

AMERICAN MUSEUM NOVITATES

Number 134

Published by
THE AMERICAN MUSEUM OF NATURAL HISTORY
New York City

Oct. 10, 1924

56.7,47L(117,78.3)

A FOSSIL GANOID FISH (*LEPIDOTUS* (?) *LACOTANUS*, NEW SPECIES) FROM THE LOWER CRETACEOUS OF SOUTH DAKOTA

BY WILLIAM K. GREGORY

The fossil fish described below was submitted for identification by Professor C. C. O'Harra, President of the South Dakota School of Mines at Rapid City, South Dakota. It was found in the Black Hills, on the James Lodge ranch, one-half mile north of Sturgis, South Dakota, in a loose detached slab supposed to be from the Lakota sandstone, which is of Lower Cretaceous age.¹ Since in some localities the Lakota occurs in association with the true Dakota sandstone (though separated from it by the Fuson shales), there might be some question of the exact age of the loose block in which the fossil was found; but Dr. J. W. Gidley, who has searched intensively for fossils in the Cretaceous formations in the Black Hills, informs me that no fishes have ever been found hitherto in the Dakota sandstone, while fish scales (referred to *Lepidosteus* but possibly belonging to the same genus as the specimen in question) do occur in the Lakota. At any rate, there can be little doubt of the Lower Cretaceous age of the fossil, which is of considerable interest because of the extreme paucity of the records of Jurassic and Lower Cretaceous fishes in North America.

DESCRIPTION

The specimen consists mostly of a sharp impression in quartzitic sandstone of the right side of the body. The mouth, dentition and branchial apparatus are wanting, and the thick, sharply rhombic scales are shown only on the inner surface; consequently, the attempt at systematic identification must be made without a knowledge either of the dentition or of the external appearance of the scales, which is unfortunate because the characteristics of the dentition and of the external surface of the scales vary in the different species of *Lepidotus*, to which genus the specimen is here provisionally referred. Nevertheless, the body does not appear to be crushed or distorted, the position of all the fins is

¹Darton, N. H. 1905. U. S. Geol. Survey, Prof. Paper 32, pp. 34, 35.

