Monographs of the Palaeontographical Society

The Palaeontographical Society was established in 1847, and is the oldest Society devoted to study of palaeontology worldwide. Its primary role is to promote the description and illustration of the British fossil flora and fauna, via publication of an authoritative monograph series. These monographs cover a wide range of taxonomic groups, from microfossils, trilobites and ammonites through to Coal Measure plants, mammals and reptiles, and from all ages from Cambrian to Pleistocene. They form a benchmark for understanding the past life of the British Isles and many include the original descriptions of numerous key species. The first monograph (on the Crag Mollusca) was published in March 1848 and the Society still continues this work today. Notable authors in the series include Charles Darwin (fossil barnacles) and Richard Owen (dinosaurs and other extinct reptiles). Beginning in 2014, the Cambridge Library Collection and the Society are collaborating to reissue the earlier publications, focusing on monographs completed between 1848 and 1918.

Monograph on the Reptilia of the Kimmeridge Clay and Portland Stone

The discovery of marine reptiles in the Jurassic rocks of central and southern England helped spark a revolution in the earth sciences, opening new vistas on deep time and revealing a variety of animals whose bizarre appearances kick-started long-standing public fascination with extinct life. Sir Richard Owen (1804–92) was at the forefront of this work and described many new species of ichthyosaurs, plesiosaurs and mosasaurs. In this monograph on the Reptilia from the Kimmeridge Clay and Portland Stone (originally published in 1861–9 and gathered together in 1889) he concentrated on the ‘pliosaurs’ from those units – large-bodied marine reptiles with huge heads, short necks and flippers – and showed that dinosaurs were not the only extinct reptile group to produce formidable predators. These formations have yielded abundant ‘pliosaur’ material, and Owen's monograph, reissued here with his 1870 study of cetaceans from the Red Crag Formation, has remained the foundation for all subsequent work on these animals.
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Monograph on the Reptilia of the Kimmeridge Clay and Portland Stone

With a Monograph on the British Fossil Cetacea from the Red Crag

Richard Owen
THE

PALÆONTOGRAPHICAL SOCIETY.

INSTITUTED MDCCCXLVII.

LONDON:

MDCCCLXI—MDCCCXXXIX.
MONOGRAPH ON THE REPTILIA OF THE KIMMERIDGE CLAY AND PORTLAND STONE.

DIRECTIONS TO THE_BINDER.

The Monograph on the Reptilia of the Kimmeridge Clay and Portland Stone will be found in the volumes of the Palaeontographical Society issued for the years 1869, 1880, and 1888. The General Title-page, Title-pages Nos. I and II, Preface, and Table of Contents, will be found in the volume for 1888.

ORDER OF BINDING AND DATES OF PUBLICATION.

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1 Pages 1—14, and Plates I—VI, belong to the Monograph on the Fossil Reptilia of the Liassic Formations, the directions for the binding of which will be found in the volume for the year 1881.

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MONOGRAPH

ON THE

REPTILIA

OF THE

KIMMERIDGE CLAY AND PORTLAND STONE.

BY

SIR RICHARD OWEN, K.C.B., D.C.L., F.R.S.,
FOREIGN ASSOCIATE OF THE INSTITUTE OF FRANCE,
ETC. ETC.

LONDON:
PRINTED FOR THE PALÆONTOGRAPHICAL SOCIETY.
1861—1889.
PREFACE

TO THE

REPTILIA OF THE KIMMERIDGE CLAY AND PORTLAND STONE.

The annual volume of the Palæontographical Society for the year 1859 was issued in the year 1861, but the discovery, determination, and description of the fossil Reptilian remains therein recorded were completed before the end of 1860.

Other fossil remains, besides those mentioned in the Monographs referred to (pp. 15 and 27) from the Kimmeridge Clay, have given confirmatory evidence of the genus *Pliosaurus*, first recorded in the ‘British Association Reports,’ 1841, and characterised in the volumes published by the Palaæontographical Society in 1861 and 1863.

R. O

*February 1st, 1888.*
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MONOGRAPH

ON THE

BRITISH FOSSIL REPTILIA

FROM THE

KIMMERIDGE CLAY.

BY

RICHARD OWEN, F.R.S., D.C.L.,
FOREIGN ASSOCIATE OF THE INSTITUTE OF FRANCE,
ETC. ETC.

No. 1.
CONTAINING
PLIOSAURUS GRANDIS.
Pages 15, 16; Plate VII.

