# Hordle Cliff

[SZ 263 923]–[SZ 273 918]

(Potential GCR site)

## Highlights

Fish remains from Hordle Cliff in Hampshire, which have recently been found associated with a diverse fauna of tetrapods including mammals, reptiles and amphibians in terrigenous deposits, may be derived from earlier or contemporaneous marine beds. The importance of the site lies in this juxtaposition of marine and terrestrial late Eocene faunas. Collecting here has also been profitable in recent decades. Continuing natural erosion of soft strata provides good opportunity for collecting from the several yielding horizons.

## Introduction

The Late Eocene (Priabonian) Totland Bay Member of the Headon Hill Formation (formerly the Lower Headon Beds or Headon Member) is exposed at Hordle Cliff, in a series of low cliffs between Becton Bunny and Milford-on-Sea that have produced an important assemblage of vertebrates including fishes, reptiles and mammals. A recent discovery of abundant amphibian remains in the Mammal Bed (Milner *et al.,* 1982) has greatly enlarged the faunal list. The section is usually masked by a thin talus, and some parts are heavily slipped, but the relevant horizons remain accessible and may easily be cleared. The geology of Hordle Cliff has been described by Hastings (1848, 1852, 1853), Gardiner *et al.* (1888), Curry (1958), Cray (1973), Milner *et al.* (1982) and Benton and Spencer (1995).

The first vertebrate remains reported from the sections of Hordle (or Hordwell) Cliff were described from the extensive collections of Searles Wood and Barbara, Marchioness of Hastings, which were assembled during the late 1840s. These remains, including numerous specimens of fishes, reptiles and mammals, were initially reported by Wood (1844) and Charlesworth (1845). Wood (1846) listed and figured further material from Hordle Cliff and Hastings (1852, 1853) reported the results of six years' further collecting, listing important finds of mammals, fishes, reptiles and birds. Subsequently, in 1855, the Hastings collection was acquired by the Natural History Museum. The site has been selected as an SSSI on the basis of its reptile fauna (Benton and Spencer, 1995). A collection of small tetrapods, including numerous well-preserved amphibian remains, made from Hordle Cliff between 1976 and 1981, containing numerous new specimens, has greatly expanded the faunal list. The specimens were obtained by Mr Roy Gardiner of Fareham from the Mammal Bed, from the same locality which had produced some of the Hastings material. Milner *et al.* (1982) reported the new finds and identified the occurrence of seven taxa of salamanders and frogs, some of which were previously unknown from the British Eocene.

## Description

As Benton and Spencer (1995) report, the stratigraphy of Early Palaeogene rocks at Hordle Cliff was described by Gardiner *et al.* (1888) and Cray (1973). The following section is abridged from Cray (1973, p. 11). The beds dip gently south-east at about 2.5° (Figure 14.15).

| | Thickness (m) |
|---|---|
| Totland Bay Member (Tower Headon Beds') | |
| Marl seen | 0.5 |
| Rodent Bed: *Limnaea* Marl with overlying dark clay ( = Rodent Bed Marl) | 0.25 |
| *Unio* Beds: grey clays with sandy layers | 3.5 |
| Green clays | 2.5 |
| *Chara* Bed: dark clays | 1.4 |

| | |
|---|---|
| Blue and green clays | 2.7 |
| *Limnaea* Limestone | 0.4 |
| Ironstone Bed | 1.2 |
| Crocodile Bed: sands | 2.0 |
| Rolled-Bone Bed: sand with abraded bones | 0.3 |
| Clay and sands | 1.4 |
| Leaf Bed: carbonaceous clay | 1.0 |
| Mammal Bed: clays, sands and sandy clays | 3.5 |
| Ironstone bed | 0.4 |
| Clays | 1.1 m |
| Lignites | seen 1.4 m |

The Totland Bay Member (Late Eocene) is included in the zone of the dinoflagellate *Wetzeliella perforate.* At Hordle Cliff the sediments form a series of low cliffs and slipped undercliffs between east of Barton-on-Sea (just west of Becton Bunny) and Milford-on-Sea. The Mammal Bed, at the base, occurs beneath Plateau Gravel to the west of Becton Bunny, from where it may be traced as a distinct scar obliquely down the cliffs to reach sea level just east of Long Mead End. Just east of Hordle House, the highest unit in the Totland Bay Member, the *Limnaea* Marl and associated horizons, crops out. The basal Colwell Bay Member ('Middle Headon Beds' (pars)) is represented at Paddy's Gap by the occurrence of the Milford Marine Bed.

