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SYSTEMATIC NOTES ON NORTH AMERICAN SILUROID FISHES OF THE GENUS *SCHILBEODES*

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AMONG the most incompletely known of the fresh-water fishes of the eastern United States are the small, venomous catfishes, popularly referred to as "madtoms." In the present paper we present data on the nomenclature and characters of four species, listed below in terms of current usage as well as of the proposed nomenclature:

NAME IN CURRENT USE	PROPOSED DESIGNATION
Schilbeodes or *Rabida insignis*	1a. *S. marginatus marginatus* 1b. *S. marginatus atrorus*, new subspecies
Schilbeodes or *Rabida exilis*	2. *Schilbeodes insignis*
Schilbeodes or *Rabida gilberti*	3. *Schilbeodes gilberti*
Schilbeodes gyrinus	4. *Schilbeodes mollis*

This report is based on a study of material in the Museum of Zoology of the University of Michigan (U.M.M.Z.), Cornell University (C.U.), and the United States National Museum (U.S.N.M.). We are particularly grateful to Dr. Leonard P. Schultz, Curator of Fishes, United States National Museum, for permission to study and report on the specimens in the National Museum collection. Much of the material used in

this study was collected by the junior author during the course of field explorations, which were supported by a grant from the Faculty Research Fund of Cornell University.

Genus *Schilbeodes* Bleeker

Pimelodon.—LeSueur, 1819: 155 (nonbinomial, because used in combination with the French vernacular *livrée*). Vaillant, 1896: 28 (name taken from LeSueur, used in combination, *Pimelodon insignarius*). Jordan, Evermann, and Clark, 1930: 155 (recognized as subgenus of *Rabida*, without characters or limits).

Schilbeodes.—Bleeker, 1858: 258 (characters; haplotype, "Schilbeodes gyrinus Blkr. = Silurus gyrinus Mitch.") Jordan, 1877*b*: 97 (diagnosis, as subgenus). Jordan and Gilbert, 1883: 98, and Swain and Kalb, 1883: 638 (in key, as subgenus). Eigenmann and Beeson, 1894*a*: 80, and 1894*b*: 44 (first use as genus). Jordan and Evermann, 1896*a*: 116, 144–45 (description).

Rabida.—Jordan and Evermann, 1896*a*: 144–45 (in key, as subgenus; orthotype, *furiosus*); 1896*b*: 234 (listed, as subgenus; type, *furiosus*). Jordan, 1929: 90, 93 (diagnosis, as genus). Jordan, Evermann, and Clark, 1930: 155 (as genus; synonymy).

Prior to 1930 it had not been noticed by American ichthyologists, nor has it been noted by the compilers of *Nomenclators,* that LeSueur introduced the name *Pimelodon,* for a species of *Schilbeodes.* LeSueur's name has priority over Bleeker's. A question might be raised as to whether LeSueur proposed a new name or merely a substitute spelling for *Pimelodus* Lacépède. In his 1819 paper, however, LeSueur used *Pimelodus* as the equivalent of Pimélode for his first species, then abbreviated this name for the subsequent species, until he came to the one which he called "Pimelodon *livrée.*" This name has been listed wrongly as "*Pimélode livrée*" in all synonymies from the time of Valenciennes (1840: 144), except those of Vaillant (1896: 28) and of Jordan, Evermann, and Clark (1930: 156). We interpret *Pimelodon* as unavailable prior to 1896, because until that time it was nonbinomial. The species name was given by LeSueur in the French vernacular, and the Latin equivalent, *Pimelodus insignarius,* was not published until 1896. Because *Schilbeodes* was availably proposed in the meantime, it is retained. We regard *Pimelodon* LeSueur

as available as of 1896, when republished by Vaillant. If the genus should be divided, a problem would arise as to whether this name would have priority over *Rabida* Jordan and Evermann (1896).