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PRINTED FOR THE PALEONTOGRAPHICAL SOCIETY.
1861.
MONOGRAPH
ON
THE FOSSIL REPTILIA
OF THE
KIMMERIDGE CLAY.

PLIOSAURUS GRANDIS.

PLIOSAURUS — Owen. Ibid., 1840, p. 54.

Tooth. Tab. VII.

Although abundant evidence of the huge dimensions of the present species of short-necked Sauropterygian has reached me since its first indication from the fragmentary evidence described in my ‘Reports’ of 1839 and 1840, no specimen has more strongly impressed me with the bulk and power of the old tyrant of the upper Oolitic seas, or, indeed, had exemplified its size on such a scale, as the portion of tooth from Kimmeridge Clay, near Oxford, figured in Tab. VII. This unique specimen forms part of the Palæontological collection of the Hon. Robert Marsham, to whom I am indebted for the present opportunity of describing it.

The circumference of the base of the crown measures 7 inches 6 lines, equaling that of a large-sized tooth of a Cachalot (Physeter macrocephalus). Of the enamelled crown 3 inches are preserved, and about as much of the cement-covered base, the largest diameter of which is 2 inches 6 lines; that of the fractured end of the crown is 1 inch 3 lines. The length of the entire tooth may be estimated at between 9 and 10 inches.

The fractured part of the base exposes a pulp-cavity (figs. 3, 5) of about 2 inches in diameter, with a hard dentinal wall of from 4 to 6 lines in thickness; the tooth would seem, therefore, to be one that had been but recently protruded. The fractured part of the crown exposes a solid and compact mass of dentine. The generic characters of the tooth stand boldly out, and the crown is subtriangular, with the two inner or concave sides continued into each other by an uninterrupted curve, and the angles between these facets and the outer or convex side of the tooth being blunted, or rounded off. The terms concave and convex refer to the longitudinal direction; all the sides are convex transversely, the outer one being the least so. This facet (fig. 1) is further distinguished by the finely wrinkled and unridged surface of the enamel. The wrinkling is produced by short, obtuse, wavy risings, frequently joining, or reticulate, and rather affecting the longitudinal course. The same character is presented by the enamel covering the contiguous parts of the other sides of the tooth, and extends furthest in that represented in
FOSSIL REPTILIA OF THE KIMMERIDGE CLAY.

fig. 2, and between the more distant longitudinal ridges on the side represented in fig. 3. There are no longitudinal ridges on the convex side (fig. 1). The enamel here, which is a mere film at the base of the crown, slightly increases in thickness towards the apex; its adhesion to the dentine is promoted by numerous fine, wavy, longitudinal, nearly equidistant, linear risings on the surface of the dentine.

On the side of the tooth fig. 2 the wavy risings of the enamel become larger, more distinct from each other, and more markedly longitudinal, as they recede from the angle dividing it from the convex side. At about an inch distance there is a definite, longitudinal ridge, of an inch in length, followed by other ridges that quickly increase in length as they approach the concave side of the tooth, having pretty regular intervals of about 2 lines. Between these long and well-marked enamel ridges there are other shorter ones proceeding from the base of the enamel, of varying lengths.

On the side of the tooth fig. 3, which transversely is more regularly convex than the side fig. 2, the strong, longitudinal, enamel ridges begin near the angle dividing it from the smoother convex side, at first with interval of about 3 lines, the intervening enamel being wrinkled, then with intervals of 1 or 1½ line, the more numerous longitudinal ridges continuing along the inner or longitudinally concave, but transversely very convex, part of the crown of the tooth. Of these more numerous and closely set ridges, probably the alternate ones only would be extended to near the apex of the tooth, a few of the others being shown to terminate at or near the fracture. The longitudinal ridges are strongly and definitely raised from the general surface of the enamel, and preserve their thickness to near their termination.

The outer longitudinal contour of the tooth (a, fig. 2) describes a simple and slight convexity; the inner one is wavy, passing from the slight concavity at the crown (b) to a corresponding convexity at the junction of the crown and base, and then again becoming very slightly concave. The transverse diameter of the crown is rather less across the convex side (fig. 1) than in the direction at right angles to this, as from a to b, fig. 2.

An entire crown of the tooth of a Pliosaurus, of the size more commonly met with, is described and figured in my ‘Odontography’ (p. 282, pl. 65, fig. 5).

In the lower jaw of the Pliosaurus from Kimmeridge Clay at Market Raisin, preserved in the Geological Museum at Oxford, there is evidence of thirty-eight teeth in each ramus, which were probably opposed to as many in the upper jaw. I estimate the lower jaw of the Pliosaurus, to which the tooth figured in Tab. VII belonged, at about 8 feet in length.