It has been established (e.g. Cray, 1973; Milner *et al.,* 1982) that the Hordle amphibians were all found in the Totland Bay Member. The provenance of the early collections, however, is difficult to assess, the locality information provided by Hastings being merely 'Upper Eocene, Hordwell', or in Lydekker's catalogue (1888a, 1888b) 'from the Headon Beds of Hordwell'. The sparse matrix on a number of specimens cannot be used to demonstrate provenance with accuracy. Some of the specimens with adhering greenish blue sandy clay may have come from the Mammal Bed, but other lithologies are undi-agnostic. It may, however, be assumed from the accounts of Hastings (1848, 1852, 1853) that most of the material came mainly from the Mammal Bed and the Rodent Bed, and also from fossiliferous pockets within the Crocodile Bed.The Rodent Bed (Hastings' Bed 1), predominantly grey clays and marls, is limited in lateral extent, cropping out just to the east of Hordle House, and extending eastwards for some 275 m before wedging out. To the west, the beds have been removed by recent erosion. The highest horizon of the Rodent Bed consists of clays, tinted pink and overlying a thin, dark, clayey sand, which in turn rests on a comminuted shell bed, the *Limnaea* Marl.

Hastings (1852, p. 194) recorded an extensive vertebrate fauna from the Rodent Bed. The finds may be bracketed with the dark clayey marl on the basis of Hastings' detailed description of the host sediment and mention of the underlying *Limnaea* Marl.

Cray (1973, pp. 10–12) described the occurrence and preservation of the vertebrates: 'occasional rodent teeth and turtle fragments were recovered from the upper levels of the *Limnaea* marl, and the overlying dark sandy clay has yielded a moderate quantity of small-sized vertebrate debris … This material is always of very small size and evidently represents a current-sorted accumulation; all the large Headon Beds species are absent. All the specimens are fragmentary and … some of the material is water worn'. Fish were not included.

The upper part of the Crocodile Bed is of fine, soft, white sands, but the lower layers are composed of more indurated sediments, which are brownish in colour. The outcrop lies to the west of Hordle House, where the beds seem to rise from the base of the cliffs, and continue westwards until just west of Long Mead End. Hastings (1852, p. 198) noted crocodilians and the freshwater turtles from the Crocodile Bed.

Hastings also observed (1852, p.197) that abundant shells invariably accompanied the vertebrate remains, that the most richly fossiliferous level lay about 3 ft (*c.* 1 m) from the top of the bed, and that the middle of the outcrop, a little to the west of Hordle House, was the most productive locality. Most material from the Crocodile Bed, however, appears to have been derived from isolated lenses rich in vertebrate remains, and such an origin is explicit in the earliest account by Hastings (1848, p. 63) : 'the vertebrae and other bones of the Crocodile and *Paloplotherium* were found at intervals of from four inches to three feet apart to the westward of the heads … I must not omit likewise to state, that close to this

crocodile's head (the whole group comprising a space of about six feet long by ten inches only in thickness, and following each other nearly in a straight line) were found the nearly entire shell of a fossil *Trionyx …* and the jaw, vertebrae, and scales of a fish of the order *Lepidosteus*'.

The Mammal Bed (*sensu* Curry, 1958; Cray, 1973), bed no. 9 of Tawney and Keeping (1883), and the upper part of bed 15 of Hastings, outcrops from beach level just west of Hordle House, westwards to Becton Bunny. Reptile material, although rare, was reported (Hastings, 1852) as coming from layers of white sand containing abundant remains of shells but no fish were mentioned.

The specimens collected recently by Mr Gardner also derive from the Mammal Bed, from the stretch of Hordle Cliff sometimes referred to as Beacon Cliff, between Becton Bunny in the west and Long Mead End in the east (upper part of bed 15 of Hastings, 1852; bed 9 of Tawney and Keeping, 1883). The material, consisting of many thousands of small bones, was found in numerous bone-bearing shelly pockets composed of pale greenish, grey sand differing in some respects from the same level as described by Hastings (1852, p. 200).

Other horizons that have yielded vertebrate remains include the Rolled-Bone Bed. In 1852 (p. 199) Hastings reported finds of turtles and crocodilians from it. However, most of the specimens are generally highly abraded and cannot be identified precisely.

