

# Encombe Bay, Swyre Head–Chapman's Pool, Dorset

[(SY 937 773)–(SY 955 771)]

## Highlights

Swyre Head to Chapman's Pool includes an important array of late Kimmeridgian reptile sites. These have produced various species of turtle, pterosaur, dinosaur, plesiosaur and ichthyosaur, including the plesiosaur *Kimmerosaurus* and a new theropod dinosaur.

## Introduction

The Upper Kimmeridge Clay exposed between Swyre Head and Chapman's Pool also known as Encombe Bay or Egmont Bight (Figure 7.6) has produced a range of fossil reptiles, ichthyosaurs, plesiosaurs, crocodilians and turtles. Many of the specimens have been collected recently. The cliffs are subject to continuing erosion and the section has good potential for future finds. The geology has been described in detail by Cope (1967; *in* Torrens, 1969a; 1978; *in* Cope *et al.*, 1980b), and the occurrence of the reptiles has been reviewed by Taylor and Benton (1986). Reptiles from these sections have been described by Brown (1981), Delair (1986) and Clarke and Etches (1992).

## Description

The Kimmeridge Clay in this section covers the upper part of the Late Kimmeridgian. It consists of a sequence of grey and bituminous shales and clays with stone bands towards the base ((Figure 7.6)A and B). The sequence according to Cope (1967; *in* Torrens, 1969a; 1978; *in* Cope *et al.*, 1980b) is:

	Thickness (m)
Portland Sand, Massive Bed	
Upper Kimmeridgian <i>fittoni</i> Zone	
Hounstout Marl	21.00
Hounstout Clay	8.35
<i>Rhynchonella</i> and <i>Lingula</i> Beds (upper part)	8.00
	<b>37.35</b>
<i>rotunda</i> Zone	
<i>Rhynchonella</i> and <i>Lingula</i> Beds (lower part)	15.00
<i>rotunda</i> Shales	13.50
<i>rotunda</i> Nodule Bed	1.80
Shales and clays	4.25
Hard bituminous shales	1.25
	<b>35.80</b>
<i>pallasioides</i> Zone	
Clays and shales (9 individual subunits, Cope, 1978)	30.00
<i>pectinatus</i> Zone	
<i>paravirgatus</i> Subzone	
Grey shales	12.10
Hard shale	0.60
Shales	6.10
Freshwater Steps Stone Band	0.40
	<b>19.20</b>
<i>eastlecottensis</i> Subzone	

Shales	8.80
Middle White Stone Band	0.45
Shales and mudstones	8.90
White Stone Band	0.95
	<b>19.10</b>

The beds have an apparent easterly dip, and the ammonite zones occur in sequence from north-west to south-east (Figure 7.6)A: *pectinatus* Zone (cliff below Swyre Head–Egmont Bight; [SY 937 773]–[SY 947 772]), *pallasioides* Zone (Freshwater Steps–Chapman's Pool; [SY 942 772]–[SY 955 771]) and the *rotunda* Zone, above this, between Egmont Bight and continuing past Chapman's Pool. The succeeding *fittoni* Zone and the Portlandian occur higher in Hounstout Cliff. The White Stone Band and Middle White Stone Band come to beach level below Swyre Head and 250 m east of that, respectively. The Freshwater Steps Stone Band reaches beach level at Freshwater Steps. The shales and clays of the *pallasioides* and lower *rotunda* Zones (i.e. between the top of the *pectinatus* Zone and the *rotunda* Nodule Bed) are sometimes known as the Crushed Ammonoid Shales.

The reptile specimens have apparently been collected largely at beach level either in the wave-cut platform west of Freshwater Steps, or in Chapman's Pool (Figure 7.6)A. Although Hounstout Cliff is accessible, no reptile remains have been reported above the lower parts of the *rotunda* Zone.

