exposing the late Bathonian succession. (Photo: R. Edmonds.)

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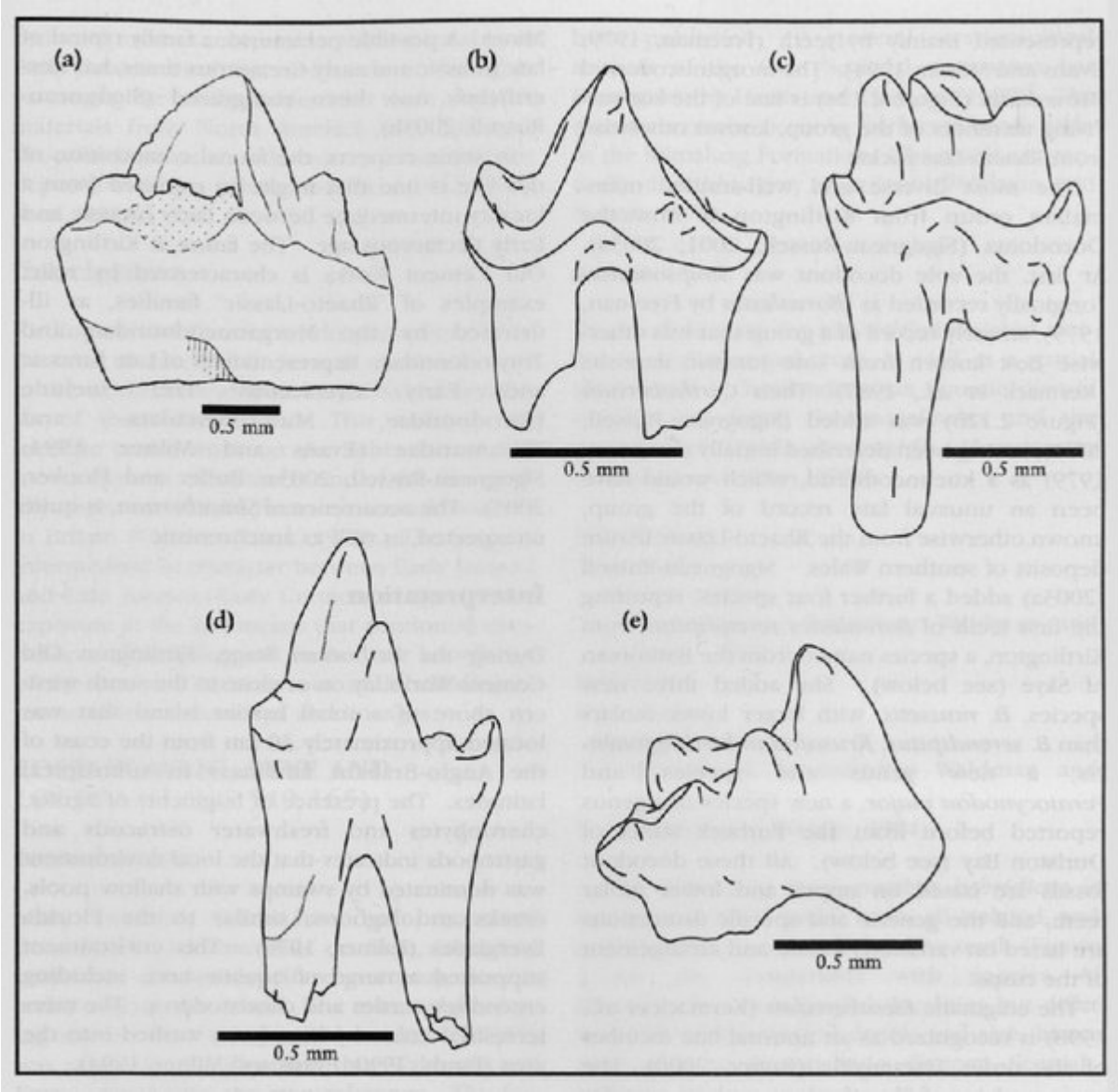

(Figure 2.12) Mammal specimens from the Middle Jurassic sediments of Kirtlington Old Cement Works, Oxfordshire. (a) Lower molar of the morganucodontid Wareolestes rex, outer view. (b) Lower molar of the docodont Cyrtlatherium canei, outer view. (c) Lower molar of the amphilestid Amphilestes from Watton Cliff, Dorset, inner view. (d) Lower molar of the amphitheriid Palaeoxonodon ooliticus, inner view (e) Upper molar of Palaeoxonodon, back view. (Based on Freeman, 1979.)