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## Loftus, Yorkshire

[NZ 736 200]–[NZ 757 193]

### Highlights

Loftus Alum Quarries have produced a diverse assemblage of marine fossil reptiles, plesiosaurs, ichthyosaurs and crocodiles. They are especially notable as the site where the pterosaur *Parapsicephalus* was found, a remarkable specimen that preserves the outline of the brain.

### Introduction

The former alum workings in the Upper Lias Alum Shale at Loftus have yielded many important fossil reptile remains. These appear to form a fauna distinct from that found at Whitby, and Loftus is thus an important companion site. The quarried platform at Loftus is partly grassed over. It has a hummocky appearance (?quarry spoil) and there are several tracks still visible. The lower parts of the cliff behind (i.e. in the Upper Lias) are still largely exposed. Thus, much of the site is still available for further examination and additional finds could be made. However, the site is isolated from the sea above a cliff of Lower to Middle Lias and erosion is probably less than at Whitby. The geology has been described by Fox-Strangways (1892) and the reptiles by Carte and Baily (1863), Seeley (1865a), Tate and Blake (1876), Newton (1888), Watson (1911a), Melmore (1930), Wellnhofer (1978) and Taylor (1992a, 1992b).

### Description

The extensive alum quarries on the Yorkshire coast between Loftus and Boulby yielded many reptile remains when they were in operation. Fox-Strangways (1892, p. 134) notes that 'the saurian remains were so numerous that one of the walks at Boulby House is edged with the vertebrae of these reptiles'. Although the two quarries are now linked and the former boundary cannot be detected, they operated separately throughout the 19th century. Loftus Alum Quarry (known as Lofthouse or Lingberry in the past) was operated by the Earl of Zetland and was closed in 1863, whereas Boulby Alum Quarry was closed in 1861 (Fox-Strangways, 1892, p. 453).

The sequence of the Upper Lias at Loftus is approximately the same as in the Staithes and Whitby sections, consisting of an ascending sequence through the upper part of the Cleveland Ironstone Formation and the Whitby Mudstone Formation (Grey Shales, Jet Rock Alum Shale members; Howarth, *in Cope et al.*, 1980b; see Whitby report above).

The Lower and Middle Lias are exposed on Hummersea Scar, west of the Alum Quarries, and on the foreshore below the quarry (*Jamesoni* Zone, Early Pliensbachian, on the wave-cut platform; *margaritatus* and *spinatum* Zones, Late Pliensbachian, Cleveland Ironstone Formation on the 80–90 m cliff). The Alum Quarries have been dug back from this lower cliff line, forming a broad shelf well above sea-level, and a high cliff rises behind to a total height of 200 m. The upper part of the cliff consists of three Early Toarcian (Upper Lias) members, capped by Mid Jurassic sediments (Dogger Formation (1.5 m), Hayburn Formation (25 m), Aalenian; Fox-Strangways, 1892).

The reptiles appear to have been found in the Loftus Alum Quarries rather than in the Boulby Alum Quarries, since the specimens are labelled 'Lofthouse'. They are all recorded as 'Zone of *A. communis*' by Blake (in Tate and Blake, 1876, pp. 246, 250, 253–4) (=Early Toarcian, *Hildoceras bifrons* Zone), and they probably came from the Main Alum Shales. The provenances of some specimens can be traced from the early literature and also from examination of matrix associated with the remains, and these confirm Blake's statement. Young and Bird (1828, p. 287) noted a plesiosaur vertebra from Loftus, while Seeley (1880) described an ichthyosaur specimen (CAMSM 35176), presumably from Loftus, as *Ichthyosaurus zetlandicus*. The type specimen of the plesiosaur *Rhomaleosaurus zetlandicus* (YORYM G503) also came from Loftus (Phillips, 1854; Tate and Blake, 1876, p. 250; Taylor, 1992a, 1992b), and presumably from the Cement Shales or the upper part of the Main Alum Shales, as confirmed also by the matrix of the specimen, a flaky, grey, pyritous

shale containing concretions around the bones. The histories of the specimens from Loftus are detailed in Benton and Taylor (1984, pp. 410–14, 416).

## Fauna

Loftus Alum Quarries have yielded many specimens according to past records, but only six may still be traced. However, these are rather important. They are preserved in the BMNH, BGS(GSM), CAMSM, WHIMS, and YORYM.

