

2. *Note on some REPTILIAN FOSSILS from Gozo.*

By J. W. HULKE, F.R.S., F.G.S.

THESE fossils were collected by the late Captain Strickland, and forwarded by Mrs. Strickland, for examination and description, to Mr. Busk, who intrusted me with them for this purpose, informing me at the same time that they came from Gozo, the Gauda of Strabo, an island adjoining Malta, reputed miocene.

As one of the fossils indicates, I believe, a new crocodile, and the other, if Gozo be really miocene, if the jaw actually came thence, and if my determination should prove correct, shows the survival of an *Ichthyosaurus* to a much later period than that of the upper white chalk, the most recent formation in which any remains of this genus have yet been found, they seemed to me worthy of being brought under the notice of this Society.

ICHTHYOSAURUS GAUDENSIS.

The fossil which I venture to refer to the genus *Ichthyosaurus* is the symphyseal part of a long slender mandible. The front end is wanting; and the rami have also been broken off just behind the symphysis. In its present mutilated state it measures 9 in. long, 1·2 transversely in front, and 2·1 at the posterior limit of the symphysis. Its outer surface is transversely gently convex, smooth, and finely wrinkled longitudinally. The upper surface presents a smooth narrow median tract, in front greatly convex transversely, behind slightly concave in the same direction, mesially divided by the symphyseal suture, in which posteriorly the splenial element is discernible. This is bordered externally by a line of shallow tooth-pits, separated by low transverse ridges, the outer ends of which ascend a short distance on a low parapet formed by the slightly higher outer edge of the dentary bone. Most of the pits are empty; and their smooth surface shows the absence of any firmer bond of union than the gum between the teeth and the mandible.

Fig. 1.—Tooth of *Ichthyosaurus gaudensis*.

Natural size.

The teeth are conical, the crown is slightly compressed, its transverse section elliptical; the fang is simple, of a bulbous figure, its exterior is smooth, its base slightly contracted and rounded. The principal tissue is a simple tubular dentine, in the crown covered by a thick enamel, while in the fang it is enveloped by a stout capsule of cementum. A pulp-cavity rises through the fang for some distance into the crown. A minute plug of spar fills its upper end; and its lower end encloses a little mass of osteo-dentine, which is continuous, through the contracted basal end of the cavity, with the external cementum.

Twenty-one teeth occupy a space of 8 inches. The length of a fang slightly exceeds $\cdot 3''$, the diameter (including the capsule) averages $\cdot 3''$, and that of the dentinal cylinder minus its investing capsule $\cdot 15''$. The apices of all the crowns are broken off, so that the entire length of the teeth is not determinable.

In their form and structure these teeth repeat so closely the characters of those of the Kimmeridge *Enthekiodon* as to suggest the great probability of their both belonging to the same genus. My note on *Enthekiodon**, communicated last session, noticed the resemblance of its teeth and of the mode of their attachment to the jaw to those of *Ichthyosaurus*; but my material was too imperfect to justify me in certainly referring it to that genus. I have now, however, indisputable evidence that it is a true *Ichthyosaurus*; and this being so, the similarity of the dental characters of this Gozo mandible to those of *Enthekiodon* affords a strong presumption that it also is Ichthyosaurian.

CROCODYLUS GAUDENSIS.

The skull is in form elongated and subtriangular. Its sides converge regularly from the posterior and outer angles of the quadrate bones to the 8th tooth, counted from behind. From this they are nearly parallel, to the 14th tooth, in front of which the snout is slightly contracted where the premaxillo-maxillary suture crosses its alveolar border. The end of the snout, including the external nostril, is wanting.

The syncipital area is a nearly flat oblong, measuring transversely along its posterior border $5''\cdot 4$, along its anterior border (a line connecting the anterior and outer angles of the postfrontal bones) $5''$, and from front to back $3''\cdot 2$. The entire surface of this area is symmetrically pitted. In its frontal part, which is hollow transversely and plane axially, the pits are grouped in lines diverging from the axis of the skull, and there is a large remarkable pit in each posterior angle of the area.

The supratemporal fossæ are very large, and have an angulated pentahedral shape. Their transverse diameter, slightly larger than the others, is $1''\cdot 8$. The intervening parietal bone has a minimum width under $\cdot 1''$.

The interorbital space is narrow, hollow transversely, plane axially, and less strongly pitted than the syncipital area.

The orbits are large, their contour is subtriangular, incomplete behind; they look directly upwards; and their long diameter is directed from behind forwards and inwards. The outer, front, and inner part of their margin is raised; and the front part is channelled by two grooves, of which one descends longitudinally on the prefrontal bone, and the other along the junction of the prefrontal and lachrymal bones.

The nasal bones posteriorly reach the level of a line joining the anterior angles of the orbits, and, descending the snout in the form

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of two narrow slips, they meet the præmaxillæ opposite the interspace between the 11th and 12th teeth, counted from behind. For some distance above and below this spot, the widths of the nasals and of the ascending slips of the præmaxillæ are so nearly equal that the junction of the two pairs of bones is inconspicuous and may easily be overlooked.

The prefrontals form rather less than half of the inner border of the orbit, and they are marked by the groove already described. The lacrymals descend along the outer border of the nasals nearly as far again as the prefrontals.

