THE CARBONIFEROUS FISH-FAUNA OF MAZON CREEK, ILLINOIS.

OF the thousands of fossiliferous ironstone nodules of Coal Measure age, occurring at Mazon Creek, near Morris, in Grundy county, Illinois, only a small percentage afford indications of vertebrate remains, and these consist principally of detached fish-scales. Occasionally, however, complete individuals of fossil fishes, and still more rarely, amphibian skeletons have been brought to light, but all told the number of even tolerably perfect specimens preserved in different museums is very insignificant. Probably the two finest series of Mazon Creek nodules ever brought together are the Lacoe collection, belonging to the United States National Museum in Washington, and the Strong collection, purchased by the late Professor Marsh for the Peabody Museum, at Yale College. Shortly before the decease of Professor Marsh, nearly all of the fossil fishes in the Strong collection were placed by that gentleman in the hands of the writer for study and description; and more recently some further material has been loaned for the same purpose by Professor C. E. Beecher, to whom grateful acknowledgments are due.

Mazon Creek fish-scales have been exhaustively studied by E. D. Cope[1] and O. P. Hay,[2] and the latter has also described a nearly perfect example of a Palæoniscid fish, named by him *Elonichthys hypsilepis*. A few other Palæoniscids and Platysomids have been described by Cope[3] and by Newberry and Worthen;[4] and two Acanthodian species have recently been made known by the present writer.[5] These citations complete the literature references on Mazon Creek fishes. In the following paragraphs

[1] *Proc. Amer. Phil. Soc.*, Vol. XXXVI (1897), pp. 71–82.

[2] *Ibid.*, Vol. XXXIX (1900), pp. 96–120.

[3] *Proc. U. S. Nat. Museum*, Vol. XIV (1891), p. 462.

[4] *Pal. Illinois*, Vol. II (1866), and Vol. IV (1870).

[5] *Bull. Mus. Comp. Zool.*, Vol. XXXIX (1902), pp. 93, 94.

brief descriptions are given of two species of *Acanthodes*, and one each of *Cœlacanthus* and *Elonichthys*, with a list of the known vertebrate fauna occurring at this locality.

GENUS ACANTHODES, AGASSIZ.

Representatives of the Acanthodii are extremely rare in the Palæozoic rocks of North America. If we neglect the detached spines of *Machæracanthus*, and the indeterminable mass of scales described by J. M. Clarke as *Acanthodes pristis*,[1] American Acanthodians are limited to but three species of *Acanthodes* and one of *Mesacanthus*.

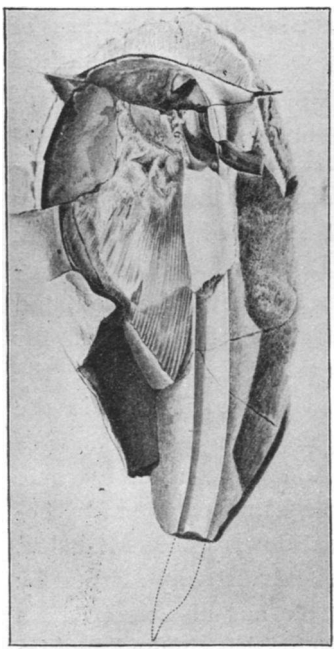

FIG. 1.—*Acanthodes marshi* Eastm. Coal-measures, Mazon Creek, Ill. Pectoral fin with associated actiontrichia and fin-spine. $\times\frac{3}{4}$.

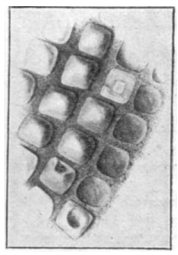

FIG. 1*a*.—Shagreen granules of *A. marshi*. $\times\frac{4}{1}$.

Of these *Acanthodesconcinnus* Whiteaves and *Mesacanthus affinis* (Whiteaves) occur in the Upper Devonian of Scaumenac Bay, Canada, and the recently described *Acanthodes marshi* and *A beecheri* are from the Mazon Creek locality, in Illinois.

Acanthodes marshi Eastman.