J. C. Mansel, Esq., of Langthorne, Blandford, Dorsetshire, has favoured me with a photograph of the lower jaw (7 feet in length) of a Pliosaurus in his museum. I hope to include a description and figure of that specimen in a future monograph.
TAB. VII.

*Pliosaurus grandis.*

Portion of tooth, nat. size.

Fig.
1. Convex or unridged side.
2. Front ridged side.

MONOGRAPH

ON THE

BRITISH FOSSIL REPTILIA

FROM THE

KIMMERIDGE CLAY.

BY

RICHARD OWEN, F.R.S., D.C.L.,
FOREIGN ASSOCIATE OF THE INSTITUTE OF FRANCE,
ETC. ETC.

No. II.
CONTAINING
PLIOSAURUS GRANDIS.

Pages 27, 28; Plate XII.

LONDON:
PRINTED FOR THE PALÆONTOGRAPHICAL SOCIETY.
1863.
MONOGRAPH
ON
THE FOSSIL REPTILIA
OF THE
KIMMERIDGE CLAY.

Pliosaurus grandis.

Pliosaurus grandis, Owen. 'Report on British Fossil Reptiles,' 8vo, 1839, p. 83.

Pliosaurus — Owen. Ibid., 1840, p. 54.

The publication by the Palæontographical Society1 of the evidence of the bulk of the Pliosaurus, afforded by a tooth of the Pliosaurus grandis in the Palæontological Collection of the Hon. Robert Marsham, attracted the attention of other geologists and collectors of fossils to the subject, and stimulated the possessor of a rich series of Palæosaurian remains from the Kimmeridge Clay at Kimmeridge, J. C. Mansel, Esq., of Whatcombe, Dorsetshire, to transmit to me the magnificent tooth which forms the subject of Plate XII.

This tooth exemplifies its most perfect state of formation; the entire fang, or root, has been developed, and the unworn state of the crown shows that the time had not arrived for the absorption of the root through pressure of a successional tooth, which undermining process is usually concomitant with the loss of efficiency of the dental instrument through the wearing down of the crown.

This tooth accordingly presents a total length of 1 foot, one third of which is formed by the enamelled crown, the other two thirds by the cement-covered root. This part expands for the first half of its extent to a diameter of 3 inches, which is the thickest part of the tooth, and then gradually contracts to

1 Volume of the Palæontographical Society, 1861, p. 15.
FOSSIL REPTILIA OF THE KIMMERIDGE CLAY.

the thin borders of the base of the pulp-cavity, where probably an additional inch of the length of the tooth has been broken away. The characteristic Pliosaurian modifications of the coronal enamel—smooth on the outer or longitudinally convex side (fig. 2), and boldly ridged on the front (fig. 1) and back (fig. 3) sides—are so truly and sharply delineated by Mr. Dinkel's skill as to dispense with verbal illustration.

In comparison with the tooth from the Kimmeridge Clay near Oxford (p. 15, Tab. VII, of a former Monograph), the crown in the present specimen, from the same formation at Kimmeridge, Dorsetshire, is shorter in proportion to its breadth, especially taken from the outer to the inner side of the base of the crown, and there is a difference in the number and disposition of the ridges, but neither of these amount to a distinction of specific value.

1 Tom. cit., Tab. VII.
TAB. XII.

_Pliosaurus grandis._

Tooth; natural size.

Fig.
1. Anterior surface, with ridged coronal enamel.
2. Posterior surface, with ridged coronal enamel, somewhat crushed and mutilated.
3. Convex or unridged side of the crown.

From the Kimmeridge Clay, at Kimmeridge, Dorsetshire. Presented by the discoverer, J. C. Mansel, Esq., of Whatcombe, Dorsetshire, to the British Museum.
The material originally positioned here is too large for reproduction in this relase. A PDF can be downloaded from the web addres given on page iv of this book, by clicking on 'Resources Available'.
MONOGRAPHS

ON THE

BRITISH FOSSIL

REPTILIA

FROM

THE KIMMERIDGE CLAY.

BY

RICHARD OWEN, F.R.S., D.C.L.,
FOREIGN ASSOCIATE OF THE INSTITUTE OF FRANCE, ETC., ETC.

No. III,
CONTAINING
PLIOSAURUS GRANDIS, PL. TROCHANTERIUS, AND PL. PORTLANDICUS.

Pages 1—12; Plates I—IV.

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1869.