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ORIGINAL ARTICLES.

I.—ON A NEW SPECIMEN OF THE CRETACEOUS FISH *PORTEUS*
MOLOSSUS, COPE.

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(PLATE XVIII.)

SEVERAL nearly complete skeletons of the primitive teleostean fish *Portheus molossus* are now known from the Chalk of Kansas¹; but none is better preserved than a remarkable trunk, nearly 12 feet in total length, lately obtained for the British Museum by Mr. Charles H. Sternberg. The specimen is shown, of about $\frac{1}{2}\frac{1}{4}$ of the natural size, in the accompanying Plate XVIII, where it is seen mounted with the head of another fish of the same proportions. All the bones remain embedded in the matrix exactly as they were found, and there is no restoration beyond slight repairs.

The vertebral centra in the fossil form a continuous undisturbed chain from the pectoral arch backwards, only damaged a little by crushing. The total number of dorsal vertebræ is about fifty-five, while that of the caudals is thirty-three. From the pectoral arch backwards to the caudal fin all the centra are impressed on the side by two deep longitudinal depressions, of which the upper is the larger. In a few of the anterior centra the lower lateral depression is especially small, and restricted to the hinder half. The lower face (well seen in some of the distorted anterior centra) is flattened between the two longitudinally extended pits in which the bases of the hæmal arches are fixed. The gently arched ribs are long and slender, all reaching the ventral border of the fish. Each rib is impressed by a slight longitudinal groove, and its upper end is somewhat expanded where it fits loosely in the socket of a small parapophysis. This parapophysis, which does not appear to be firmly fixed in the pit of the centrum, is much more expanded in front of the socket than behind, and is in direct contact with the adjacent parapophyses. The arrangement is well shown in a drawing by O. P. Hay,² in which it was originally mistaken for a neural arch. In the anterior half of the abdominal region in the fossil the neural arches are accidentally removed, but further back several are in place,

¹ A. R. Crook, *Palæontographica*, vol. xxxix, p. 109, fig. 1, 1892; H. F. Osborn, *Bull. Amer. Mus. Nat. Hist.*, vol. xx, pp. 377–81, pl. x, 1904; C. E. McClung, *Kansas Univ. Science Bull.*, vol. iv, p. 243, pl. xii, 1908.

² O. P. Hay, *Zool. Bull.*, vol. ii, p. 47, fig. 12, 1898; corrected in *Bull. Amer. Mus. Nat. Hist.*, vol. xix, p. 56, 1903.

Porthetus molossus, Cope. Chalk: Kansas. Reduced to $\frac{1}{24}$ nat. size; original nearly 14 feet in length. Exhibited in the British Museum (Nat. Hist.).

The black line under the specimen represents 6 feet in length.

and there are a few scattered examples. Like the hæmals, they are loosely inserted in pits which extend nearly the whole length of the centra. As shown also by Hay,¹ each arch consists of a pair of thin laminæ, right and left, loosely apposed in the median plane, and surmounted by a long and slender neural spine, behind which a smaller and shorter rod-like process also rises upwards. Each arch slightly overlaps or clasps that next following, but without so well-defined a facet as that represented by Hay. Above some of the neural arches there are remains of the curved free fin-supports. In the caudal region both the neural and hæmal arches are firmly fixed in the pits of the vertebral centra as far as the origin of the caudal fin. Though longitudinally extended at their base of insertion, they do not overlap or interlock, but the tail is strengthened by the sharp backward curvature and inclination of all the neural and hæmal spines. The base of each neural arch is a little triangular expansion, strengthened by a vertical lateral ridge, but not bearing any posterior process, and not in contact with the next arch of the series. The base of each hæmal arch is shaped almost like the parapophysis in the abdominal region, but the hæmal spine is directly continuous with it.² The hæmal arches within the caudal fin are much thickened, in close contact, and articulate with the corresponding centra in open sutures.

There are no intermuscular bones in the caudal region or below the vertebral column in the abdominal region; but some may perhaps occur among the confused remains in the dorsal part of the abdominal region.