We prefer, however, to follow Jordan and Evermann in referring all of the species of Ameiuridae with an adnate adipose fin, other than the stonecat, *Noturus flavus,* to one genus, *Schilbeodes* Bleeker. There appears to be no clear-cut line of demarcation between the species having a smooth pectoral spine (*Schilbeodes*) and those with a serrated pectoral spine (*Rabida*), because the species that are extreme in this character, namely *S. leptacanthus* and *S. furiosus,* are connected by a virtually unbroken chain of forms showing intermediate degrees of pectoral-spine serration. The other characters which were used by Jordan and Evermann to distinguish *Rabida,* either as a subgenus or a genus, are even less tangible.

Eastern Madtom

1. *Schilbeodes marginatus* (Baird)

The eastern madtom has long been known as *Schilbeodes insignis,* or by some authors, recently, as *Rabida insignis.* It now becomes evident (see p. 22) that the name *insignis* belongs with the related species of the Mississippi Valley, currently known as *Schilbeodes* or *Rabida exilis.* Hence the next available name, *marginatus,* is resurrected for the eastern madtom. This species is divisible into at least two subspecies. The synonymy is given in full under the subspecies headings.

Schilbeodes marginatus (the "*insignis*" of recent authors) has generally been interpreted as the exclusively Atlantic coast representative of *S. exilis* (the true *insignis*). It was recorded long ago, however, from the upper Kanawha or New River system by Cope, whose Sinking Creek record has been repeated by Fowler (see synonymy). Cope's report was apparently the basis for the early records of the Atlantic coast form from "upper Ohio valley," "Ohio River," and finally "Ohio." We, too, have collected madtoms of the *insignis* group in the New River system in Virginia. They prove to be

related more closely to *S. marginatus* than to the true *S. insignis.* They seem, however, to be distinct enough to warrant subspecific separation and are here referred to the new subspecies, *Schilbeodes marginatus atrorus,* characterized by the sharply bicolored, black-bordered fins (especially the caudal fin). The more widespread subspecies takes the name *S. m. marginatus* (p. 6).

S. m. atrorus occurs also in the Atlantic coast drainage basin, for the same type—though not quite so extreme—occupies the Roanoke River system. Except for this insertion of *S. m. atrorus* in the middle of its range, *S. marginatus* is relatively consistent in its characters. From the northern limit of the species in the Merrimack River system of New Hampshire (Hoover, 1936: 239; Bailey, 1938: 151, 172, 182) southward to the Susquehanna River drainage basin in Pennsylvania and Maryland, and again in the stream systems of the Carolinas and Georgia south of the Neuse, the fins are rather evenly pigmented, grading outward to weakly blackish margins or dusky submarginal bands.

In the Potomac, James, and Chowan systems north of the Roanoke and in the Tar and Neuse systems to the south, the coloration approaches that of *atrorus.* A gradient in color pattern is thus indicated:

1. Fins consistently approaching a unicolor pattern, merely dusky or blackish toward margin: *S. m. marginatus,* in the northern and southern but not in the central part of the Atlantic coast drainage.
2. Fins in some fish nearly unicolor but often more sharply marked, yet without a definitely black border, except in a few individuals: *S. m. marginatus,* in the Potomac, James, Chowan, Tar, and Neuse river systems (to the north and south of the Roanoke system).
3. Fins sharply bicolor, often very sharply so, occasionally rather indefinitely bicolor: *S. m. atrorus,* slightly atypical, in the Roanoke River system.
4. Fins consistently very sharply bicolor: typical *S. m. atrorus,* in the upper Kanawha (New) River system.

Each category in this gradient shows some intergradation with the adjacent ones, because of extensive individual variation.