This species is remarkable for being one of the largest, as, on the other hand, *A. beecheri* is one of the smallest known *Acanthodians*. In *A. marshi*, not only are the shagreen granules much coarser than those of *A. bronni* and *A. wardi*, which are the largest of European species, but the fin-spines are considerably longer and stouter, averaging about 9^{cm} long, and from .5 to .8^{cm}

[1] *Bull. U. S. Geol. Surv.*, No. 16 (1885), p. 42.

wide. In Fig. 1 is shown a very interesting pectoral fin preserved in counterpart, and retaining the actinotrichia in natural association with the spine. The fibrous rays are quite long and numerous as compared with those of other species, and extend well up toward the point of insertion of the spine. There is no trace here, unfortunately, of a basal cartilage abutting against the proximal end of the spine, nor does this specimen display any of the dermal granules with which the fin membrane was stiffened, although such are exhibited by a smaller specimen belonging to the Yale Museum. The scales of *A. marshi* are in

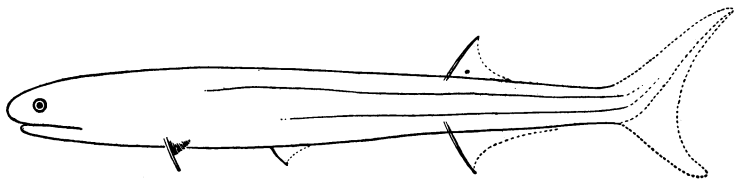

FIG. 2.—*Acanthodes beecheri* Eastm. Coal-measures, Mazon Creek, Ill. Restoration showing outline of body and position of fins. $\times\frac{2}{1}$.

the form of shagreen granules, averaging about one square millimeter in size, smooth and polished externally, and gently convex or rounded on both the outer and attached surfaces. (Fig. 1*a*). The internal structure consists of fine layers of dentine arranged in quadrate fashion about a small central pulp-cavity. The best account of the microscopic structure of Acanthodian and Thelodus-like scales is that given by Rohon about nine years ago.[1]

Acanthodes beecheri Eastman.

Description. — A very small species, attaining an extreme length of about 5.5 cm. Body elongated and slender, the maximum depth being contained about nine times in the total length. Pectoral spines not much stouter or longer than the others; pelvic fins small, slightly nearer the pectorals than the anal; anal fin slightly larger than the dorsal, which is placed immediately behind. Length of dorsal and anal spines greater than maximum depth of trunk. Caudal lobe remarkably elongate. Scales extremely minute.

This species is represented by two nearly complete individuals preserved in counterpart and belonging to the Yale Museum,

[1] *Mem. Acad. Imp. Sci. St. Petersbram*, Vol. XLI (1893), No. 5, p. 22.

neither of which, however, exhibits the caudal region satisfactorily, nor are the heads well preserved. Only the dorsal and anal fin-spines are displayed by the larger specimen; but in the smaller all the fin-spines are preserved, although the dorsal is slightly displaced and the distal ends of the pectorals are wanting. The accompanying figure, based on both specimens, is of composite nature, and represents the general outline and proportions of the fins, the restored parts being indicated in dotted lines.

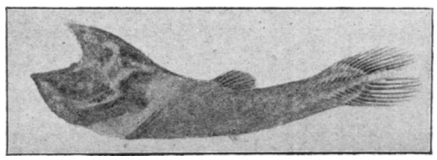

FIG.—3. *Cœlacanthus exiguus*, sp. nov. Coal-measures, Mazon Creek, Ill. Complete individual, lacking posterior dorsal and anal fins. $\times\frac{8}{1}$.

GENUS CŒLACANTHUS, AGASSIZ.

J. S. Newberry records having received from Mazon Creek "a single specimen each of *Eurylepis* and *Cœlacanthus*, probably not distinct from those found at Linton, Ohio." No examples of the former genus have come under the writer's observation, but ornamented scales and head-plates referable to *Cœlacanthus* sometimes occur in Mazon Creek nodules, and very rarely there are found complete fishes of small size, evidently quite distinct from other described species. In most specimens the posterior dorsal, anal, and pectoral fins are lacking, and it seemed at first sight as if the second dorsal had become lost through specialization. One individual, however, shows it very distinctly, and the absence of this and the anal in the remaining examples is to be attributed to faulty preservation.

Cœlacanthus exiguus, sp. nov.

Description.—A small species, attaining a maximum length of about 4.5 cm. Trunk narrow and elongated, the head occupying about one-fourth of the total length. First dorsal consisting of relatively few stout rays, and situated slightly in advance of the pelvic pair; second dorsal midway between the first dorsal and principal caudal; the latter comprising nine stout rays above and below. [Scale-structure and ornamentation of head-bones not observed.]

This species is represented by ten specimens in the Yale, and one in the Harvard Museum, most of them being only about 3 cm long, and very deficient in preservation. They agree in having a narrow, gradually tapering body, which terminates in an equilobate caudal fin, with indications that the axis was prolonged into a supplementary caudal. The first dorsal and caudal, owing to their stronger attachment, are present in nearly all specimens, but the remaining fins have in most cases become destroyed. The first dorsal has usually seven or eight stout rays, and is situated near the middle of the trunk. Ten long, hollow rays are to be counted in the single specimen displaying the posterior dorsal, and nine above and below in the symmetrical caudal. The neural and hæmal spines are very long in the abdominal and caudal regions. The ossifications of the axial skeleton are continued nearly to the termination of the principal caudal. The squamation must have been exceedingly delicate, as no indications of scales are to be observed in any of the specimens, nor do any of them have the cranial elements satisfactorily preserved.