The upper surface of the snout has been flattened by pressure. It is marked with a rather coarse longitudinal wrinkling. The borders of the snout are even behind the 8th tooth, but in front of this the prominence of the alveoli makes them slightly crenated.

The under surface of the skull has the common features of a crocodile's. The mesial borders of the palatine and pterygoid bones meet throughout their length. The posterior nares, wholly included within the posterior border of the connate pterygoid alæ, look backwards. The transverse diameter of their opening slightly exceeds the axial diameter. The pterygo-palatine foramina are long and narrow, their inner border is nearly straight, and their outer border is concave.

The occipital surface of the skull is nearly plane vertically, slightly convex transversely above the foramen magnum, and external to this slightly hollow.

The mandibular symphysis, with about 4" of both rami behind it, and nearly as much in front of it, remains attached to the under surface of the snout. The symphysis begins opposite the interspace between the 7th and 8th maxillary teeth, counted from behind. The splenial bones are included in it.

The teeth are subequal, conical, sharply pointed; when fully extruded slightly retrocurved, unequally compressed laterally, the outer surface more convex than the inner one, the compression increasing towards the apex of the crown, and forming here a back and front smooth edge. The hinder maxillary teeth are shorter, they taper less, and are more compressed than those in front. The fang is large, and it has a capacious, open pulp-cavity. The crown has a thick coat of enamel, which on the outer side of the tooth is marked by low longitudinal striæ, widely set near the base, and closer and finer near the apex; on the inner side it is extremely finely striated or, rather, wrinkled.

A label affixed to the fossil before it came under my hands, and when it was still nearly hidden in the matrix, showed that it had been referred to *Melitosaurus champsoides*, Owen. I have compared it with the type specimen of this species in the British Museum*, and find that it agrees with this in the long mandibular symphysis, in the narrowness of the ascending processes of the præmaxillæ, and in the

* The terminal 13 inches of the maxillæ and mandible of a large crocodilian.

manner of union of these with the nasal bones; but the teeth differ: those of *Melitosaurus champsoides* (making allowance for the much larger size of the individual) are stouter, much less sharply pointed, and less tapering; their enamel marking has also a different character, being much more finely wrinkled than in this Gozo crocodile.

In its elongated form and its regularly tapering outline (not suddenly contracted in front of the orbits as in the Indian gavial), in the commencement of the nasal bones opposite the front borders of the orbits, in the slenderness of these bones, and in their insensible junction with the ascending processes of the præmaxillæ the skull of the Gozo crocodile resembles that of the existing *Rhynchosuchus Schlegelii*; but it differs from it in several particulars, amongst which are the crenation of the alveolar border of the distal halves of the snout, the more oblong shape of the syncipital area, the larger size and different shape of the supratemporal fossæ, the raised margin of the orbit, and the more hollow interorbital space. I propose for this Gozo crocodile the specific name of *gaudensis*.

Dimensions.

	in.
From the posterior border of the syncipital area to the anterior	3.2
From ditto to the anterior border of the parietal bone	2.1
From ditto to the anterior limit of the frontal bone	6.7
From ditto to the posterior limit of the prefrontal bone.....	4.0
From ditto to the anterior limit of the prefrontal bone	6.1
From ditto to the anterior limit of the lachrymal bone	7.1
From ditto to the anterior limit of the nasal bones	14.6
From ditto to the posterior limit of ditto.....	13.5
From ditto to the last maxillary tooth	4.6
Breadth of syncipital area, its posterior border	5.4
Ditto, its anterior border.....	5.0
Supratemporal foramina, axial diameter	1.7
Ditto, transverse diameter	1.8
Interforaminal parietal septum, minimum width under	0.2
Orbits, distance between their inner borders.....	1.0
Axial diameter of	2.3
Transverse diameter of	1.5
Breadth of skull at hindermost tooth.....	5.2
Ditto at 10th tooth from behind	2.6
Ditto in front of 14th tooth	1.6
Length of 6th maxillary tooth	1.6
Antero-posterior diameter of 10th maxillary tooth at the junction of the crown and fang.....	0.4

DISCUSSION.

Dr. DUNCAN suggested that the Ichthyosaurian fossil might be derivative from some secondary rock. He mentioned that Dr. Leith Adams had once sent him an *Aspidiscus cristatus* from the Hippurite Limestone, which was stated to have come from Malta. To account for this, he suggested that the Miocene of Malta might have been supported on beds of Cretaceous age, and fossils from that source might have become imbedded in the coral reefs of the later date.

Capt. SPRATT expressed a doubt of the fossil having really come from Gozo. He did not recognize the cretaceous-looking matrix as belonging to any of the rocks of that island, with all of which he was acquainted. The nearest approach to that kind of rock was to be found in the lowest of the deposits near Cairo, which were probably Eocene.

Prof. T. RUPERT JONES suggested an examination of the Foraminifera in the matrix, with the view of determining its Secondary or Tertiary age. He mentioned the occurrence of rolled nodules of older rocks in beds of later age at Gozo.

Mr. BUSK stated that a stone of similar character to the matrix occurred in Malta, if not in Gozo, but probably in both.

Mr. HULKE, in reply, observed that he had in his paper intentionally left the stratigraphical part of the question untouched, and confined himself to the palæontological aspect of the remains.