The Thin Shell Bed above the Lower Ironstone Band has yielded one of the largest collections of reptiles from Hordle. This bed occurs immediately above the ironstone band (numbered 8 in Tawney and Keeping's section), which is usually considered to mark the base of the Mammal Bed. However, Cray (1973, pp. 17–18) regarded this unit as distinct on the basis of its mammal fauna, which is similar to that of a bed below the ironstone band. Hastings listed a wide range of taxa: 'an equal quantity of snake and lizard vertebrae, some mammal teeth, rodent jaws, scales and vertebrae of fish, crocodile debris, *Trionyx* and *Emys,* and more rarely larger and better preserved bones including astragalus and carpal bones' [translation]. A similar fauna was mentioned by Hastings as occurring in the thin white sandy marl below the lower Ironstone Band, bed No. 7 of Tawney and Keeping (1883).

**Fauna**

The Hastings Collection is in the NHM, and other material is held in CAMSM, OUM and YORMS.

Chondrichthyes: Elasmobranchii: Neoselachii: Galeomorphii

*Physogaleus secundus* (Winkler, 1874)

*Syliorhinus woodwardi* Cappetta, 1976

'*Scyliorhinus*' *biauriculatus* (Casier, 1950)

*Synodontaspis acutissima* (Agassiz, 1843)

Chondrichthyes: Elasmobranchii: Neoselachii: Batomorphii

*Dasyatis* spp.

*Myliobatis striatus* Buckland, 1837

*M. toliapicus* Agassiz, 1843

*Myliobatis* sp.

*Rhinobatos bruxelliensis* (Jaekel, 1894)

Otoliths

TETRAPODA

Lissamphibia: Anura: Discoglossidae

'discoglossid 1' of Milner *et al.* (1982)

'discoglossid 2' of Milner *et al.* (1982)

Anura: Pelobatidae

*Eopelobates* cf. *E. hinschei* Estes, 1970

Anura: Palaeobatrachidae

*Albionbatrachus wightensis* Meszoely *et al.,* 1984

Caudata: Salamandridae

*Salamandra sansaniensis* Lartet, 1851

*Chelotriton* cf. C. *paradoxus* Pomel, 1853

*Triturus* sp.

## Interpretation

This section exposes a wide variety of sediment types and facies of the late Eocene Headon Hill Formation in which change of depositional environment consisted of the progressive infilling of an orginally marine basin. It is regarded (Curry, 1992) as having an original depositional depth of about 100 m and terminating a few metres above sea level. Sea-level oscillations and strandline movement occurred without cease, as the cyclic activity, initiated in Palaeocene times, continued. The fish fossils are initially confined to the horizons which also yield tetrapod remains, and many may have been derived fossils. The tetrapods (frogs and salamanders) are diverse, but all are forms found within the proximity of water and where there is extensive terrestrial vegetation. *Salamondra sansaniensis* is known from the Oligocene and Miocene rocks in France, Spain and Germany, but not elsewhere in Britain.

The Milford Marine Band fauna of microsharks marks a brief marine incursion, the waters of which supported a fauna of predators dependent upon unidentified small prey, probably both benthonic and pelagic.

### Comparison with other localities

The Totland Bay Member at Hordle Cliff is directly correlated with the top of the same unit (Insole and Daley, 1985) at Headon Hill, Isle of Wight, on the basis of their Late Eocene (Priabonian) mammal faunas and occurrence of calcareous nannoplankton zones NP17 and NP20 (Curry *et al.,* 1978). The Hordle fauna includes a range of amphibians and fishes comparable to the Headon Hill finds (see Headon Hill report). However, there are differences between the two localities in the range and abundance of taxa, with the Hordle fauna being at least quantitively different from that at Headon Hill. This may be a local ecological or taphonomic effect (Milner *et al.,* 1982).