Specific localities in the *pectinatus* Zone include the 'ledges below Swyre Head, [SY 939 773]' for a partial *Teleosaurus* specimen (DORCM G.347, label), thus *eastlecottensis* Subzone. Arkell (1947c, p. 78) noted that the White Stone Band occasionally contains 'saurian vertebrae and bones'. A plesiosaur centrum (DORCM G.172) is noted as *pectinatus* Zone, above highest White Stone Band, west of Freshwater Steps on shore ledge', thus above the Freshwater Steps Stone Band in shales of the *paravirgatus* Subzone.

Recent finds confirm the occurrence of reptiles in the *pectinatus* Zone. A vertebra and ribs of a crocodilian were found by R.A. Langham in the White Stone Band, thus base of the *eastlecottensis* Subzone, to the west of Freshwater Steps. The same collector also found some limb bones of a pterosaur just above the Freshwater Steps Stone Band at Freshwater Steps, thus *paravirgatus* Subzone. Finally, P.A. Langham found some turtle remains (BMNH R8699) from a horizon in the shales just above the Freshwater Steps Stone Band, about 300 m west of Freshwater Steps, thus *pectinatus* Zone also.

Brown (1981, p. 301) reported a skull and isolated teeth of the plesiosaur *Kimmerosaurus langhami* (BMNH R8431) from 'Endcombe Bay' (also known as Egmont Bay) in the Crushed Ammonoid Shales (Figure 7.7). R.A. Langham (pers. comm. to M.J.B., 1982) gave further information on the find stating that it came from a location '*in situ* in shale at the base of the cliff approximately 270 m west of Freshwater Steps', thus perhaps shales of the *eastlecottensis* Subzone at [SY 924 773]. If the find site is generally in the vicinity of Encombe Bay then the specimen could, in fact, come from the upper *pectinatus* Zone, the *pallasioides* Zone, or the *rotunda* Zone; Brown (1981, p. 301) suggested the *rotunda* Zone. However, Brown *et al.* (1986) revise the horizon as 'about 2 m above the Middle White Stone Band' in the upper part of the *eastlecottensis* Subzone of the *pectinatus* Zone (Cope *et al.*, 1980b; Cox and Gallois, 1981). A second partial skull and mandible with some associated postcranial remains (BMNH R10042) belonging to *K. langhami* was reported by Brown *et al.* (1986, pp. 225–34) from the type locality and horizon, *in situ* about 3 m east of the site of R8431. This was collected by P.A. Langham in 1976.

Other records include phalanges of a pliosauroid (DORCM G639) from 'below Encomb(e) House at... [SY 942 772]', thus just west of Freshwater Steps, and probably the *pectinatus* Zone. Some plesiosaur vertebrae and a rib (DORCM G5093; BGS(GSM)) came from around [SY 940 773], also presumably *pectinatus* Zone. A partial ichthyosaur skeleton (BMNH R8693) came from a water-worn platform exposed at low tide, 400 m east of the Yellow Ledge, thus *scitulus* Zone, much lower down. Clarke and Etches (1992) note a plesiosaur limb bone from a higher horizon, the *rotunda* Zone, at Chapman's Pool. Other plesiosaur and ichthyosaur specimens are not so well localized (Taylor and Benton, 1986).

All of the finds, as at Kinuneridge Bay, appear to have been made in the shales; Brown (1981, p. 304) notes that BMNH R8431 was preserved in a clay matrix. The preservation of this skull was generally good, and surface ornament was

visible. Parts of the skull were slightly crushed and the dentary somewhat 'eroded'. Other specimens from this area are generally isolated postcranial elements (vertebrae and limb bones) or slightly disturbed partial skeletons. Fuller details are given by Taylor and Benton (1986).