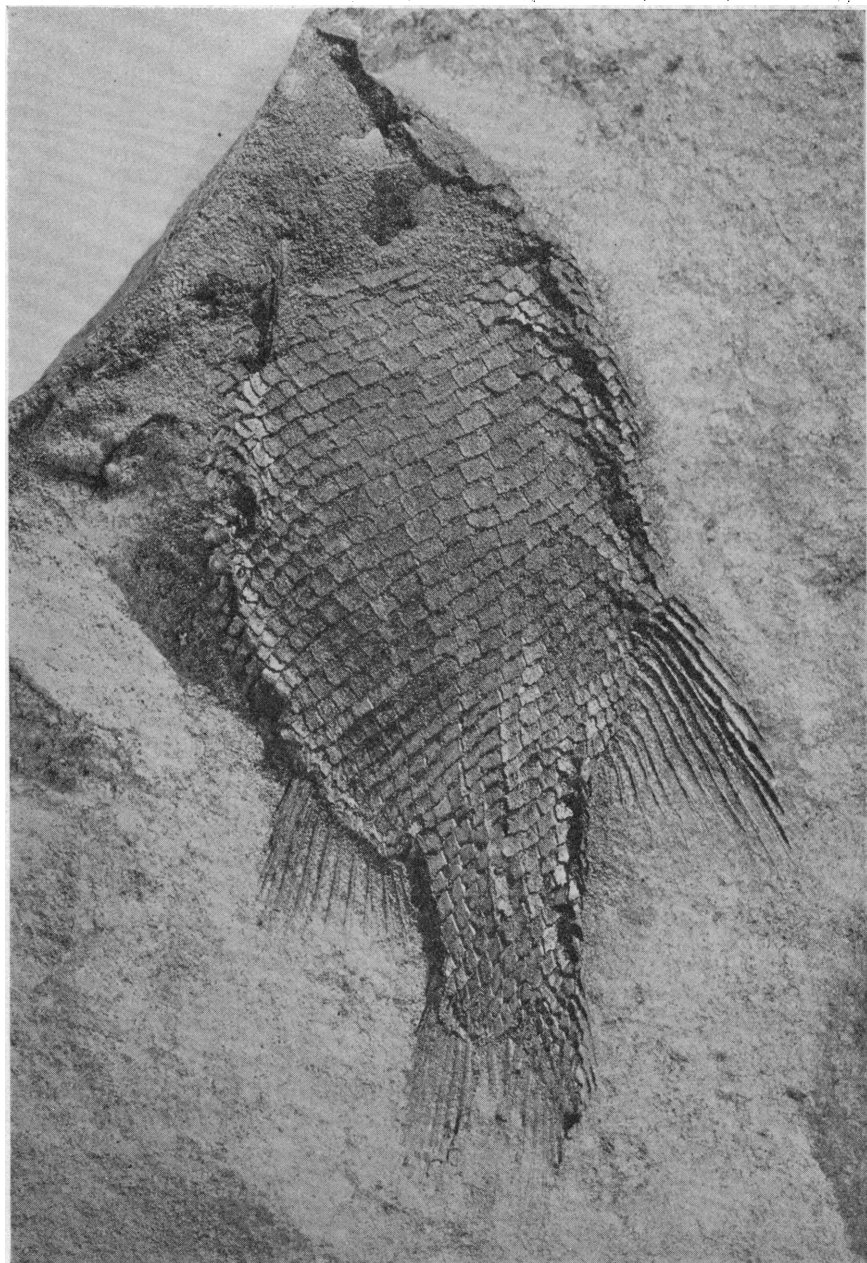


Fig. 1. *Lepidotus* (?) *lacotanus*. Type. Natural size. Photograph by Albert Thomson.

certain, the exact form of the scaly portion of the tail can be made out, and the dermal rays are well preserved on the dorsal, anal and greater part of the caudal fin. Moreover, the shape of the top of the head and the position and form of the upper part of the orbit are clearly shown.

That the specimen is an actinopterygian ganoid is clearly shown by the form of all the fins and by the presence of sharply rhombic, thick ganoid scales. Reference to the chondrosteian family of Catopteridæ is eliminated especially by the form of the fleshy part of the tail, which in the present specimen is not obliquely truncate but has the rounded lower lobe and obliquely produced upper lobe of the primitive holostean ganoids. The normal body form, the primitive scalation and fins, exclude it at once from the deep-bodied Pycnodontidæ. Conspicuous differences from the Macrosemiidæ are afforded by the dorsal fin, which is not elongate above the back but has its anterior border behind the pelvic fins. The evidently small head and short space between the orbit and the posterior border of the operculum are points of significant difference from the large-headed and large-mouthed family Eugnathidæ; the body also is fairly short and deep, whereas in the last-named family it is elongate. The form of the head, body and fins also eliminates the long-bodied Amiidæ and Pachycormidæ. From the Pholidophoridæ the specimen is distinguished especially by the deeper body and by the enlarged fulcra on the dorsal and anal fins.

Coming to the family Semionotidæ, to which there is every reason for referring the specimen, we may at once eliminate *Dapedius* and its cycloid-bodied allies, which have widely extended dorsal and anal fins. *Semionotus* itself comes much nearer and may be regarded as a Triassic structural ancestor of the South Dakota form, distinguished by the more primitive form of the body and fins. By far the closest resemblances observed are afforded by the species of *Lepidotus*,¹ which in Europe range from the Upper Triassic upward to the Upper Cretaceous, and in Brazil are represented by a single species from the Upper Cretaceous. The genus *Lepidotus* was reported by Leidy² and others from scales found in the Upper Cretaceous of western North America, but, with the possible exception of the scales from the Kiowa shales of Kansas, referred by Williston³ to *Lepidotus* sp., these remains have been referred by authors

¹Woodward, A. S. 1895. "Catalogue of the Fossil Fishes in the British Museum (Natural History)." Part 3, pp. 77-127; Traquair, R. H. 1911. "Les Poissons Wealdiens de Bernissart." Mem. Mus. roy. d'Hist. nat. de Belgique, VI, pp. 16-26, Pls. II, III; Priem, F. 1908. "Étude sur le Genre *Lepidotus*." Ann. de Paléont., III, pp. 1-19, Pls. I-II; Agassiz, L. 1835-45. "Recherches sur les Poissons fossiles," I, atlas.

