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NOMENCLATURAL NOTES ON THE COTTOID  
FISHES OF MICHIGAN

BY CARL L. HUBBS

The present paper deals with the five species of *Cottus*, or fresh water sculpins, which inhabit the streams and lakes of Michigan, and the adjacent Great Lakes. The conclusions arrived at in the course of the investigation necessitate the proposal of several changes in the classification and nomenclature of each species.

The writer wishes to thank Mr. T. L. Hankinson for the loan of specimens of *C. franklinii* and *C. ricei*.

GENUS *COTTUS* LINNAEUS

*Cottus* Linnaeus, Syst. Nat., Ed. 10, 1758, p. 264; Girard, Smiths. Contr. Knowl., 3, 1851, p. 33; Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 1941; Kendall, Bull. U. S. Fish Comm., 22, 1902 (1904), p. 362; Gill, Smiths. Misc. Coll., 52, 1908, p. 114.

Logotype,—*Cottus gobio* Linnaeus.

*Uranidea* DeKay, New York Fauna, Fishes, 1842, p. 61; Jordan and Gilbert, Bull. U. S. Nat. Mus., 16, 1883, p. 693; Jordan and Evermann, *ibid.*, 47, pt. 2, 1898, p. 1963.

Haplotype,—*Uranidea quiescens* DeKay (= *Cottus gracilis* Heckel).  
*Cottopsis* Girard, Proc. Boston Soc. Nat. Hist., 3, 1850, p. 303;  
 Smiths. Contr. Knowl., 3, 1851, p. 61.  
 Orthotype,—*Cottus asper* Richardson.  
*Potamocottus* Gill, Proc. Boston Soc. Nat. Hist., 8, 1861, p. 40.  
 Logotype,—*Cottus punctulatus* Gill.  
*Tauridea* Jordan and Rice, Man. Vert. E. U. S., Ed. 2, 1878, p. 255.  
 Orthotype,—*Cottopsis ricei* Nelson.

With the exception of *Cottus (Tauridea) ricei* of the Great Lakes, the numerous American species of *Cottus* apparently present no characters by which they may be satisfactorily grouped either generically or subgenerically. Two characters have been so used by authors in general: the development of palatine teeth, and the number of rays in the pelvic fin. These two features are correlated neither with each other nor with other characters, and both vary widely within obviously specific limits. Consequently it appears that these characters are not of the kind that prove of value in the distinction of natural groups.

The palatine teeth vary widely, not only specifically, but intraspecifically as well. In fact in several species these teeth may be either present or absent. For example in *Cottus asper* the palatine teeth, though usually well developed, are occasionally obsolete.<sup>1</sup> This species is the genotype of *Cottopsis* Girard, a group based solely on the development of palatine teeth.<sup>2</sup> In other cases the teeth on the palatines are occasionally developed in those species in which the teeth are normally lacking.

The number of pelvic fin rays varies in *Cottus gracilis*, as both Kendall and Gill have indicated (*l. c.*). Consequently both

<sup>1</sup> Snyder, Bull. U. S. Bur. Fish., 27, 1907 (1908), p. 184.

<sup>2</sup> *Potamocottus* Gill is also based upon species with palatine teeth. The earlier but inapplicable name *Pegedictis* Rafinesque (see Gill. *l. c.*), sometimes altered to the correct orthography *Pegedichthys*, has been used by some authors, including Jordan and Evermann (*l. c.*), to designate those species having no palatine teeth.

of these authors have united Uranidea with Cottus, as the only character known to distinguish these nominal genera is the number of pelvic rays (1, 4 in Cottus; 1, 3 in Uranidea). Snyder<sup>3</sup> has called attention to the occasional loss of the fourth soft pelvic ray of *Cottus punctulatus*. Similarly in *Cottus franklinii* (q. v.) the fourth ray, although normally lacking, is developed as a rare variation. This lack of constancy in the number of pelvic rays, involving an intraspecific variation which is identical with that used in distinguishing Uranidea from Cottus, indicates that this group is not a natural unit, the fourth soft pelvic ray having probably been independently lost in several cases. Confirming this supposition, the species having but three soft pelvic rays occur in three separated regions: from New England to Labrador and the Great Lakes, in the streams of northwestern United States, and in Japan.