	Numbers
<b>Sauropterygia: Plesiosauria:</b>	
<i>Eretmosaurus macropterus</i> (Seeley, 1865a) Type: CAMSM J35182	1
<i>Rhomaleosaurus zetlandicus</i> (Phillips, 1853) Type: YORYM G503	1
' <i>Plesiosaurus</i> sp.'	1
<b>Ichthyopterygia: Ichthyosauridae</b>	
<i>Stenopterygius acutirostris</i> (Owen, 1840) Type of <i>Ichthyosaurus crassimanus</i> Blake, 1876: YORYM G497	1
<i>Temnodontosaurus platyodon</i> (Conybeare, 1822)	1
<b>Archosauria: Pterosauria: 'Rhamphorhynchoidea'</b>	
<i>Parapsicephalus purdoni</i> (Newton, 1888) Type: BGS(GSM) 3166	1

## Interpretation

Loftus Alum Quarries have yielded type specimens of four species, of which at least two are apparently unique to this locality. *Eretmosaurus macropterus* has been recorded from Whitby.

The plesiosaur *Eretmosaurus macropterus* is represented by a fine articulated skeleton with a total length of 5 m. The skull is relatively short (0.25 m) and the teeth are long and curved. The neck is long (2 m) and consists of 39 vertebrae, and the tail is 1.3 m long. The limbs are very large: they all measure over 1 m in length. The only descriptions (Seeley, 1865a; Blake, *in* Tate and Blake, 1876, p. 246; Watson, 1911a) are brief and the specimen has never been figured.

*Rhomaleosaurus zetlandicus* is about 6 m long, with a long skull (1.1 m), short neck (1.5 m) and long tail (2 m). The limb bones are large. The specimen was collected in about 1850 (Phillips, 1853, 1854; Carte and Baily, 1863; Blake, *in* Tate and Blake, 1876, pp. 249–50) and has recently been redescribed in detail (Taylor, 1992a, 1992b).

*Ichthyosaurus crassimanus* Blake (1876, pp. 253–4) is 10 m long and has a 2 m skull. The front paddles (0.8 x 0.3 m) are larger than the hind paddles (0.6 x 0.25 m). It was described in some detail by Melmore (1930). McGowan (1974a, pp. 31–2) ascribed it to *Stenopterygius acutirostris*, but later (McGowan, 1976, p. 675, footnote; 1979, pp. 120–1) provisionally placed it in *Leptopterygius*. There is a problem regarding the locality of this specimen. Blake (*in* Tate and Blake, 1876, p. 254) noted its provenance as 'Lofthouse', but Simpson (1884, p. 12) stated that it came from Kettleless. Later authors have been noncommittal: 'Alum Shale Quarries north of Whitby' (Melmore, 1930, p. 615); 'Alum Shales north of Whitby' (McGowan, 1974a, p. 32); 'near Whitby' (Pyrah, 1979, p. 423). We assume that it came from Loftus since that is the locality quoted by its original describer. A large specimen of *Temnodontosaurus platyodon* (5 m long), with a 1.25 m head, has also been recorded (Simpson, 1884, p. 12).

The pterosaur *Parapsicephalus purdoni* (Figure 5.9), originally ascribed to the genus *Scaphognathus* (from the Late Jurassic Solnhofen Beds of Germany) by Newton (1888), is represented by a partial skull, which lacks dentition and the snout tip. The skull is long and low and has large openings, especially the antorbital fenestra. The preservation of this specimen is such that a fine brain cast is displayed, which shows how the relatively large brain fits obliquely in the skull behind the eye. The forebrain is large and the olfactory lobes are short. The large optic lobes are a reptilian feature, but

they are not quite dorsal in position, which is a bird-like feature. The cerebellum is small and there are large flocculi (Newton, 1888; Wellnhofer, 1978, pp. 30, 39). *Parapsicephalus* is one of the earliest true rhamphorhynchids (Unwin, 1991) and it falls in a time interval when relatively few pterosaurs are known. Other late Early Jurassic pterosaurs include *Campylognathoides* and *Dorygnathus* from Germany and India (Wellnhofer, 1978, pp. 73–4).