²Leidy, J. 1860. "Extinct Vertebrata of the Judith River." Trans. Amer. Philos. Soc., XI, Pl. XI, figs. 20-23.

³Williston, S. W. 1900. Kansas Univ. Quar., IX, p. 29.

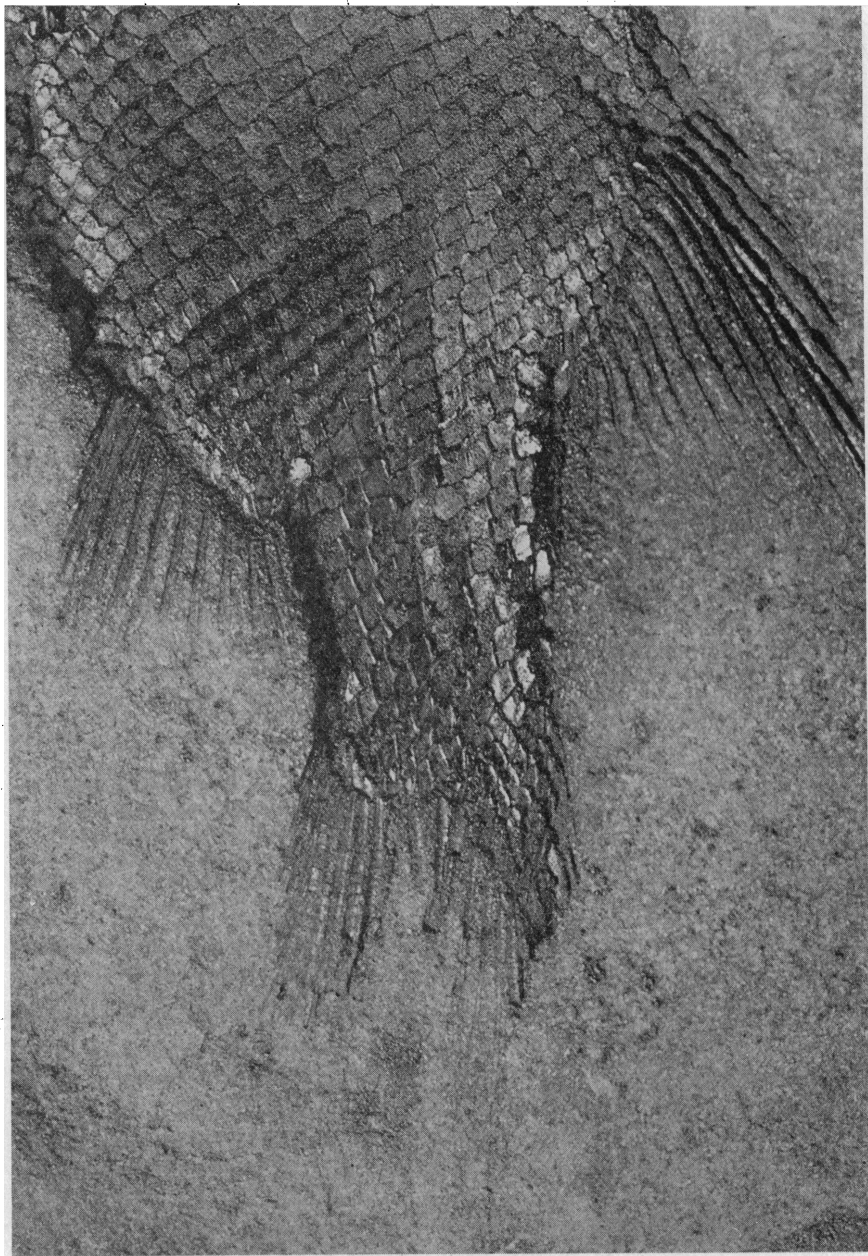


Fig. 2. *Lepidotus* (?) *lacotanus*. Enlarged view ($\times\frac{3}{2}$) of posterior half of type. Photograph by Albert Thomson.

to *Lepidosteus* and its immediate relatives.¹ So far as I can determine from the literature recorded in Dean's Bibliography² and other sources, the South Dakota fossil is the first American specimen of the *Lepidotus* group in which the general form of the body is shown. Dr. J. W. Gidley, who has had much experience in collecting in the Black Hills Cretaceous, concurs in this opinion.