KEY TO THE SPECIES OF COTTUS INHABITING THE  
WATERS OF MICHIGAN

- a.<sup>1</sup>—Preopercular spine short and little curved; head broadly rounded in outline; lateral line normally terminating below base of second dorsal.
  - b.<sup>1</sup>—Pelvic rays constantly 1, 4; palatine teeth normally present.
    - c.<sup>1</sup>—Distance from anus to tip of snout when measured backward extending to a point nearer base than end of caudal; body rather robust; dark bars definitely developed .....*meridionalis*.
    - c.<sup>2</sup>—Distance from anus to tip of snout when measured backward extending to a point nearer end than base of caudal; body rather slenderer; dark bars less distinctly developed .....*bairdii*.
  - b.<sup>2</sup>—Pelvic rays usually 1, 3; no palatine teeth; distance from anus to tip of snout, when measured backward, extending to a point nearer base than edge of caudal; dark bars of body not very distinctly developed.

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<sup>3</sup> Bull. U. S. Bur. Fish., 37, 1907 (1908), p. 101 and footnote.

- c.*<sup>1</sup>—First dorsal lower, only about half as high as second; pectoral longer, usually reaching beyond origin of anal; body usually more slender ..... *gracilis*.
- c.*<sup>2</sup>—First dorsal higher, about two-thirds or three-fourths as high as second; pectoral shorter, reaching not, or barely, to origin of anal; body usually less slender..... *franklinii*.
- a.*<sup>2</sup>—Preopercular spine long (as long as eye) and spirally curved; head subspatulate in outline when viewed from above; lateral line complete; no palatine teeth ..... *ricei*.

*Cottus meridionalis* Girard

*Cottus meridionalis* Girard, Proc. Am. Ass. Adv. Sci., 2, 1850, p. 410; Proc. Boston Soc. Nat. Hist., 3, 1850, p. 189; Smiths. Contr. Knowl., 3, 1851, p. 47, pl. 1, figs. 9, 10.

*Cottus alvordii* Girard, Smiths. Contr. Knowl., 3, 1851, p. 46, pl. 1, figs. 7, 8.

*Uranidea spilota* Cope, Proc. Acad. Nat. Sci. Phila., 1865, p. 82.

*Cottus spilotos* Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 1961.

*Cottus ictalops* Jordan and Evermann, *l. c.*, 1898, p. 1950 (in part); Fowler, Occ. Pap. Mus. Zool. Univ. Mich., No. 60, 1918, p. 49, pl. 13.

*Cottus richardsonii* Gill, Smiths. Misc. Coll., 52, 1908, p. 114 (in part).

This species is fairly common in the streams of southern Michigan.

As Dr. Gill (*l. c.*) has insisted, Rafinesque's name *ictalops* apparently is not applicable to this or any other cottoid species. *Pegedictis ictalops* Rafinesque was probably based upon one of the Etheostomatinae.

Study of material from various localities in the Mississippi Valley has shown that the characters used by Girard to differentiate *alvordii* from *meridionalis* are not constant, and hence not of taxonomic significance. The number of fin rays varies widely in this species, as illustrated by the following counts of anal rays in specimens in the Field Museum of Natural History.

Variation in the Number of Anal Rays in *Cottus meridionalis*

Locality	Anal rays					
	10	11	12	13	14	15
Illinois: Lockport and Joliet.....—	—	—	1	6	5	1
Indiana: Ft. Wayne .....—	—	1	2	5	2	—
Indiana: Cherry Creek .....—	—	8	18	1	—	—
Missouri: Several localities .....1	—	2	7	8	—	—
Arkansas: Batesville .....—	—	—	—	7	—	—
Alabama: Florence .....—	—	2	7	6	—	—

*Cottus bairdii* Girard

*Cottus richardsonii* Agassiz, Lake Superior, 1850, p. 300; Girard, Smiths Contr. Knowl., 3, 1851, p. 39, pl. 1, figs. 1, 2. (Not *Trachidermis richardsonii* Heckel, 1840, also a species of *Cottus*, synonymous with *Cottus asper* Richardson, 1836.)