## Fauna

### Testudines: Cryptodira: Thalassemyidae

*Pelobatochelys* sp. BMNH R8699

### Archosauria: Crocodylia: Thalattosuchia

'*Teleosaurus* sp.' DORCM G.347

*Dakosaurus*/*Metriorhynchus* R.A. Langham collection

### Archosauria: Pterosauria

Unnamed R.A. Langham collection

### Archosauria: Dinosauria: Theropoda

Gracile theropod (OUM)

### Sauropterygia: Plesiosauria: Cryptoclididae

*Kimmerosaurus langhami* Brown, 1981 Type specimen: BMNH R8431; also BMNH R10042

### Sauropterygia: Plesiosauria: Elasmosauridae

'*Colymbosaurus* sp.' DORCM G.172, G.184

### Sauropterygia: Plesiosauria: Pliosauridae

*Pliosaurus* sp. DORCM G.186, G.639; Etches collection

### Ichthyopterygia: Ichthyosauria

*Grendelius* sp. BRSMG

'*Ophthalmosaurus* sp.' DORCM G.8, BMNH R8693

## Interpretation

The turtle *Pelobatochelys* is represented by a partial carapace, about 0.4 m long, with remains of limbs (BMNH R8699). The genus is known only from Dorset and was founded on carapace plates from Weymouth. If this undescribed specimen from Encombe Bay belongs to *Pelobatochelys*, the remains include the first record of its limbs.

The partial skeleton of '*Teleosaurus*' (vertebrae, ribs, jaws; DORCM G.347) may belong to one of several Kimmeridgian crocodile genera (e.g. *Dakosaurus*, *Machimosaurus*, *Steneosaurus*, *Teleosaurus*). Exact identification depends on snout length and features of the skull roof which is not preserved.

A gracile theropod dinosaur is represented by a partial skeleton of the hip region in the OUM.

The only fossil reptile from Encombe Bay that has been described is *Kimmerosaurus langhami* (Brown, 1981, pp. 300–14; Brown *et al.*, 1986). The type specimen (BMNH R8431; (Figure 7.7)) consists of the posterior part of a skull roof,

an occiput, partial braincase, partial lower jaws and 11 isolated teeth. The referred material from Freshwater Steps (BMNH R10042) consists of a braincase, mandible, atlas-axis complex and five cervical vertebrae. The skull is 0.3 m long. *Kimmerosaurus* differs from all other plesiosaurs by the nature of the teeth, which lack the usual longitudinal ridges, and are greatly recurved and elliptical rather than circular in cross-section. The skull is the most lightly built of all species known from the Late Jurassic and there is no sagittal crest on the parietals, a clear difference from all other plesiosaurs. *Kimmerosaurus* is one of only five genera of Late Jurassic plesiosauroids recognized as valid by Brown (1981), and one of only two species from the Kimmeridgian. The other, *Colymbosaurus trochanterius* Owen, known from five postcranial skeletons and a number of isolated propodials, is the longest and heaviest English plesiosauroid, measuring 6 m from the tip of the snout to the end of the tail. Brown (1981) referred the two genera to different families, tentatively placing *Kimmerosaurus* with *Cryptoclidus* in the Cryptoclididae and *Colymbosaurus* in the Elasmosauridae. The possibility that *Kimmerosaurus* might be synonymous with *Cryptoclidus* was discussed by Brown *et al.* (1986). Among the available material, the only elements shared by both forms are the anterior cervical vertebrae (in *Kimmerosaurus*, only in specimen R10042), and these appear closely comparable. Should this be the case, the wider taxonomic status of Elasmosauridae and Cryptoclididae would need to be reviewed.

The elasmosaurids have very long necks, produced by increases both in the number of cervical vertebrae and in the lengths of centra, particularly among the anterior cervicals. The anterior cervicals possess a further distinguishing character, in the development of a lateral keel and an articular face which has either a single shallow concavity or an open V-shape (Brown, 1981). The cryptoclidids, by contrast, have medium-length necks (28–32 cervical vertebrae), and the anterior cervical centra have a deep concavity with a convex rim.

The other plesiosaur remains from Encombe probably belong to *Colymbosaurus* (DORCM G172, G184, G5093) and *Pliosaurus* (DORCM G186, G639) respectively.