A peculiar type of intergradation is thus indicated. For some distance on either side of the centrally located Roanoke River system (where the range of *S. m. atrorus* splits the distributional territory of *S. m. marginatus* into two parts), some of the individuals in certain irregularly scattered localities closely approach *S. m. atrorus* in coloration. This is true in the Potomac drainage about Washington, and in the James River system. Thus, out of 52 specimens collected in the Catawba River of the James system, north of Fincastle, Virginia, 2 or 3 have the caudal and first dorsal fins quite as sharply bicolored as in *S. m. atrorus* from the Roanoke, with black margins and almost no melanophores elsewhere; many have the fins almost uniformly dusky, darkening somewhat outward; still others provide a transition. From the Chowan system, separated from the Roanoke only by tidal inlets, we have seen one series, from Waqua Creek, Brunswick County, Virginia, which almost equals *atrorus* in the bicoloration of the fins, and 2 specimens, from the Blackwater River at Zuni, Virginia, which are very definitely of the *S. m. marginatus* type (with almost uniformly dusky fins). Many of the Neuse River fish are like typical *marginatus* or merely approach *atrorus,* but two specimens, collected long ago by J. W. Milner at Kinston, North Carolina, might, in the absence of contrary evidence of geographical variation, be referred to *S. m. atrorus.*

It is barely possible that these specimens from Kinston, North Carolina, may represent a local population of *S. m. atrorus* that exists, or that formerly existed, in the lower Neuse River. Both have 17 anal rays (a rather low number). For comparison with the data in Tables I–III, we give the proportions for these specimens. Measurements in standard length (94 and 99 mm.): body depth, 5.4–6.2; predorsal length, 2.9–3.0; head length, 3.8–4.1. Measurements in head length: head depth, 2.3–2.4; head width, 1.3–1.4; fleshy interorbital, 2.5–2.7; snout length, 2.8–2.9; dorsal spine, 3.1–3.3; pectoral spine, 1.6–1.8; pectoral fin, 1.3–1.5. Pectoral spine in pectoral

fin, 1.3 in both; orbit length in snout length, 2.0–2.4; caudal ratio 1, 1.7–1.8; caudal ratio 2, 2.6–2.7.

Two misuses of the name *marginatus* caused some confusion in the early literature: (1) The name *Noturus marginatus* was listed by Nelson (1876: 50), with the range "Wabash valley and south (Jordan)," for a species which Jordan (1878*b*: 68) soon afterward identified as *Noturus miurus*. (2) *Noturus occidentalis* Gill (1862: 45–46), from the Platte River, an obvious synonym of *Noturus flavus*, has been confused with *Schilbeodes marginatus*. Günther (1864: 105) described, as *Noturus occidentalis*, some specimens sent to the British Museum by the Smithsonian Institution, but his description applies to *Schilbeodes marginatus*, as Jordan (1877*a*: 372; 1877*b*: 99) noted, on the advice of Gill. Günther's locality, Platte River, was presumably taken from Gill's account rather than from his own specimens. The fact that Günther associated this locality with a description of *Schilbeodes marginatus* led to the inclusion of "Nebraska" and "Platte River" in the range of *Noturus insignis* as given by Swain and Kalb (1883: 640).

Key to the Subspecies of *Schilbeodes marginatus*

1a.—Vertical fins dusky, bordered with darker (except for a fine whitish edge); entire caudal fin rendered more or less dusky by widespread melanophores. Dorsal and pectoral spines averaging shorter (in the typical, northern race). *Atlantic coast drainages, from the Merrimack in New Hampshire to the Oconee in Georgia (exclusive of the Roanoke)* ..... *S. m. marginatus*

1b.—Vertical fins strongly bicolored, pale toward base but blackish to jet-black in an outer band; caudal fin almost clear of pigment in the light part. Dorsal and pectoral spines averaging longer than in the typical, northern race of *S. m. marginatus*. *Basins of the Roanoke and upper Kanawha systems, Virginia* ..... *S. m. atrorus*

Common Eastern Madtom

1*a*. *Schilbeodes marginatus marginatus* (Baird)

Noturus marginatus.—Baird, *in* Anonymous, 1863: 23 (*nomen nudum;* "Carlisle, Pa. S. F. Baird. (1571.)"; specimen sent to University of Michigan). Baird, *in* Cope, 1869: 237 (original diagnosis and records, in part; head of James River and the Suseque-

hanna). Cope, 1870: 484 (Catawba and Yadkin rivers). Jordan and Copeland, 1876: 160 (range, in part). Jordan, 1876: 303 (characters; range—except "W."); 1877*a:* 371–72 (detailed comparison with *exilis;* range—"Ohio" included by error).

