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# Culand Pits, Burham, Kent

[TQ 738 617]

## Highlights

The Culand Pits, Burham are Britain's richest Chalk (Late Cretaceous) reptile site (Figure 8.19). In their heyday, they were then source of beautiful specimens of turtles, marine lizards, pterosaurs and plesiosaurs. The specimens include original material of five new species, and the pterosaurs and marine lizards have attracted particular attention.

## Introduction

The two Culand Pits on Blue Bell Hill near Burham, the Lower Pit [TQ 737 613] and the Upper Pit [TQ 739 619], have yielded some of the most important fossil reptiles from the British Chalk (Figure 8.20), which form the basis for several descriptive papers. The chalk quarries are still accessible, although no longer working and further finds could only be made with excavation.

Lower Culand Pit is in the Lower Chalk (Cenomanian) and Upper Culand Pit is in the Middle and Upper Chalk (Turonian). Jukes-Browne and Hill (1903, p. 35) give a sketch section which makes this clear. The lowest units of the Chalk, the Chloritic Marl and the Chalk Marl (Cenomanian, *mantelli* Zone), were recorded in the tramway between Burham Brick Pit [TQ 723 610] and the Chalk Quarries (Jukes-Browne and Hill, 1903, pp. 46–7). Further details of the quarries are given in a series of papers by Dibley (1900, 1904, 1907, 1918, Dibley and Spath, 1926) and by Dines *et al.* (1954). Kennedy (1969, pp. 482–6) gave a section, with details of the ammonites, for the Lower Chalk. The reptiles have been described by Owen (1842b, 1842e, 1851b, 1852a), Owen (*in* Dixon, 1850), Bowerbank (1846, 1848, 1852), Mantell (1842), Lydekker (1889b), Woodward (1888), Woodward and Sherborn (1890), Seeley (1870b) and Wellnhnfer (1978).

## Description

A combined section of the Chalk in the two quarries, summarized from Jukes-Browne and Hill (1903, pp. 49, 382; 1904, pp. 158–9) and Dines *et al.* (1954, pp. 32, 37, 42), is:

	Thickness (m)
UPPER CULAND PIT	
Soil	0.3
Upper Chalk (planus Zone)	
Very rough, rubbly, hard, crystalline chalk	6.1
Rough, lumpy chalk	4.9
Layer of flints	0.2
Massively bedded chalk	1.5
Layer of flints	0.2
Rough, hard, lumpy chalk	1.1
Layer of flints	0.2
Rather rough and lumpy chalk	0.9
Rather rough, hard chalk with scattered flints	0.9
	<b>16.3</b>
Middle Chalk ( <i>lata</i> and <i>labiatus</i> Zones)	
Firm, soft, lumpy chalk	1.2
Firm, white, smooth chalk	7.6–9.1
Massive, homogeneous, white chalk	35.7
	<b>c. 46.0</b>

## LOWER CULAND PIT

Middle Chalk and Melbourn Rock	9.1
Lower Chalk	
<i>Plenus</i> Marls (Belemnite Marls) ( <i>gracile</i> Zone)	
Yellowish-grey laminated marl	0.3–0.4
Pale yellowish-grey manly chalk	1.8
Grey Chalk and <i>mantelliana</i> Band ( <i>naviculare</i> and <i>rhotomagense</i> Zones). Beds 6, 7 and 8, Firm white chalk passing gradually down into grey chalk	about 25
Bed 5. Grey manly chalk	about 5

Some museum specimens are labelled 'Lower Chalk' (BMNH 28706) and others as 'Middle Chalk' (BMNH 49008–10) or '*H. subglobosus* Zone, Middle Chalk' (R3735–6), but others lack horizon information. Hence, it is impossible to gain an impression of the vertical distribution of reptile finds through the Chalk in the Culand Pits.

The fossils are generally well preserved and fine detail may be seen (e.g. in the pterosaurs and lizards). Skeletons may be largely articulated (e.g. *Dolichosaurus*), or broken up. Often only isolated teeth and vertebrae of larger forms are found.

## Fauna

The abundant reptile remains from the Culand Pits are preserved in the BMNH, CAMSM and MAIDM. These are generally labelled 'Burham' or 'Blue Bell Hill'.