The ichthyosaur remains (BMNH R8693; DORCM G.8) could belong to one of several genera that occur elsewhere in the British Kimmeridgian (e.g. *Macropterygius*, *Grendelius*, *Nannopterygius*, *Ophthalmosaurus*). Identification is based on the shape of the skull (e.g. snout length, shape, size and position of openings) or on features of the paddles. A new specimen of *Grendelius* in the BRSMG will be described shortly (McGowan, in prep.). The taxonomy of Late Jurassic ichthyosaurs is controversial (McGowan, 1976; A. Kirton, pers. comm., 1981), and fragmentary remains are hard to identify.

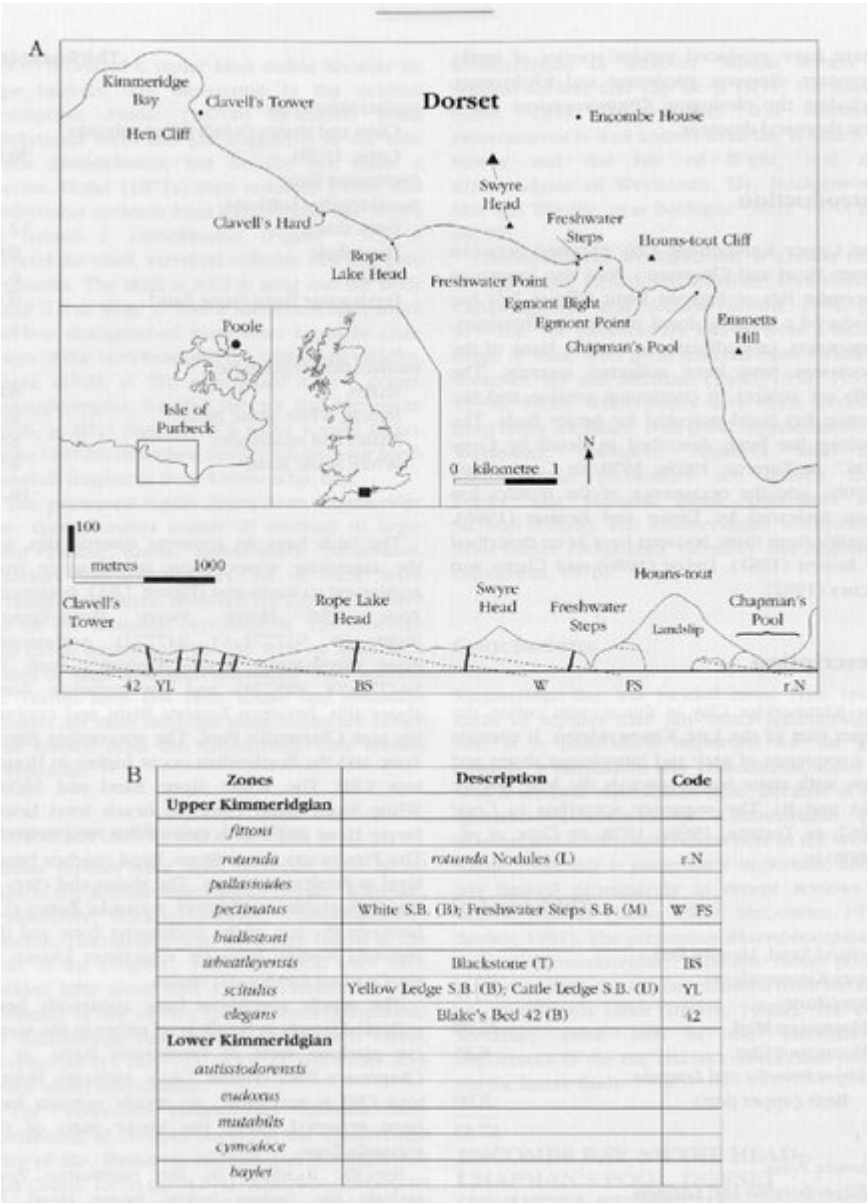
## Comparison with other localities

Late Kimmeridgian reptile sites are rare, and none has been highly productive. Some ichthyosaurs, plesiosaurs and crocodilians have come from units equivalent to those described here at Ringstead Bay, Dorset [SY 75 81], and rare remains from the Hartwell Clay of Buckinghamshire (*pallasioides* Zone). A referred specimen of *Kimmerosaurus* (BMNH R1798) came from Weymouth, probably from a cliff exposure between Sandsfoot Castle and the old Portland Ferry Bridge and therefore Early Kimmeridgian in age (Damon, 1884; see Smallmouth Sands report). The disused Kimmeridgian pits on Shotover Hill, Oxfordshire ([SP 558 065], [SP 560 066], [SP 562 066], [SP 564 066], etc.) have yielded some reptiles from the *pectinatus* Zone (Shotover Grit Sands, Shotover Fine Sands), as well as more abundantly from the Early Kimmeridgian.

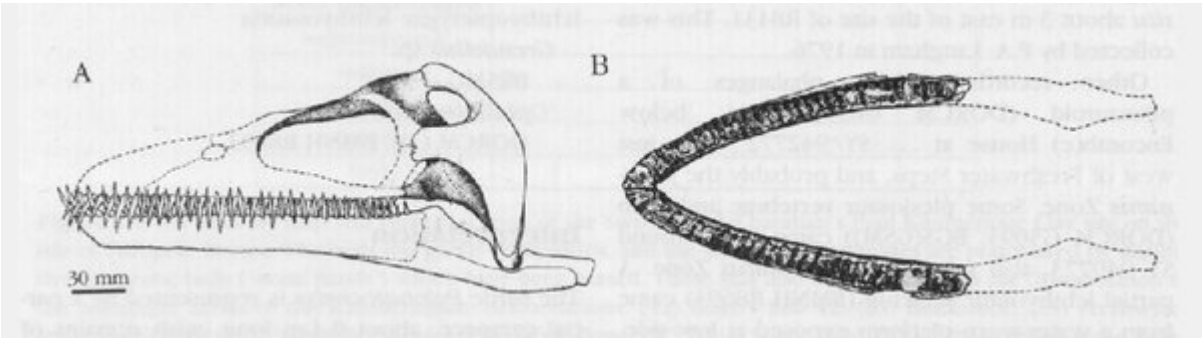