Noturus occidentalis (misidentification).—Günther, 1864: 105 (description only).

Noturus flavus (misidentification).—Uhler and Lugger, 1876: 151 (description; ecology; Maryland records). Nelson, 1890: 671 (description; Vermont to Virginia and westward; in New Jersey catalogue).

Noturus insignis (misidentification).—Jordan, 1877*b:* 97, 100 (comparisons; synonymy, and nomenclature in part; range); 1878*a:* 118 (Susquehanna River); 1878*d:* 335 (description; range); 1878*e:* 414 (Pennsylvania to Georgia). Jordan and Brayton, 1878: 87, 93–94 (distribution—Ohio River basin excepted). Jordan, 1880: 335 (diagnosis; range). Bean, 1880: 112 (James River, Virginia; Potomac River; Bainbridge, Pennsylvania). Jordan and Gilbert, 1883: 100 (description; synonymy in part; Pennsylvania to South Carolina). Swain and Kalb, 1883: 638, 640–41, 643–44 (comparisons, range, and synonymy in part; *exilis* confused). Jordan, 1885: 802 (range). Jordan and Gilbert, 1886: 6 (comparison). Jordan, 1890: 101, 109, 114, 125, 127, 131, 134, 136 (coloration; habitat; records, Virginia and North Carolina). Bean, 1892: 19–20, Pl. 19, Fig. 26 (description; use as bait; synonymy, etc., in part; range). Evermann and Cox, 1895: 304, 308–9 (records, Neuse River system). Jordan, 1899: 42 (diagnosis; range).

Schilbeodes insignis.—Jordan and Evermann, 1896*a:* 145, 147 (comparisons; descriptions; range; synonymy in part; designation of type series of *N. marginatus* from Pennsylvania); 1896*b:* 234 (range; synonymy); 1900: 3236, Pl. 28, Fig. 66 (Consy Creek, Bainbridge, Pennsylvania). Bean, 1903: 95–96, 489, 740 (synonymy in part; description; range). Fowler, 1906: 173, Pl. 15 (description; Crosswicks Creek near Trenton, New Jersey). Smith, 1907: 70 (diagnosis; range, especially in North Carolina). Fowler, 1915: 208–9 (records—except those for Virginia and Missouri). McAtee and Weed, 1915: 5–7, 10, and Radcliffe and Welsh, 1916: 40–41 (Potomac River system and Maryland records). Welsh, 1916: 54 (records, Peedee systems). Fowler, 1917*a:* 110, 117 (Harihokake Creek, New Jersey; Pennsylvania records); 1917*b:* 34–36, 1 pl. (breeding habits; coloration; associated species; Tohickon Creek, Pennsylvania); 1918: 90, and 1919: 57 (Pennsylvania records); 1920*a:* 299 (Paupack Lake outlet, Pennsylvania); 1920*b:* 150 (New Jersey records); 1921*a:* 387, and 1921*b:* 63 (Pennsyl-

