

IV. JURASSIC SAURIAN REMAINS INGESTED WITHIN FISH.

BY C. R. EASTMAN.¹

(Plates X-XI.)

Paleontology affords numberless instances where the nature of the food-supply of various lower and higher vertebrates can be positively determined by the actual stomach-contents which have been preserved within the abdominal cavity of the creatures concerned. These instances are sometimes of special value in confirming *a priori* conclusions respecting the diet of fossil vertebrates based upon the general character of their dentition. Other cases may attract interest on account of peculiar conditions or associations, which are either to be directly observed, or suggest themselves by inference. Mention should be made, too, of the considerable literature which has grown up within recent years concerning coprolitic matter and so-called "gastroliths," or stomach-stones.

A few of the above-mentioned occurrences are deserving of particular notice, on account of their possessing special points of interest, and because they afford a sort of standard for estimating the importance of a newly discovered case of fossilization about to be described in the present article.

Among mammals, the most familiar instances of the preservation of undigested food in the alimentary tract are furnished by the mammoth and mastodon. A dozen years or so ago much discussion was aroused concerning the possible survival into modern times and domestication by man of the so-called *Neomylodon listai* of Ameghino, or *Grypotherium domesticum* of Roth. Concerning the antiquity of the remains that have been described under these names, the last word would seem to have been spoken by Dr. A. S. Woodward in

¹ An abstract of this article was presented at the annual meeting of the Paleontological Society, held at Washington, D. C., December 28, 1911.—Editor.

² On a portion of a mammalian skin, named *Neomylodon listai*. *Proc. Zool. Soc.*, London, 1899, p. 154. Exhibition of newly discovered remains of *Neomylodon* from Patagonia. Rept. 69th Meet. Brit. Assoc. Adv. Sci., Dover, p. 783.

articles published jointly with Dr. F. P. Moreno.² The idea that some of these creatures found in caverns of Patagonia were stall-fed, being kept in captivity by aboriginal inhabitants, received credence through the finding of vegetable fibers resembling chopped hay in association with their mummified remains.

Writing in 1900, Nordenskjöld,³ after an examination of the dung of one of these sloths, announced the following conclusion: "Le contenu des excréments montre que cet animal se nourrissait d'herbes et pas de feuilles et qu'il mâchait et digérait mal sa nourriture." That the author just quoted does not err on the side of rashness may be judged from the following non-committal remark: "Quant à la question de savoir si le *Glossotherium* a été contemporain de l'homme, je n'ose pas encore répondre définitivement."

Among reptiles, the most numerous and best authenticated cases where the nature of the food-supply is determinable, either from ingested prey, or from hard parts, such as scales, teeth, etc., preserved within coprolites,⁴ occur within the order Ichthyosauria. The question as to whether all so-called "embryoes" included within the abdominal cavity of *Ichthyosaurus* are really foetal, or are not in part at least young reptiles that have been swallowed, has been recently discussed by Branca.⁵ A similar question in regard to the supposed embryo contained within the body of the type specimen of *Compsognathus* was raised not long since by Dr. Franz Nopsca.⁶ If Marsh's original interpretation of this interesting specimen be set aside, no positive evidence remains that Dinosaurs were viviparous.

Turning our attention to the class of fishes, instances are known where distinctly recognizable skeletons of bony fishes are preserved within the intestinal tract of fossil sharks. A striking example is that of *Carcharias* (*Scoliodon*) in the Bologna Museum. The wonder-

² Nordenskjöld, E., La Grotte du *Glossotherium* (*Neomylodon*) en Patagonie. *Bull. Soc. Géol. France*, 1900 [3], vol. 28, pp. 29-32. See also Hatcher, J. B., The Mysterious Mammal of Patagonia. *Science*, N. S., 1899, vol. 10, pp. 814-815.

⁴ For an exhaustive investigation of reptilian coprolitic matter from the Wealden of Belgium one may refer to a contribution by M. Bertrand, entitled "*Les coprolithes de Bernissart*." *Mém. Musée Roy. Belg. d'Hist. Nat.*, Vol. I, 1903.

⁵ Branca, W. Two papers published 1907-8 in *Abh. Akad. Wiss. Berlin, Phys. Abh.* No. 3, and *Sitzber. Akad. Wiss. Berlin*, pp. 392-6. The latter is entitled "*Nachtrag zur Embryonenfrage bei Ichthyosaurus*."