## Conclusions

The whole coast section from Swyre Head to Chapman's Pool (Encombe Bay) represents the best British Late Kimmeridgian (=Early Tithonian) reptile site. It has produced a selection of marine reptiles that have not yet been described in full. One undescribed turtle may be the first specimen of the poorly known genus *Pelobatochelys* with limb remains. The two partial skulls and some postcranial remains of *Kimmerosaurus langhami* Brown, 1981 show that this was a plesiosaur with several unique features that may form part of a lineage separate from the commoner plesiosaurid–elasmosaurid and pliosaur groups. Marine faunas of this age are rare elsewhere in the world, with similarly isolated remains known from France and Germany. At the same time in North America and Africa, the only known faunas are of terrestrial organisms. This potential for future discoveries gives the site its conservation value.

References



(Figure 7.6) (A) Locality map and vertical section of the Swyre Head–Chapman's Pool Kimmeridge Clay site on the Isle of Purbeck, Dorset. The beds dip gently southwards, and the shales and mudstones are punctuated by distinctive limestone beds ('stone bands') which have been named. These may also be matched with the (B) tabulation of the ammonite zones of the Kimmeridgian. Abbreviations: (42) Blake's Bed 42; (BS) Blackstone; (FS) Freshwater Steps Stone Band; (r.N) rotunda Nodules; (SB) Stone Band; (W) White Stone Band; (YL) Yellow Ledge Stone Band; (in the zonal chart, B, L, M, U and T refer to basal, lower, middle, upper and topmost parts of the zones). After Taylor and Benton (1986); based on Cope (1967, 1978); Cope et al. (1980b); Cox and Gallois (1981).



(Figure 7.7) The plesiosauroid *Kimmerosaurus langhanii* Brown, 1981, from the Upper Kimmeridge Clay of Egmont Bay. (A) Restoration of the skull in lateral view; (B) lower jaws viewed from above. After Brown (1981).