vania records); 1923: 16 (Yadkin and Catawba rivers). Pratt, 1923: 96 (compiled). Brimley and Mabee, 1925: 15 (Boone's Pond, Wake County, North Carolina). Coker, 1925: 59 (ecology; Paddy's Creek, North Carolina). Fowler, 1925: 24 (Big Conewago Creek, Pennsylvania). Fowler and Carlson, 1927: 66 (Pennsylvania records). Eaton, 1928: 41–42 (Keuka Lake, New York). Greeley, 1928: 99, 105 (New York records). Hubbs and Greene, 1928: 390 (Lake Ontario basin). Pickens, 1928: 30 (upper South Carolina). Truitt, Bean, and Fowler, 1929: 36–37, Fig. 6 (description; Maryland records). Hildebrand, 1932: 53 (range; river systems in North Carolina; Catawba River near Old Fort; characters). Greeley, 1934: colored Pl. 9; 1935: 96 (New York records). Hoover, 1936: 239 (New Hampshire record). Greeley, 1936: 77, 84–85: 1937: 87, 97; and 1938: 69 (New York records; use as bait; breeding habits). Bailey, 1938: 151, 172, 182 (New Hampshire records; comparisons). Shrenkeisen, 1938: 166–67 (compiled). Bailey and Oliver, 1939: 152 (Merrimack drainage, New Hampshire). Hubbs and Lagler, 1939: 26 (characters; range); 1941: 63–64 (comparison; range and habitat). Fowler, 1944: 52 (Tobyhanna Creek, Pennsylvania).

Rabida insignis.—Jordan, 1929: 93 (characters; range). Jordan, Evermann, and Clark, 1930: 156 (synonymy in part; range). Pratt, 1935: 90 (compiled). Fowler, 1935: 19–20 (South Carolina records). Driver, 1942: 254 (compiled).

Rabida gilberti (misidentification).—Fowler, 1935: 19, Fig. 37 (South Carolina records).

Madtom.—Odell, 1935: 132 (Delta Lake, New York).

Margined madtom.—Odell and Senning, 1936: 93, 95 (lake records, Delaware and Susquehanna river systems, New York); 1938: 99 (Waneta Lake, New York).

RANGE (Map 1) AND GEOGRAPHICAL VARIATION.—As already noted (p. 4) the range of the typical subspecies, *S. m. marginatus,* is the Atlantic coast drainage, from the Merrimack River system in New Hampshire southward to Georgia, with a break in the Roanoke system, which is occupied by *S. m. atrorus.* Average differences can be detected in comparing samples of *S. m. marginatus* from north and south, respectively, of the range of *S. m. atrorus.* The chief difference so far noticed lies in the length of the pectoral spine. This spine, measured from its extreme base, enters the head 2.1 to 2.8 (average, 2.35) times in 14 specimens from the north; 1.6 to

2.5 (average, 2.06) times, in 20 fish from south of the Roanoke. In 13 specimens of each form the dorsal spine enters the head 3.0 to 4.3 (average, 3.35) times in the north, and 2.4 to 3.6 (average, 3.08) times in the south. Some of the overlap is probably due to age and sex rather than to geographical variation. Eventually, the subspecies *S. m. marginatus* as here delimited may be further subdivided, but the data at hand hardly warrant such action.

The populations of *S. m. marginatus* north and south of the Roanoke also differ a little in the average number of anal rays (Table I). The average number is slightly higher in the south than in the north. Thus, in respect to both the length of the spines and the number of anal rays, *Schilbeodes marginatus* follows the trend of geographic variation that is characteristic of the Ameiuridae (Hubbs, 1940: 209–10).

The southern limit of *S. m. marginatus* seems to be the Oconee River system in eastern Georgia. Jordan (1878*e*: 414)

TABLE I

NUMBER OF ANAL RAYS IN FIVE FORMS OF *Schilbeodes*

All rays were enumerated. The skin was slit at the front of the fin to make sure of an accurate count.