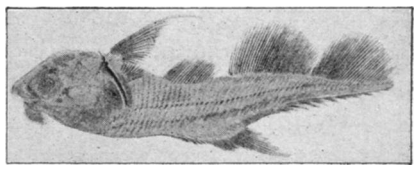

FIG. 4.—*Elonichthys perpennatus*, sp. nov. Coal-measures, Mazon Creek, Ill. Complete individual, the distal portions of median fins not fully shown. $\times\frac{2}{1}$.

GENUS ELONICHTHYS, GIEBEL.

Two closely related species are already known from Mazon Creek, *E. peltigerus* Newberry, and *E. hypsilepis* Hay. A study of the type-specimen of Newberry and Worthen's so-called "*Amblypterus macropterus*," now preserved in the Yale museum, leaves no doubt that this is only a mutilated individual of *E. peltigerus*. The type of the following new species is preserved in the Museum of Comparative Zoölogy.

Elonichthys perpennatus, sp. nov.

Description.—A very small species, having a total length of about 2.5 cm, of which the head occupies a little less than one-fourth. Fins extremely well

developed, the pectorals unusually long, and anal much extended; fulcra minute. Scales relatively small, obliquely striated; dorsal ridge-scales enlarged.

Only one individual is at present known of this interesting little form, which is shown in Fig. 4. The head is poorly preserved, and the distal extremities of nearly all the fins are either broken away or obscured by matrix. Nevertheless, sufficient characters remain for the recognition of this as a distinct species of *Elonichthys*, its chief peculiarity consisting in the remarkable development of all the fins. The pectorals are fully one-fourth the total length, and the anal has a more extended base-line than in any other species of the genus. The dorsal appears to have been high and acuminate, but is largely concealed by matrix. The caudal is also unfavorably exposed, and flexed out parallel with the main axis; but it is plain that the upper lobe was much prolonged, and covered with very large, striated ridge-scales. The dorsal-fin rays appear to have been widely jointed; the articulations of the other fins are not clearly recognizable. The dermal rays of the anal and lower lobe of the caudal are directly supported by the large hæmal spines, which are firmly united with their arches. The squamation is nowhere well preserved, but is best indicated in the anterior part of the trunk. The cranial structure does not admit of particular description. Appearances suggest that the specimen here described is an immature individual, differing however, from other known species.

LIST OF CARBONIFEROUS VERTEBRATES OCCURRING AT MAZON CREEK, ILLINOIS.

ELASMOBRANCHII.

1. *Pleuracanthus* (*Diplodus*) *compressus* Newb. (Occurs also in Ohio and Indiana.)
2. *Pleuracanthus* (*Diplodus*) *latus* Newb. (Occurs also in Ohio and Indiana.)
3. *Pleuracanthus* (*Diplodus*) *lucasi* Hay.
4. *Acanthodes beecheri* Eastm.
5. *Acanthodes marshi* Eastm.
6. *Campodus scitulus* (St. J. and W.).

DIPNOI.

7. *Ctenodus* sp. indes.
8. *Sagenodus foliatus* Cope.[1]
9. *Sagenodus lacovianus* Cope.[1]
10. *Sagenodus occidentalis* (Newb. and W.).[1] (Occurs also at Linton, Ohio.)
11. *Sagenodus quadratus* (Newb.).[1] (Occurs also at Linton, Ohio.)
12. *Sagenodus quincunciatus* Cope.[1]
13. *Sagenodus reticulatus* (Newb. and W.).[1]
14. *Sagenodus textilis* Hay.[1]

[1] Founded on scales.

CROSSOPTERYGII.

15. *Rhizodopsis* (?) *mazonius* Hay.[1]
16. *Cœlacanthus exiguus* nobis.
17. *Cœlacanthus robustus* Newb.[1] (Occurs also at Linton, Ohio.)

ACTINOPTERYGII.

18. *Eurylepis* sp. indet. (*fide* J. S. Newberry).
19. *Rhadinichthys gracilis* (Newb. and W.).
20. *Elonichthys hypsilepis* Hay.
21. *Elonichthys peltigerus* Newb.[2] (Occurs also at Linton, Ohio.)
22. *Elonichthys perpennatus* nobis.
23. *Platysomus circularis* Newb. and W.
24. *Platysomus lacovianus* Cope.
25. *Platysomus orbicularis* Newb. and W.

AMPHIBIA.

26. *Amphibamus grandiceps* Cope.

[1] Founded on scales.

[2] Including the so-called "*Amblypterus macropterus*" Newb. and Worthen.

C. R. EASTMAN.