Bouldnor and Hamstead Cliffs, Isle of Wight

[SZ 391 913]

Highlights

Bouldnor and Hamstead Cliffs is the only site in Britain for Oligocene reptiles, the fauna of five or six species of turtles, snakes and crocodilians is small, but important worldwide because of the general rarity of Oligocene reptiles sites everywhere.

Introduction

The Bembridge Limestone Formation and Bouldnor Formation (Figure 9.2) exposed at Bouldnor Cliff have produced the best fauna of British Oligocene reptiles. Large areas of the cliff are affected by landslips and debris flows, but exposures on the foreshore, visible at low water, are normally excellent and many new finds could be made.

The cliff sections at Hamstead and Bouldnor cliffs have been described by Forbes (1856), White (1921), Daley (1972, 1973), Daley and Edwards (1974) and Insole and Daley (1985).

Reptile remains have been noted sporadically by authors on the stratigraphy of the site, but there are no comprehensive descriptions. Hooker and Ward (1980) summarize the fauna, while Moody (1980a) gives some details of the turtles.

Description

At Bouldnor Cliff the whole of the Bouldnor Formation (Cranmore Member, Hamstead Member, Bembridge Marls Member; *c.* 87 m) and underlying Bembridge Limestone Formation are exposed. The Bembridge Limestone Formation, with the Late Eocene/Osborne Member below, occurs in the east of the section in Hamstead Ledge [SZ 401 920], where three freshwater limestone beds are developed. West of Hamstead Point sections are seen in the top of the Bembridge Limestone Formation, the whole of the overlying Bembridge Marls Member and part of the Hamstead Member.

The Bembridge Marls Member here comprises 21.5 m of fresh- and brackish-water sediments, mainly clays and silts, and contain an abundant, but taxonomically restricted, molluscan fauna (Daley, 1972). The lower part of the unit occurs in the cliffs, but the sequence is best exposed on the foreshore and may be seen at low tide immediately to the west of Hamstead Ledge where numerous shell beds are developed in green or grey muds. All of the beds become visible at low water during the equinoctial spring tide. The Bembridge Oyster Bed (Forbes, 1856) (Bed HAM I of the Bembridge Marls Member), also seen at Whitecliff Bay, occurs at the base of the succession. The restricted assemblages include taxa which are regarded by modern analogy as brackish-water forms. The rest of the sequence is made up of grey to bluish-grey silts and clays deposited variously under fresh- and brackish-water conditions. Beds HAM XXIII–XXV (Daley, 1973) contain abundant monocotyledonous leaf fragments and the water-plant seeds *Brasenia* and *Stratiotes,* which occur in bands with the gastropods *Viviparus* and *Galba* (a pulmonate).

The Black Band, taken to mark the base of the Hamstead Member, occurs low in the cliffs about 200 m east of a line of posts. This comprises a carbonaceous mud and contains freshwater gastropods such as *Viviparus.* At the base of the unit, autochthonous root systems penetrate into the underlying bed. Another black, lignitic clay (the *Nematura* Bed) occurs somewhat higher up in the Hamstead Member succession, but contains a distinctive brackish-water molluscan fauna. The greater part of the Hamstead Member consists of grey-green and green muds with occasional dark-brown to black, laminated muds. However, these are much obscured by recent mudflows.

The succeeding Cranmore Member (9.2 m) is marked by a sudden change from brown-grey to bright green clay. The member occurs in the top of the cliff at the west of the exposure where it is capped by 'Plateau gravel'. The member is divided into the *Corbula* Beds (marine) and the *Cerithium* Beds (non-marine), which together consist of a mixture of grey,

blue and black fossil-iferous clays.

The section is based on White (1921, pp. 133–4, 140–1), Daley (1973), Daley and Edwards (1974), Daley and Insole (1984) and Insole and Daley (1985).