⁶ *Neues Jahrb. f. Min.*, 1903, Supplement, vol. 16, pp. 476-494. See also the following: F. v. Huene, "*Der vermuthliche Hautpanzer des Compsognathus longipes Wagn.*" *Ibid.*, 1901, vol. 1, pp. 157-160.

ful preservation of muscle fibers and other soft parts in the Upper Devonian *Cladoselache* encourages the expectation that further light may be forthcoming respecting the food-habits of that primeval shark.

Very peculiar conditions have been observed by Campbell Brown in the case of a Liassic shark, *Hybodus*, which had apparently encountered a swarm of immature belemnites and proceeded to make a meal of them. In this connection the author states: "Das gefräßige Thier war augenscheinlich in einen dichten Schwarm kleinerer Belemniten gerathen und hatte sich mit denselben vollgestopft. Bei der Verdauung traten dann Beschwerden ein. Belemnitenrostra sind nicht gerade besonders geeignet, die Spiralklappe im Colon eines kleinen Haifisches zu passiren, besonders wenn mehrere Hundert zu gleicher Zeit im Magen liegen. Der Tod des Haies kann nicht überraschen!"⁷

Among teleostean fishes, it is not uncommon to find specimens showing the particular nature of their stomach contents. The predaceous ganoid *Caturus*, from the Upper Jura of Solenhofen, very often contains recognizable portions of *Leptolepis* within the abdominal cavity. In the Paris Museum of Natural History is preserved a slab containing two individuals of *Blochius*, from the Eocene of Monte Bolca, the larger one having apparently partially swallowed the other. Agassiz, however, states that the appearances are deceptive, and that the two individuals may have chanced to be comesuperimposed one upon the other in a rather striking attitude. Nevertheless he remarks:⁸ "Je ne prétend pas nier d'une manière absolue la possibilité d'une pareille coïncidence."

We have now to consider the very singular, if not indeed unique conditions presented by two specimens of Jurassic fishes belonging to the Bayet collection of the Carnegie Museum. The first of these which invites attention is a form, referable to the genus *Belonostomus* (Plate X), from the Lithographic Stone (Lower Kimmeridgian) of Cerin, in southeastern France. The species, judging from the slender proportions of the head, in which the snout is greatly elongated, is probably to be identified as *B. tenuirostris* Agassiz, but it is evidently an immature example, the total length of which probably did not exceed 16 cm. The caudal region is lacking, but the head and anterior part of the trunk are very clearly shown. The scales, cranial and

⁷ Brown, C. "Ueber das Genus *Hybodus* und seine systematische Stellung." Palaeontogr., 1900, vol. 46, p. 163.

⁸ Agassiz, L. "Poissons Fossiles," 1844, vol. 2, pt. 2, p. 257.

facial bones, and vertebral centra would seem to be preserved partly in the form of an impression, partly as structures in which the external surface has been eroded away, or removed by chemical action.

The fish itself would not be remarkable, except for the circumstance that it happens to contain the skeletal remains of a small Rhynchocephalian reptile, probably *Homæosaurus*, within the abdominal cavity. The prey had been gulped down head first, and may have caused the death of the fish, as the digestive process had not advanced far enough to dismember the limbs nor to disturb the natural position of parts beyond a slight lateral compression of the trunk. The surface characters of the head are shown with tolerable distinctness, a depression is indicated which may be the pineal foramen, and a few slender teeth are exposed on one side anteriorly. The vertebral column of the reptile is preserved for some distance beyond the sacral region, and some of the anterior limb-bones are clearly visible. It is hoped that the accompanying plate (Pl. X) may aid in rendering the above-described conditions more intelligible to the reader.

The second specimen referred to, which is worthy of notice in this connection, likewise forms part of the Bayet collection, and was derived from the same horizon and locality as the first. It is a very complete teleostean skeleton, having a total length of 19 cm., and is preserved in the form of remarkably sharp counterpart impressions in a slab of lithographic limestone. The systematic position of the fish represented is very close to that of the type species of the so-called genus *Attakeopsis*, established by Victor Thiollière in 1858, but regarded by the late Karl von Zittel, Dr. A. Smith Woodward, and others as identical with the earlier described *Oeonoscopus* of O. G. Costa (Ittiol. Foss. Italia, 1853, p. 2). The example under discussion appears, however, to present more than individual differences from the solitary known species of *Oeonoscopus* occurring in the Cerin lithographic limestone, and is accordingly regarded as representing a distinct species.