### Testudines: Cryptodira

'*Chelone* sp.' BMNH 41642, R1345, R1934

'*Chelone/Lytoloma* sp.' BMNH 49008–10

*Chelone (Cimochelys) benstedii*' (Mantell, 1841) Type specimen: BMNH 28706

*Puppigerus camperi* (Gray, 1831) CAMSM B20600–5

*Protostega* sp.' BMNH R3736

'chelonian' BMNH R3735

### Lepidosauria: Squamata: Sauria:

Dolichosauridae

*Dolichosaurus longicollis* Owen, 1850 Type specimen: BMNH 49002. Also BMNH 32268

### Lepidosauria: Squamata: Sauria:

Mosasauridae

*Mosasaurus* sp. MAIDM unnumb.

### Archosauria: Pterosauria: Pterodactyloidea:

Ornithocheiridae

*Ornithocheirus compressirostris* (Owen, 1851) Type specimen: BMNH 39410; others: BMNH 39411, 39416, 49003–4, MAIDM unnumb.

*Ornithocheirus cuvieri* (Bowerbank, 1851) Type specimen: BMNH 39409

*Ornithocheirus giganteus* (Bowerbank, 1846) Type specimen: BMNH 39412. Others, BMNH 39413–5, 39417

*Ornithocheirus* sp. BMNH 41637, 49005–6, R1357–8, R1935–6, R2644

### **Sauroptrygia: Plesiosauria: Plesiosauroidea**

*Cimoliasaurus smiths'* (Owen, 1884) BMNH 49007

### **Sauroptrygia: Plesiosauria: Pliosauroida**

*Polyptychodon interruptus* Owen, 1841 BMNH 41641, 41644, 46959, 49007, R1217, R1938

## **Interpretation**

The turtle remains from the Culand Pits consist of complete and partial carapaces — hence the difficulties in identification, since turtles are classified mainly on the basis of their skulls. Owen (1842b) described four marginal plates and remains of ribs of a small turtle from Burham (Figure 8.20)A, B. He named this fragment *Chelone benstedii* in the explanation to the figure (Owen, 1842b, p. 176; 1842e, p. 412, pl. 39, fig. 5). In a footnote (1842e, p. 412) dated 'April, 1842', Owen ascribed these plates to a skeleton more recently acquired from Burham. Mantell (1842) described this fairly complete carapace and plastron, and noted that it was found in the Lower Chalk (i.e. Lower Culand Pit?). The carapace was oval, 150 mm long and 100 mm wide in the middle. Further turtle remains noted by Mantell (1842, p. 158) included an abdominal plate and a femur. Owen (1842b, p. 176; 1851b, pp. 4–8) further described these specimens. The small size of these turtles led some authors (e.g. Lydekker, 1889b) to consider them to be juveniles, whereas others regarded them as adults (e.g. Woodward, 1888, pp. 275–6).

The other turtles listed above, on the basis of old museum labels, include several forms that may be wrongly identified — *Puppigerus camperi* is a common Eocene species, for example (Moody, 1974). Owen (1851b, pp. 9–11) called these *Chelone camperi* and Lydekker (1889b, p. 31) noted the probable mistake.

The lizard *Dolichosaurus* was described by Owen (*in* Dixon, 1850, pp. 388–95; 1851b, pp. 22–9); Mackie (1863); Lydekker (1888a, p. 275) and Woodward (1888, pp. 281–2). The type specimen (BMNH 49002) is a crushed skull and a series of vertebrae and ribs, with scattered, short limb bones ((Figure 8.20)C. Owen (1842e, p. 412) had earlier ascribed the posterior portion of the skeleton to *Rhaphiosaurus*, a genus also known from Cambridge. The two parts of the skeleton were later associated and renamed. This lizard had a small head with conical teeth and a long, thin body; the presacral vertebral column consists of 57 vertebrae and is about 450 mm long. The dolichosaurs are elongate marine lizards which swam in a snake-like fashion.

A jaw in MAIDM is referred to '*Vilosasaurus gracilis*' Owen, 1850. Mosasaurs were large marine lizards with specialized predatory dentition. They are surprisingly rare at Burham, although more common elsewhere in the English Chalk.