	Thickness (m)
Solent Group	
Bouldnor Formation	
Cranmore Member (Upper Hamstead Beds of White, 1921)	
Corbula Beds	5.8
Cerithium Beds	3.4
Hamstead Member (Lower Hamstead Beds of White, 1921)	
Green and mottled clays, with lignite beds and shell beds	c. 25
Water-Lily Bed: laminated lignite with seeds, palm leaves, water lily leaves and molluscs	0.6
Green and red marls (much obscured)	c. 2
White Band: green clays with white shell-marls	1.8
Green clay with ironstone nodule band (much obscured)	10.8
Nematura Bed: black lignitic clay, full of gastropods	0.9
Green and black clays, with bivalves and gastropods	8.1
Black Band: lignite, full of *Paludina* and *Unio*	0.5
Bembridge Marls Member (Bed notation from Daley, 1973)	
HAM XXXI–XXX1V: green, red and mottled clays	10.2
HAM XXX: lignite with seeds and molluscs	0.6
HAM XXVI–XXIX: clays with seeds and molluscs	c. 5.0
HAM XXIII–XXV: lignite and clay, rich in water-plant seeds, leaf fragments, and gastropods	c. 2.0
HAM XX–XXII: freshwater clays and silts	1.6
HAM XIX: green clays and white marls, with bivalves	0.2
HAM XVI–XVIII: green mudstone and lignite band	15
HAM XV: black clay with gastropods	0.9
HAM XI-XIV: mudstones and siltstones, with bivalve band	3.3
HAM VI-X: grey and blue-green laminated clays, with brackish-water bivalves and gastropods	2.7
HAM V: greenish-grey clay with bands containing *M. acuta, Serpula* sp. and *Viviparus lentus*	0.3
HAM I–IV: grey and black clays with shelly partings and bands containing bivalves and gastropods; thin shell bed with *Ostrea at* the base	0.9
Bembridge Limestone Formation	

In the Bembridge Marls Member, vertebrate material is quite common, but usually comminuted. Fish vertebrae are mentioned by Daley (1972) as occurring commonly at many horizons, whereas fish scales and teeth are found in others. It is possible, but not proven, that the larger reptile and mammal remains may also derive from particular levels.

Fauna

Faunal lists are summarized by Hooker and Ward (1980) and Moody (1980a), but fuller accounts are not yet available. The specimen counts are based on collections in the BMNH and IWCMS.

	Numbers
Testudines: Cryptodira:	
Trionychidae	

Ocadia crassa (Owen, 1849)	1
Trionyx sp.	3
Lepidosauria: Squamata: Serpentes	
Paleryx sp.	1
Archosauria: Crocodylia: Neosuchia:	
Eusuchia: Alligatoridae	
Diplocynodon hantoniensis (Wood, 1944)	several
Diplocynodon sp.	several
crocodilian	several

Interpretation

Daley (1973) postulated three main environments of deposition for the Bembridge Marls Member. In the lower part the Bembridge Oyster Bed, which coincides with the main transgressive period of the Bembridge Marls Member, is interpreted as an estuarine deposit, since the sediments contain few primary sedimentary structures, and a fauna consisting predominantly of comminuted *Ostrea* shell debris indicates a considerable amount of water movement, in contrast to the fauna of lagoonal environments. Daley (1972) noted that the molluscan assemblages from this part of the succession are comparable with those of tropical and subtropical mudflats of the present day. The predominantly grey or blue-grey clays which form the bulk of the Bembridge Marls Member are interpreted as lagoonal in origin; the bivalves are commonly in life position, and some of the sediments exhibit varve-like lamination. On the basis of sedimentary evidence (ripples, irregular lamination, presence of lignite) the central and upper parts of the deposit are thought to represent floodplain and lacustrine deposits.

The trionychid turtles are represented by recent Finds of complete carapaces and limited skull material (in IWCMS). The new trionychid carapaces fall into high- and low-domed types. The high-domed forms show great variation in the cross-sectional thickness of their shells, whereas in the low-domed forms the carapace is of uniform thickness. One of the specimens exhibits 'pathological' distortion of the rear dorsal surface of the carapace. The new skull material consists of a partial braincase with both quadrates attached. There are some associated postcranial remains of cervical vertebrae, but no carapace or lower jaw. New finds also include specimens of the crocodilian *Diplocynodon,* which had an estimated length of about 4 m.

Comparison with other localities

The Bembridge Marls Member has been correlated on the basis of mammals and charophytes with the Tongrian Stage in Belgium and the Ludian (Late Eocene) in the Paris Basin (Curry *et al.,* 1978). There has been some controversy over whether the beds should be included in the Eocene or Oligocene, but most British workers consider them as belonging to the latter.