*Cottus bairdii* Girard, Proc. Am. Ass. Adv. Sci., 2, 1850, p. 410; Proc. Boston Soc. Nat. Hist., 3, 1850, p. 189; Smiths. Contr. Knowl., 3, 1851, p. 44, pl. 1, figs. 5, 6.

*Cottus wilsonii* Girard, Smiths. Contr. Knowl., 3, 1851, p. 42, pl. 1, figs. 3, 4.

*Cottus ictalops* Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 1951 (in part; apparently not *Pegedictis ictalops* Rafinesque).

This species or subspecies seems to be a northern form of *Cottus meridionalis*. It occurs with (or near) *Cottus gracilis* or its representative, *C. franklinii*, in the upper Ohio basin; in Cayuga Lake, New York; in Lake Superior; and probably in intervening localities. Specimens in the Field Museum of Natural History, referable to *Cottus bairdii*, were taken in Cayuga Lake, New York, and at Sault Ste. Marie and Lizard Islands, Lake Superior. Like Girard's specimens, which he referred to *richardsonii*, *bairdii* and *wilsonii*, those at hand have the anus more posterior than in *Cottus meridionalis*.

One of the diagnostic features of *C. wilsonii* as defined by Girard, is the branching of the pectoral rays. In the series from Cayuga Lake, agreeing in most details with Girard's description and figure of *wilsonii*, one specimen has two

pectoral rays, another but one ray, branched on each side; the other five specimens of the same lot have all the rays simple. This occasional branching of the pectoral rays is not confined to this species however, for a large example of *Cottus meridionalis* from Joliet, Illinois, has some pectoral rays branched, three on one side, one on the other.

In comparing Lake Superior and Cayuga Lake material, certain average differences were noted. In the Lake Superior specimens the vertical of the greatest depth usually passes before rather than behind the origin of the first dorsal; the fins are a little shorter, the eye a little larger, and the caudal peduncle usually slenderer. These differences, however, are far from constant, and are probably to be regarded as racial rather than specific or even subspecific. Should the Lake Superior race be found on further study to be worthy of specific or subspecific denomination, it must receive a new name, as *Cottus richardsonii* Agassiz is preoccupied.

*Variation in Number of Anal Rays in Cottus bairdii*

Locality	Anal rays			
	11	12	13	14
Sault Ste. Marie and Lizard Islands, Lake Superior .....	—	5	15	4
Cayuga Lake, New York .....	1	2	4	—

*Cottus gracilis* Heckel

*Uranidea gracilis* Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 1968 (with synonymy).

*Cottus gracilis* Kendall, Bull. U. S. Fish Comm., 22, 1902 (1904), p. 362.

*Cottus richardsonii* Gill, Smiths. Misc. Coll., 52, 1908, p. 114 (in part).

A single specimen of this species is at hand from Michigan, a locality far west of any previously recorded for the species. It was collected in Little Manistee Creek, tributary to Lake Michigan, by Gen. John McNulta, in July, 1899. It agrees

in essential respects with specimens taken at Ithaca and McLean, New York, from streams flowing into Cayuga Lake; from Worcester, New York, on the upper Susquehanna; and from Labrador.

Dorsal rays, VIII, 17; anal, 12; pelvics, each I, 3; first dorsal half as high as second, the two fins narrowly conjoined at base; pectoral reaching to above third anal ray. A prickly area in axil of pectoral fin, as in some specimens from western New York. Depth, 5.0; head, 3.0; eye, 6.2; upper jaw, 2.3; no palatine teeth. Upper parts marked with a rather obscure reticulated pattern, without definite bars. Fins dark, the first dorsal black with a narrow whitish margin. Length to caudal, 80 mm.

*Cottus franklinii* Agassiz

*Cottus franklinii* Agassiz, Lake Superior, 1850, p. 303; Girard, Proc. Am. Ass. Adv. Sci., 2, 1850, p. 411; Proc. Boston Soc. Nat. Hist., 3, 1850, p. 189; Smiths. Contr. Knowl., 3, 1851, p. 33, pl. 2, figs. 5, 6.

*Uranidea franklinii* Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 1967.

*Uranidea hoyi* Putnam, in Nelson, Bull. Illinois Mus. Nat. Hist., 1, 1876, p. 41; Jordan and Evermann, *l.c.*, 1898, p. 1969.