Plesiosaurs are represented by some paddle bones referred to '*Cimoliasaurus smithi* (Owen, 1884)' by Woodward and Sherborn (1890). Lydekker (1889a, p. 215) noted that this species was 'doubtful', since it was based on small proportional characteristics of a dorsal vertebra. The heavier pliosaur *Polyptychodon interruptus*, a common species in the English Chalk, is represented by several teeth, vertebrae and paddle bones from the Culand Pits. Neither of these marine reptiles is known from an articulated skeleton, but comparison with better-preserved fossils elsewhere shows that *Cimoliasaurus* was a long-necked fish-eater, and *Polyptychodon* a shorter-necked, large-headed fish- and reptile-eater.

The most important fossil reptiles from the Culand Pits are the pterosaurs. Owen (1842e) described some hollow limb bones from Kent as those of birds. Bowerbank (1846) discovered a fragment of the jaws and teeth of a definite pterosaur,

with portions of the hollow limb bones, in the Lower Chalk of 'Hailing', and named them *Pterodactylus giganteus*. Woodward (1888, p. 238) noted that these finds actually came from Burham, as indicated by Bowerbank (1852). Owen (1846, pp. 545–8) reaffirmed the 'bird nature' of his bones and named them *Cimoliornis*. Bowerbank (1848, 1852) described further pterosaur jaw material from Burham as *P. cuvieri*, and argued again that pterosaurs were reptiles. Owen (*in* Dixon, 1850, pp. 401–4; 1851b, pp. 88–104; 1852) finally acknowledged that the hollow bones belonged to pterosaurs and not birds, and he described (1851b) a third species from Burham, *P. compressirostris*, also on the basis of a snout. These three species were subsequently shown (Seeley, 1870b, pp. 28–94, 112–18) to belong to the Cretaceous genus *Ornithocheirus*. More detail of these debates are given by Woodward (1888, pp. 283–5).

The three species of *Ornithocheirus* from Burham are based on partial skulls and skeletons (Figure 8.20)D–F. The type of *O. giganteus* is a partial skull, pectoral girdle and other fragments, and other limb bones come from the same site. *O. compressirostris* is based on a partial skull and fragments of limb bones, all from Burham. *O. cuvieri* was also based on a snout and a wing bone. The three species are distinguished on proportional differences of the snout shape and tooth arrangement. The estimated lengths vary from 250 mm to 450 mm. The available material is listed by Lydekker (1888a, pp. 11–13). Wellnhofer (1978, pp. 56–8) reviewed the Burham pterosaurs and regarded all three species as valid.

The fauna at Burham is a mixture of large marine carnivores (*Mosasaurus*, *Cimoliasaurus*, *Polyptychodon*), turtles (*Chelone*), a marine lizard (*Dolichosaurus* and ?*Mosasaurus*) and pterosaurs (*Ornithocheirus*), the latter forms probably washed in from land. The vertebrates of the Chalk were reviewed by Woodward (1888).

### **Comparison with other localities**

Most of the genera recorded from the Culand Pits have also been found in other Chalk quarries in southern England (see listing above), but none of the other sites has such a diverse fauna. Similar Late Cretaceous marine faunas are known from the Chalk of Belgium, France, Sweden, and from North America (Texas, Mississippi, Alabama, New Jersey, Kansas, etc.). However, these overseas Chalk localities are dominated by mosasaurs (Russell, 1967), a group that is barely, if at all, represented in the Culand Pits.