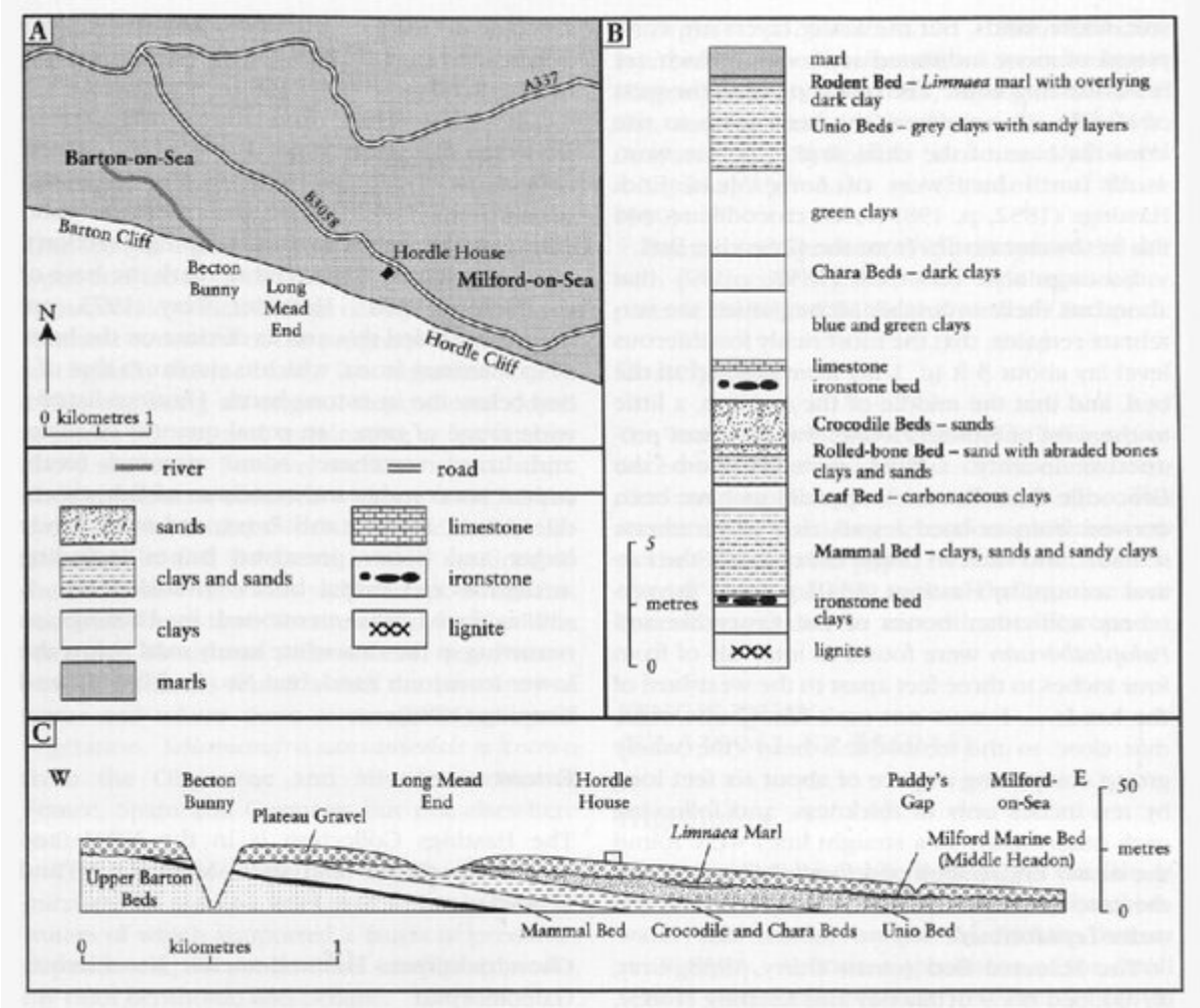
The Milford Marine Bed within the overlying Middle Headon Beds (Colwell Bay Member) at Paddy's Gap, Hordle [SZ 278 917], has yielded a diverse microshark fauna that includes the galeomorphs '*Scyliorhinus*' *biauriculatus, Scyliorhinus woodwardi, Synodontaspis* (*Eugomphodus*) *acutissima, Physogaleus secundus,* and the batiods *Rhinobatos bruxelliensis, Dasyatis* sp., *Myliobatis striatus, Myliobatis toliapicus, Myliobatis* sp. (Hooker and Ward, 1980).

Benton and Spencer (1995) compared the site with productive localities for reptiles in other parts of the Isle of Wight and western Europe.

## Conclusion

The Totland Bay Member at Hordle Cliff has produced a rich tetrapod fauna of mammals, reptiles and amphibians of Late Eocene age. The recent finds, including several amphibians new to the British Palaeogene, indicate that the terrestrial fauna of this region during the Late Eocene was as diverse as continental Europe.

**References**




*(Figure 14.15) Headon Beds at Hordle Cliff, Hampshire (after Cray, 1973).*