The distinguishing characters of the new form, which may be designated as *O. elongatus*, are included in the following brief diagnosis:

***Oeonoscopus elongatus*, sp. nov.**

(Plate XI.)

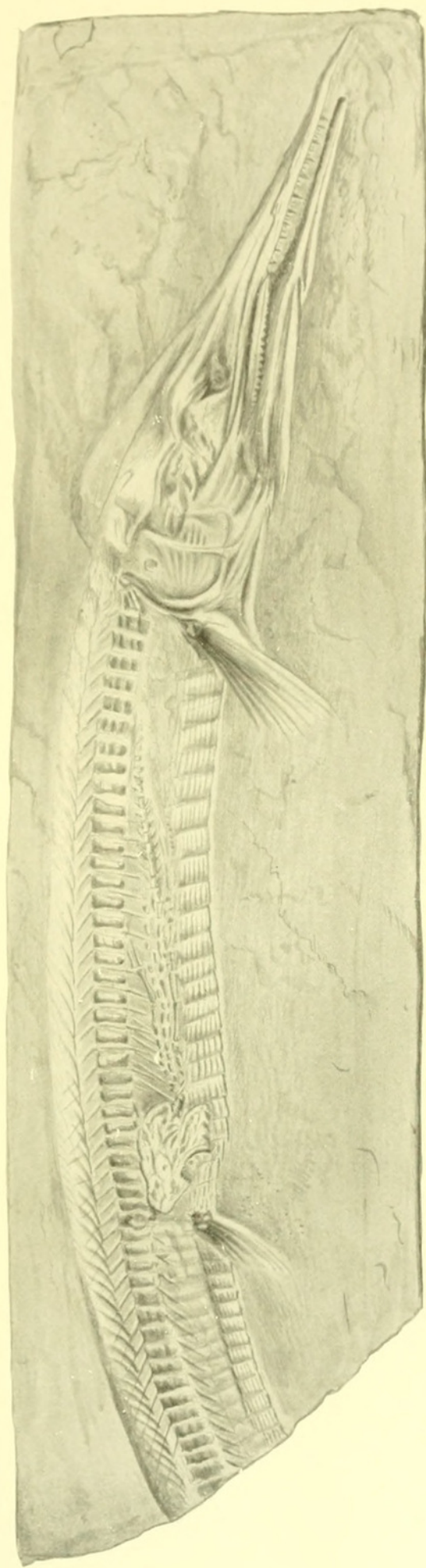
Type.—Nearly complete fish in counterpart: Carnegie Museum Cat. Nos. 4079 + 4079a.

A small species, attaining a total length of about 20 cm., and distinguished from all others belonging to the same genus by its slender and elongated form of body, and by the more anterior position of the dorsal fin, which arises opposite the pelvic pair, and does not extend back of a point midway between them and the insertion of the anal. Length of the head with opercular apparatus exceeding the maximum depth of the trunk, and contained about five times in the total length of the fish. Vertebrae about fifty in number, with strong neural and hæmal spines. A single large ridge-scale at the upper and lower borders of the caudal pedicle. Teeth small and conical. All fins relatively small, caudal lobes not much expanded. Scales indistinctly shown.

One of the halves of the counterpart in which this specimen is contained is illustrated in the accompanying plate, the original drawing having been made by Mr. Sidney Prentice. Within the abdominal cavity, or more particularly, within that part of it lying between the paired fins, is to be seen a tolerably distinct impression of a small reptile resembling a Lacertilian, the precise nature of which is indeterminate, but very probably is akin to *Homæosaurus*. Only the head and anterior position of the vertebral column are clearly recognizable, and it is noteworthy that the creature appears to have been swallowed tail foremost, whereas in the first described specimen the position of parts is reversed. The size of the ingested remains is practically the same in the case of both specimens.