### **Comparison with other localities**

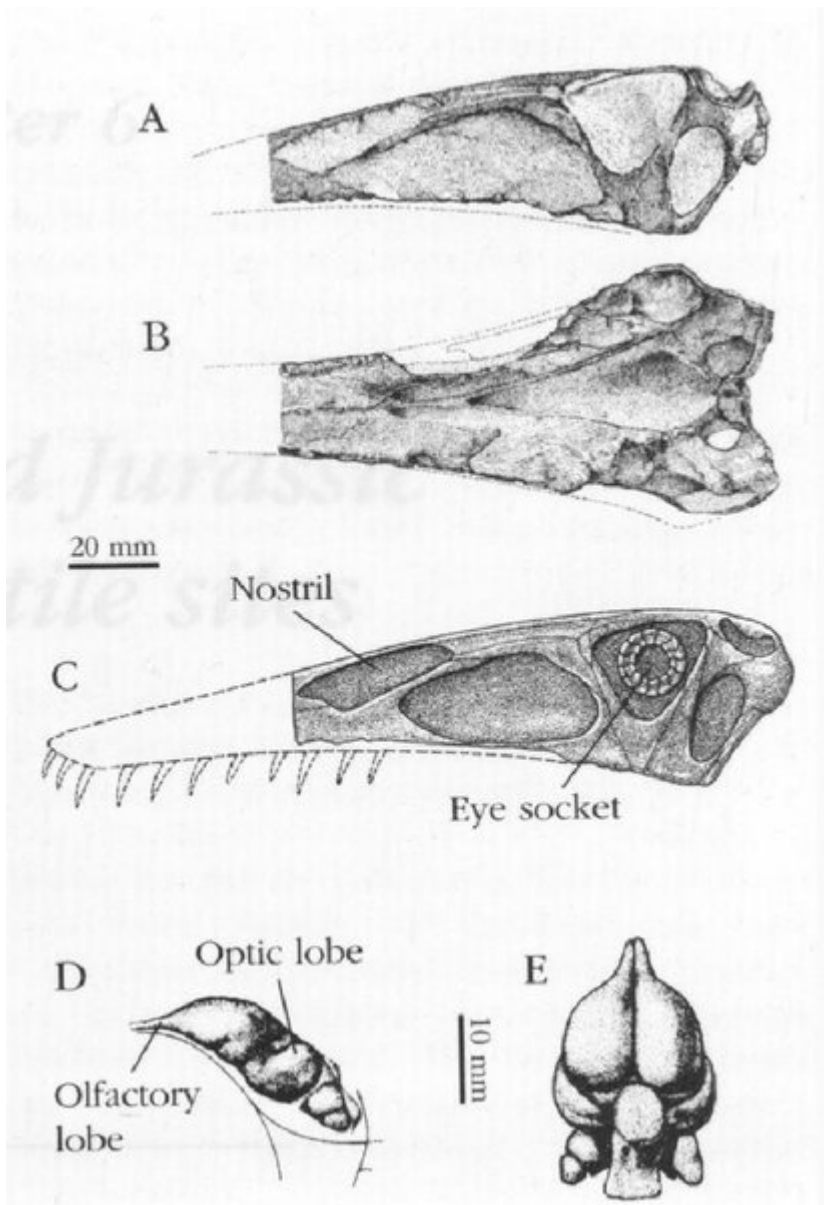
Loftus Alum Quarries are most immediately comparable with Kettleness Alum Quarries to the south [NZ 83 16] and the coast at Port Mulgrave [NZ 80 18]. The coast east of Whitby [NZ 90 12]–[NZ 93 10] has produced more species of reptiles and more specimens, but those from Loftus are broadly different taxa. Only the plesiosaur *Eretmosaurus macropterus* is shared with Whitby. The pterosaur *Parapsicephalus* is unique to Loftus.

### **Conclusions**

Loftus Alum Quarries have never been as rich in reptile remains as the Whitby coast, but the taxa are different. The ichthyosaurs are much larger than those from any other British Upper Lias locality. The two species of plesiosaur are also large and probably unique to Loftus. Of particular importance is the unique specimen of *Parapsicephalus*, the only British Upper Lias pterosaur described, and of great significance in general because of the fine brain cast that is preserved.

The combination of this historic importance and some potential for future finds gives the site considerable conservation value.

### **[References](#)**



(Figure 5.9) The pterosaur *Parapsicephalus purdoni* (Newton, 1888) from the Lower Jurassic Alum Shales Member of Loftus, Yorkshire. (A), (B) and (C) skull in lateral and ventral views; (D) and (E) brain cast in left lateral and dorsal views. From Westphal (1976).