*Uranidea kumlieni* Hoy, in Nelson, *l.c.*, 1876, p. 41; Jordan and Evermann, *l.c.*, 1898, p. 1967; Forbes and Richardson, Nat. Hist. Surv. Illinois, 3, 1908, p. 328.

Numerous specimens of this species were examined from Lake Superior (off Isle Royal, Lizard Islands, and Sault Ste. Marie), and one from Lake Michigan (off Ludington, Michigan). *Cottus franklinii* is known only from rather deep water in Lakes Superior and Michigan. The three nominal species, *franklinii*, *hoyi*, and *kumlieni*, the latter two described from Lake Michigan, seem to be inseparable, comprising a form but slightly differentiated from *Cottus gracilis*.

One specimen in the series at hand from Lake Superior has three soft pelvic rays on one side, four on the other.

*Cottus ricei* (Nelson)

*Cottopsis ricei* Nelson, Bull. Illinois Mus. Nat. Hist., 1, 1876, p. 40.

*Uranidea ricei* Jordan and Gilbert, Bull. U. S. Nat. Mus., 16, 1883, p. 953.

*Cottus ricei* Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 1952; Forbes and Richardson, Nat. Hist. Surv. Illinois, 3, 1908, p. 327; Jordan and Thompson, Proc. U. S. Nat. Mus. 38, 1910, p. 78, fig. 3.

*Uranidea pollicaris* Jordan and Gilbert, Proc. U. S. Nat. Mus., 5, 1882, p. 222.

*Cottus pollicaris* Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 1954.

This aberrant species heretofore has been known only from a few specimens taken in Lakes Michigan and Ontario. A series of five from Lakes Michigan, Huron and Superior, have been gathered together by the writer for comparison. A study of this lot has indicated that the presence or absence of prickles, as in several other cases in the genus, is merely an intraspecific variation. When present the prickles are either coarse or weak, and cover a varying proportion of the surface of the body below the lateral line. Just below the main, long, spirally curved preopercular spine there is a smaller downward directed spine, and below and before this one there are indications of about two smaller spines on the bridges of bone between the sensory cavities in the preopercle; the mandibular bones are similarly cavernous; the end of the maxillary is fleshy. Palatine teeth are absent, but simulated by rows of non-dentigerous papillæ, which were apparently mistaken for teeth by Nelson. Considering the foregoing facts there appear to be no grounds for the distinction of *Uranidea pollicaris* from *Cottus ricei*. The type descriptions of both nominal species conform in essential details with the specimens at hand. The more important characters of the series are tabulated below.



Table of Characters of Five Specimens of *Cottus ricei*

Lake	Michigan	Huron	Superior		
Specimen (data given below).....	1	2	3	4	5
Dorsal rays .....	VIII, 17	VII, 17	VII, 16	VII, 17	VIII, 18
Anal rays .....	13	14	13	13	13
Pectoral rays .....	17	16	16	16	16
Depth (approximate) .....	5.7	7.0	7.0	5.6	6.7
Head .....	3.35	3.2	3.3	3.25	3.0
Eye .....	5.6	4.6	4.7	5.5	4.4
Upper jaw .....	2.9	3.4	3.1	3.4	3.3
Length of preopercular spine from angle of ridge, into eye .....	1.0	1.0	1.0	0.8	1.0
Length to base of caudal .....	87	43	48	41	33

Prickles: Absent (1); weak, few below lateral line (2); absent (3); coarse, extending one-third distance from lateral line to anal base (4); coarse, investment complete (5).

*Data for Specimens Similarly Numbered in the Above Table*

1.—Mouth of Chicago River, Chicago, Illinois; collected by Emil W. Youngren, March 1, 1909; loaned by the Chicago Academy of Sciences.

2.—Lake Michigan, near Chicago, Illinois; deposited in the Field Museum through the city water system, from the intake about two miles out in the lake.

3.—Lake Michigan, off Ludington, Michigan; collected by Dr. R. J. Seymour; loaned by Mr. T. L. Hankinson.

4.—Near Port Huron, Michigan, at the southern end of Lake Huron; loaned by Mr. T. L. Hankinson.

5.—Lake Superior, from west end of Ambre Harbor, Michipicoten Island; collected by Dr. H. V. Ogden, September, 1901.