So far as preserved, the specimen conforms with Smith Woodward's generic description³ of *Lepidotus*, with the important exception that the flank-scales, as seen on the medial surface, do not have their antero-superior and antero-inferior angles produced forward. Significant agreements with *Lepidotus* are shown, not only in the general form of body and position of the fins, but in the number and arrangement of the fin fulcra and articulated rays, as well as in other characters mentioned below.

The specimen is much smaller than the adult forms of all the numerous hitherto-described species of *Lepidotus*, but it is difficult to decide whether we are dealing with a small-sized species or with the young of a larger form. In the table the measurements of seven specimens, pertaining to several species of *Lepidotus*, are arranged in columns from left to right according to size. The large *Lepidotus mantelli* measured in the right-hand column is more than seven times as large as the South Dakota fossil, but the other specimens grade downward to one of *L. bernissartensis*, which is only about 1.6 times as large.

The Lakota form is identical with or closely approaches the European species in the following characters: (a) the number of scales in an oblique row, passing downward and backward from the anterior base of the dorsal fin; (b) the number of scales in an oblique row downward from the posterior ray of the dorsal; (c) the numbers of fulcra and soft rays, so far as preserved, in the dorsal, anal and caudal fins. Apart from its smaller size it differs from the larger individuals of the European species chiefly in: (a) the greater length of the caudal pedicle in comparison with the depth of the same; (b) the more forward position of the pelvic fins; (c) the lesser convexity of the back, in front of the dorsal fin. Some or all of these characters might possibly be consistent with the view that the South Dakota specimen represents merely the young of some species closely allied to those of Europe. In any event, the reduction or complete absence of the peg-and-socket articulations on the medial

¹Hay, O. P. 1902. "Bibliography and Catalogue of the Fossil Vertebrata of North America." U. S. Geol. Survey, Bull. No. 179, p. 377.

²Dean, Bashford. 1923. "Bibliography of Fishes," III, p. 623.

³Op. cit., p. 77.

Comparative measurements of <i>Lepidotus</i> (?) <i>lacotanus</i>	<i>Lepidotus</i> ? <i>lacotanus</i> type	<i>L. bernisartensis</i> ; half-grown, Traquair, 1911, Pl. II, Fig. 4	<i>L. minor</i> ; ? half-grown, Agassiz, tome 2, table 34	<i>L. bernisartensis</i> ; Traquair, 1911, Pl. II, Fig. 6	<i>L. minor</i> ; A. S. Woodward, 1915, Pl. VI	<i>L. bernisartensis</i> ; restoration, Traquair, 1911, Fig. 4	<i>L. mantelli</i> ; A. S. Woodward, 1915, Pl. VII, Fig. 7
(1) Body length, middle of orbit to middle of caudal pedicle	100 mm.	.....	175	....	200	416	744
(2) Length, middle of orbit to anterior base anal fin	70	112	123	....	153	313	561
(3) Length, middle of orbit to posterior base dorsal fin	76.4	120	130	....	150	313	580
(4) Body depth, below anterior base dorsal fin	47	70	71	....	100	208	270
(A) Body depth index $\frac{(4) \times 100}{(1)}$	47	.....	40	....	50	50	36?
(5) Depth, top occiput to anterior base pectoral fin	25	.....	51 est.	....	52	143	206
(B) Head depth index $\frac{(5) \times 100}{(1)}$	25	.....	29	....	26	34	27.6
(6) Middle of caudal pedicle, least depth	16	.....	22	34	40	67.6	90 est.
(7) Distance posterior base anal fin to post.-inferior border caudal pedicle	19.3	.....	.....	35.6	40.5	76.4	.....
(C) Index relative length caudal pedicle $\frac{(7) \times 100}{(6)}$	120	.....	.....	105	101	113	.....
(8) Distance between anterior border pectoral and pelvic fins	23	56	41 est.	....	57	148	.....
(D) Index relative distance between pectoral and pelvic fins $\frac{(8) \times 100}{(1)}$	23	.....	23	....	28	35	.....
(9) Distance anterior border pelvic to anterior border anal fin	31	33	45	....	55	100	.....