The left clavicle is seen from within, and exhibits the characteristic long and slender precoracoid arch crushed upon its inner face. Below it the base of the left pectoral fin appears, showing the bases of the four stout anterior rays in their natural position. The same rays of the right pectoral fin are well displayed lying over the ribs, the longest equalling in length a chain of about eighteen vertebrae. All these rays are gently arched bony rods, flattened on the outer face and marked only with a few longitudinal striations, evidently due to their structural fibres. The first, second, and fourth rays appear to be nearly complete to their distal end, where they scarcely taper and lack all traces of transverse articulations. The first ray is the stoutest and largest, with a sharply though irregularly rounded anterior border; the second ray is at least half as wide as the first ray, and its slender distal end, split by crushing, is preserved in the fossil to a greater length than the latter; the third ray, though seen on the left, is restored on the right side, but it is clear that its distal end cannot have been much expanded; the fourth ray is less stout, and shorter than the others. Behind these rays in another specimen in the British Museum (No. P. 10611) the pectoral fin is completed by three or four very short rays, which expand distally into a finely divided and articulated portion.

The pelvic fins are preserved apparently in their natural position, arising beneath about the forty-eighth vertebra. They are less than

¹ O. P. Hay, Zool. Bull., vol. ii, p. 51, figs. 15, 16, 1898.

² See figures by O. P. Hay, Zool. Bull., vol. ii, p. 48, figs. 13, 14, 1898 (in which the hæmal arch is described as neural, and vice versa).

half as long as the pectoral fins—a proportion very different from that observed in the restored paired fins in the specimens at New York and Lawrence (Kansas). The pelvic bones, which are well shown, are firmly articulated in the middle line at their base, and correspond in shape with those originally ascribed to *Portheus* by Cope.¹ The first fin-ray is much stouter and larger than the others, but it expands a little towards its distal end, and must have been finely divided and articulated at its extremity. The whole fin, in fact, resembles that of another specimen in the British Museum (No. P. 6326) which has already been figured.²

Of the median fins, the dorsal and anal are only imperfectly preserved, but the remains suggest that these fins were arranged as in *Chirocentrites*³ and the living *Chirocentrus*, not as in the restorations at New York and Lawrence (Kansas). The anal fin clearly arises at the beginning of the caudal region, where both the fin-supports and the bases of the fin-rays are seen in nearly undisturbed series. It is uncertain, however, whether this fin extended as a low fringe backwards—it can only be noted that a few displaced short and broad fin-supports in the hinder part of the fossil may have belonged to such an extension. The dorsal fin is represented only by a few supports and imperfect rays at some distance behind the origin of the anal, and it seems probable that if it originally extended further forwards or backwards some traces would be exhibited.

The deeply forked and powerful caudal fin is already well known, and the new specimen confirms previous descriptions. There is clearly no sudden termination of the vertebral column with a urostyle as in *Chirocentrus*; but the five or six hindmost vertebræ form an upturned series, rapidly diminishing in size, as in the Elopines and other primitive teleostean fishes.

Remains of large and thin scales occur in various parts of both the abdominal and the caudal region, and their outer face often exhibits an irregular coarse tuberculation like that of the opercular bones. The rounded tubercles do not appear to be enamelled.

The new specimen of *Portheus* now described, while confirming previous descriptions in many respects, is thus of importance as showing for the first time the relative proportions of the paired fins and the probable true relationship of the dorsal and anal fins. It has already been pointed out that there are striking resemblances between *Portheus* and *Chirocentrites*, and the facts now published concerning the fins make it doubtful whether the species belonging to these two categories can any longer be referred to two distinct genera.

EXPLANATION OF PLATE XVIII.

Portheus molossus, Cope; nearly complete trunk, with the head of another individual; about $\frac{3}{4}$ nat. size. Obtained by Mr. Charles H. Sternberg from the Niobrara Chalk of Kansas, U.S.A. (Brit. Mus. No. P. 11125.)

¹ E. D. Cope, *Vert. Cret. Form.* (Rep. U.S. Geol. Surv. Territ., vol. ii, 1875), p. 192, fig. 9.

² A. S. Woodward, *Foss. Fishes English Chalk* (Mon. Pal. Soc., 1907), p. 101, fig. 28.

³ J. J. Heckel, *Denkschr. k. Akad. Wiss. Wien, math.-nat. Cl.*, vol. i (1850), p. 203. See also A. S. Woodward, *Foss. Fishes English Chalk*, p. 99, fig. 25.