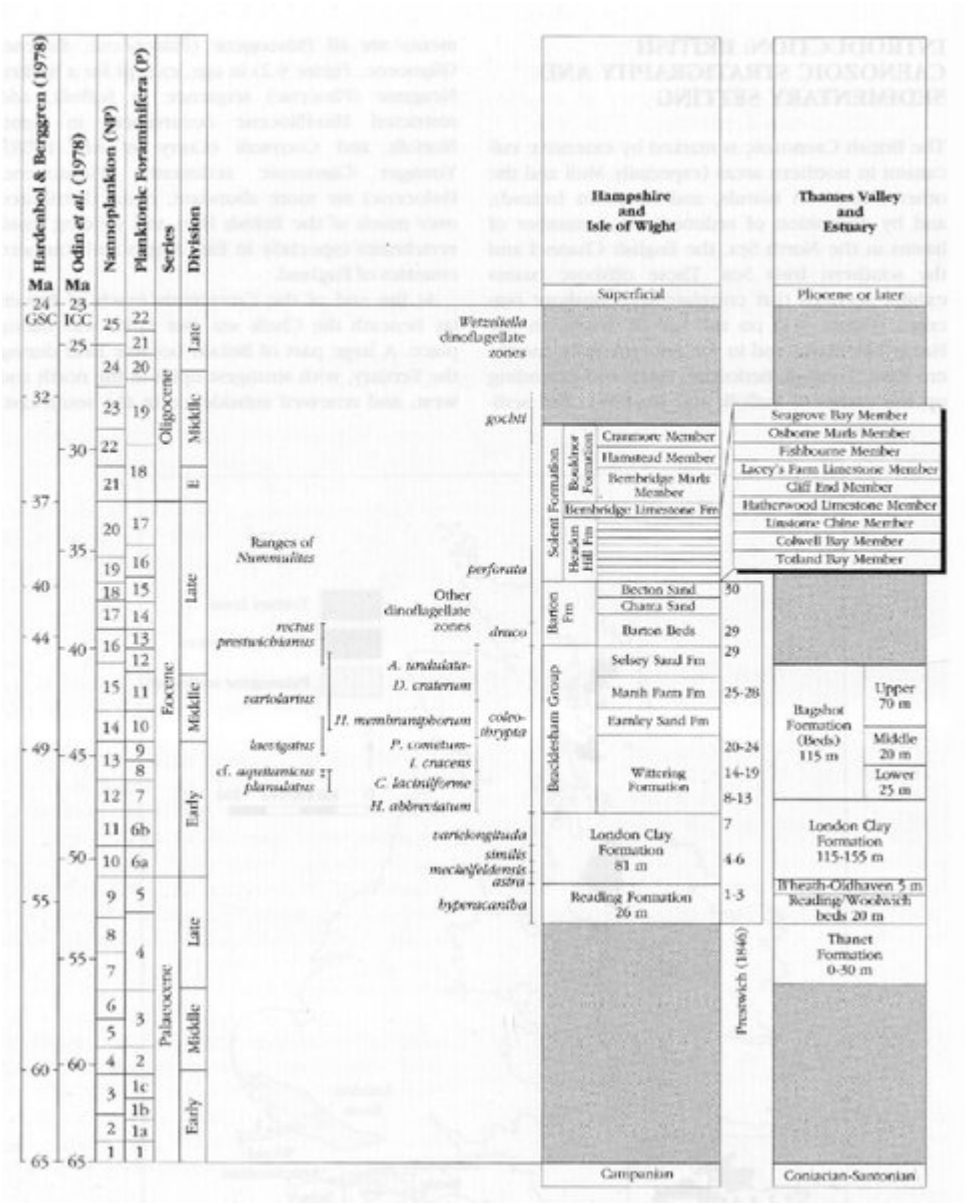
Oligocene trionychids have been recorded from Monteviale in Italy (*Trionyx capellini*), Steiermark, Austria (*T. styriacus*), Catalonia (*T. marina*) and China (*T. gregaria*) (M■ynarski, 1976, pp. 77–9). The crocodilian *Diplocynodon* has been reported especially from the Late Eocene Headon Beds of Hordle and Headon Hill (see above), as well as from sediments ranging in age from the Early Eocene to Miocene of Europe and the USA (see Headon report).

Oligocene reptiles are known from North America and Europe, but finds are much rarer than for those of Eocene or Miocene age. The famous Quercy deposits in France span the Eocene–Oligocene boundary, and thus equate in age with the Bembridge Marls. These have produced a diverse array of lizards, snakes, crocodilians and turtles. Other continental European Oligocene localities are spread as far afield as Spain and the Ukraine, and Germany and Italy. The mammals have been heavily studied, the reptiles less so. It is hard to make detailed comparisons with the Hamstead–Bouldnor locality until the reptiles from the site are more fully described.

Conclusions

Britain's only Oligocene reptile site, and one of the few of that age in the world. This international importance, plus the continuing opportunities for new finds provided by erosion, establish the site's conservation value.

References



(Figure 9.2) Summary of Tertiary stratigraphy, showing global standards and some major British formations. Based on Curry et al. (1978).