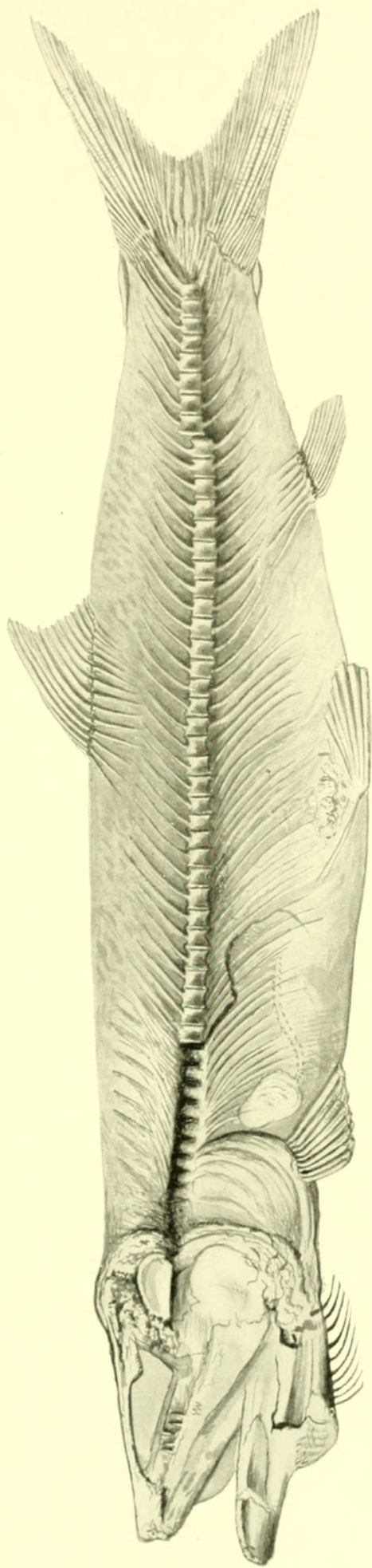
So far as the present writer is aware, these two are the only instances afforded by paleontology where fossil reptiles happen to have become preserved within the abdominal cavities of fish. These occurrences are all the more remarkable, when it is remembered that the contained reptiles were terrestrial, and their ichthyic foes marine in habitat. This apparent anomaly may perhaps be accounted for by supposing the primitive lizards in question to have inhabited the shores of coral islands in the late Jurassic sea, which covered central Europe at the time. One may suppose the prey to have been captured in proximity to land, or possibly the terrestrial creatures were carried out to sea by floating vegetation to which they had clung, and were seized at a distance from land. The latter hypothesis finds perhaps a certain degree of plausibility from the abundance of plant remains which are known to occur at the Cerin locality.

The two specimens which are described and portrayed in the present



Belonostomus tenuirostris Agassiz juv. $\times \frac{5}{4}$.





Oronoscopus elongatus, sp. nov. (Type). $\times \frac{1}{1}$.

article form part of a representative and extremely important collection of fossil remains, both vertebrate and invertebrate, from the Lithographic Stone (Lower Kimmeridgian) of southeastern France and Bavaria. The whole of this superb collection was purchased some eight years ago from Baron Ernst de Bayet of Brussels by Mr. Andrew Carnegie, and generously presented by him to the institution founded by him in Pittsburgh.

EXPLANATION OF PLATES.

PLATE X.

Belonostomus tenuirostris Agassiz juv. Lithographic Stone; Cerin (Ain), France. Head and anterior portion of the trunk of an immature individual apparently belonging to this species, within the abdominal cavity of which is contained the skeleton of a small Rhynchocephalian reptile, probably *Homæosaurus*. The prey has been swallowed by the fish headforemost. The head, anterior limbs, and greater part of the vertebral column of the contained reptile are very clearly shown. Car. Mus. Cat. No. 4080. $\times \frac{1}{1}$.

PLATE XI.

Oeonoscopus elongatus, sp. nov. Lithographic Stone; Cerin (Ain), France. Holotype, preserved in counterpart, showing an imperfectly preserved Rhynchocephalian skeleton within the abdominal cavity. Car. Mus. Cat. No. 4079. $\times \frac{5}{7}$.



Eastman, Charles Rochester. 1911. "Jurassic saurian remains ingested within fish." *Annals of the Carnegie Museum* 8(1), 182–187.

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