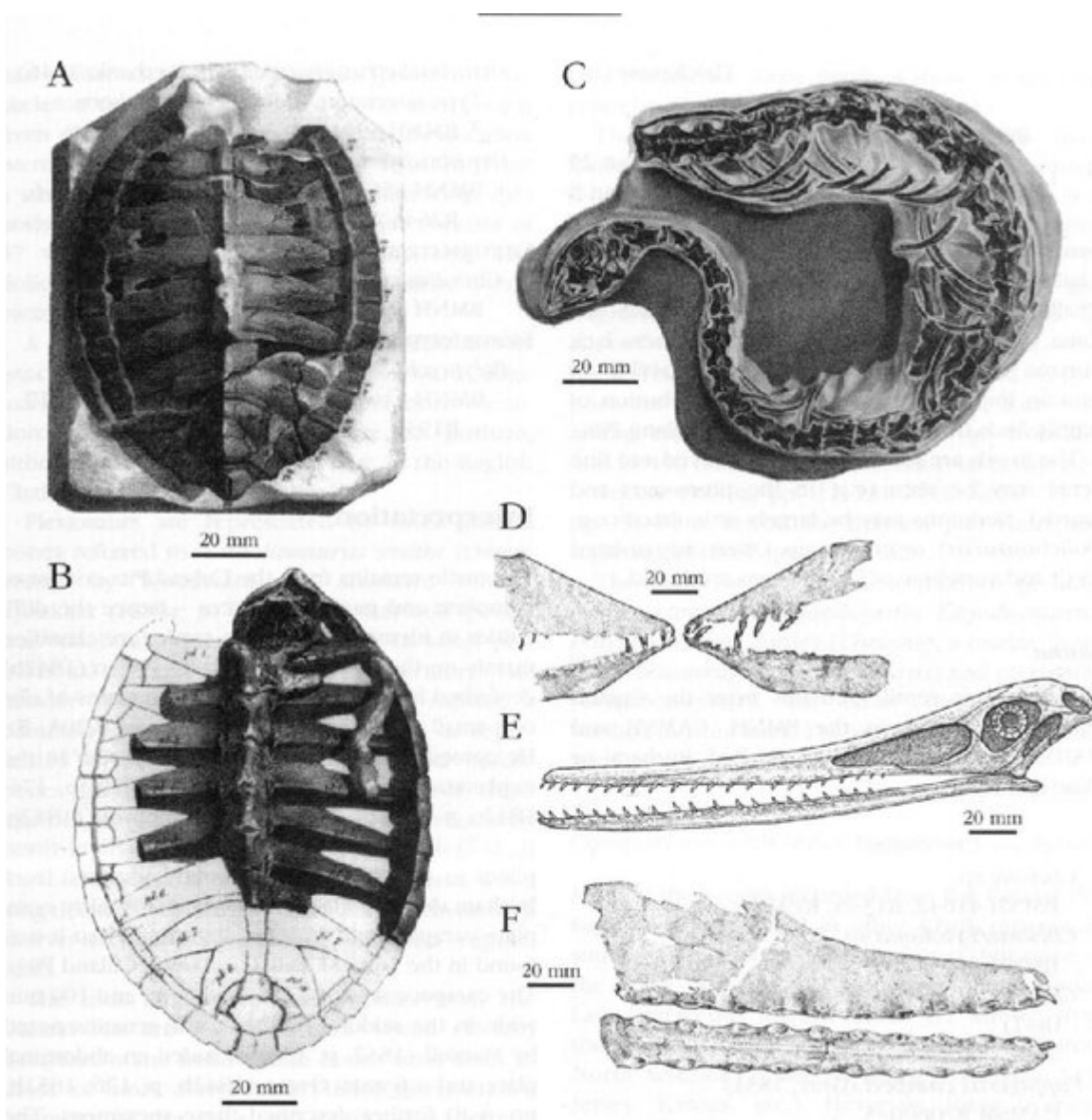
### **Conclusions**

The Culand Pits at Burham have yielded the most complete fauna of Chalk reptiles in Britain. The mosasaurs, so typical of certain localities, are rare, but several well-preserved fossils of turtles, lizards, plesiosaurs and pterosaurs have been collected. These include type specimens of five species. This is the best British Chalk reptile site with potential for new finds and a key Late Cretaceous site of international importance, hence its • considerable conservation value.

### **References**



(Figure 8.19) The rather overgrown Upper Culand Pit, Burham, showing the Middle and Upper Chalk, source of several specimens of fossil turtles, marine lizards, pterosaurs and plesiosaurs. (Photo: M.J. Benton.)



(Figure 8.20) Typical reptiles of the Late Cretaceous Middle Chalk of the Culand Pits, Burham, Kent. (A) and (B) The turtle *Chelone (Cimolochelys) benstedii* (Mantell, 1841), carapace in dorsal and ventral views; (C) the elongate marine lizard *Dolichosaurus longicollis* Owen, 1850, crushed skull and anterior part of skeleton; (D) the pterosaur *Ornithocheirus compressirostris* (Owen, 1851), skull in lateral view; (E) *O. cuvieri* (Bowerbank, 1851), anterior part of snout in lateral and crown views; (F) *O. giganteus* (Bowerbank, 1846), anterior part of snout, right and left sides. (A)–(C) After Owen (1851b); (D)–(F) after Wellnhofer (1978), from various sources.