Comparative measurements of <i>Lepidotus</i> (?) <i>lacotanus</i>	<i>Lepidotus</i> ? <i>lacotanus</i> type	<i>L. bernisarlensis</i> ; <i>L. half-grown</i> , Traquair, 1911, Pl. II, Fig. 4	<i>L. minor</i> ; ? half- grown, Agassiz, tome 2, table 34	<i>L. bernisarlensis</i> ; <i>L. Traquair</i> , 1911, Pl. II, Fig. 6	<i>L. minor</i> ; A. S. Woodward, 1915, Pl. VI	<i>L. bernisarlensis</i> ; restoration, Traquair, 1911, Fig. 4	<i>L. mantelli</i> ; A. S. Woodward, 1915, Pl. VIII, Fig. 7
(E) Index, relative distance between pelvic and anal fins $\frac{(e) \times 100}{(1)}$	31	.....	26	....	27.5	24	.....
(10) Number of scales in oblique row from anterior base dorsal downward and backward	22	21 est.	20	....	22	21	21
(11) Distance along this row (10)	40	67	62	....	87	190	270
(12) Average depth of scales in oblique row from dor- sal base	1.8	3.2	3.1	....	4	9	13
(13) Number of scales, ob- lique row, anterior border pelvic, upward and for- ward	15	21 est.	.....	....	20	21	.....
(14) Distance along this row (13)	40	83	72	....	89	227	.....
(15) Average depth scales in (13)	2.6	4	.....	....	4.4	10.8	.....
(16) Number of scales in oblique row from poster- ior ray dorsal, downward and backward	13	.....	13	....	19	14	.....
(17) Distance along (16)	23	.....	34	....	62	101.6	.....
(18) Average depth scales in (16)	1.77	.....	2.3	....	3.2	7.2	.....
(19) Number of scales in antero-posterior series	35	.....	.....	....	38	41	.....
(20) Distance along lateral line of this series	83	.....	.....	....	162	335	.....
(21) Average antero-pos- terior length scales in lateral line series (19)	2.4	.....	.....	....	4.3	8.1	.....

aspect of the scales, as well as of the antero-dorsal and antero-ventral processes of the same, taken in conjunction with the wide separation in space and time from the known European forms, makes it probable that the specimen represents a distinct species, which may be named **Lepidotus** (?) **lacotanus**.

The sunfish-like form of the body rather suggests a fresh-water habitat of the fish, and there is much further evidence in support of this suggestion. According to Darton,¹ the Lakota formation has yielded fossil wood, a few stegosaur bones, some plants of Lower Cretaceous age, pine needles, cycads, an isopod crustacean (probably of the family *Ægidæ*), an *Estheria*, a scale of a gar pike (*Lepidosteus*) and a crocodile tooth—all fresh-water forms. Professor Knight of the University of Wyoming, who has kindly examined the specimen, tells me that the Dakota-Lakota in the Black Hills region are non-marine formations of fresh-water, æolian and partly terrestrial deposition.

The question whether *Lepidosteus* may not be derived directly from *Lepidotus*, a view for which Goodrich² and others have brought forward considerable evidence, is not much advanced by the discovery of the present specimen.

¹Darton, N. H. 1905. "Geology and Underground Water Resources of the Central Great Plains." U. S. Geol. Survey, Prof. Paper 32, pp. 34, 35.

²In Lankester's "Treatise on Zoology," 1909, Part 9, Cyclostomes and Fishes, pp. 342-344.