	Number of Anal Rays										
	14	15	16	17	18	19	20	21	22	No.	Ave.
S. m. marginatus											
N. of Roanoke R. system	...	...	1	10	9	2	...	...	...	22	17.55
S. of Roanoke R. system	...	1	...	6	7	7	4	...	...	25	18.24
S. m. atrorus											
Kanawha River system	...	...	...	.....	6	3	5	...	...	14	18.93
Roanoke River system	...	...	1	6	11	9	2	...	...	29	18.17
S. insignis											
Mississippi R. system	...	...	1	1	2	10	7	2	2	25	19.40
S. leptacanthus											
Florida	...	8	5	1	.....	.....	...	...	...	14	15.50
S. mollis											
S. New York and New Jersey	4	6	8	2	.....	.....	...	...	...	20	15.40

listed the range of the eastern madtom as Pennsylvania to Georgia, but subsequent authors (other than Hubbs and Lagler, 1941: 64) have indicated South Carolina as the southern end of the distribution. Two small series from Georgia, in the University of Michigan Museum of Zoology, were collected on November 12, 1931, by Donald Ameel, in South Fork of Broad River near Danielsville, Madison County, and in Allens Creek, of the Oconee River system, north of Talmo. These and the other record stations are charted on Map 1.

MEASUREMENTS.—Additional measurements made on 10 specimens of *S. m. marginatus,* 5 from north and 5 from south of the Roanoke basin, indicate no definite geographic trend, but are given (combined) for comparison with the data on *S. m. atrorus* and *S. insignis:*

Measured into standard length:
- Body depth, 5.8 to 6.9 (average, 6.3)
- Predorsal length, 2.7 to 3.0 (average, 2.9)
- Head length, 3.7 to 3.9 (average, 3.75)

Measured into head length:
- Head depth, 2.0 to 2.3 (average, 2.2)
- Head width, 1.2 to 1.3 (average, 1.3)
- Fleshy interorbital, 2.5 to 3.0 (average, 2.7)
- Snout length, 2.6 to 3.0 (average, 2.8)
- Pectoral fin length, 1.3 to 1.5 (average, 1.45)

Measured into pectoral fin:
- Pectoral spine, 1.3 to 1.5 (average, 1.4)

Measured into snout length:
- Orbit length, 2.0 to 2.7 (average, 2.3)

Measured into distance from origin of dorsal to adipose notch:
- Distance from adipose notch to end of caudal fin, 1.3 to 1.7 (average, 1.5)

Measured into distance from origin of anal to base of caudal:
- Distance from origin of lower procurrent caudal rays to base of caudal, 2.5 to 2.9 (average, 2.7)

BLACKBORDERED EASTERN MADTOM

Schilbeodes marginatus atrorus, new subspecies

(Plate I)

Noturus marginatus (identification correct to species only).—Cope, 1868: 237 (characters, in part; "Sinking Creek of the Kanawha").

Jordan and Copeland, 1876: 160 ("Ohio Valley"). Jordan, 1876: 303 ("W." in range). Jordan and Gilbert, 1877: 2 ("Ohio valley"—wrongly included in Indiana list). Klippart, 1877: 153 ("Ohio valley"—wrongly included in Ohio list). Jordan and Brayton, 1878: 87 ("Ohio River basin"). Swain and Kalb, 1883: 640 ("Ohio River"—basin understood).

Noturus insignis (misidentification).—Jordan, 1878*c:* 368 ("Upper Ohio river"—basin understood); 1889: 353 (comparison; Roanoke River at Roanoke, Salem, and Alleghany Springs); 1890: 118, 121–22 (same material; habitat; color).

Schilbeodes insignis.—Fowler, 1915: 209, and 1923: 9 (Sinking Creek, Virginia). Hubbs and Lagler, 1941: 65 ("the Kanawha River system of West Virginia [sic] (subspecies?)"). Jackson and Henderson, 1942: 96–98, 100, 104, 107–8, 110, 115, 119 (records, Roanoke River near Roanoke, Virginia; resistance to pollutants).

RANGE (Map 1).—The typical race of this subspecies occupies the upper Kanawha or New River system, above the Kanawha Falls. The known specimens are all from Virginia, but the form no doubt occurs also in West Virginia and probably in North Carolina, in the same drainage basin. The same form, not quite so extreme in its characters, inhabits the Roanoke River system in Virginia. The habitat of *S. m. atrorus* is thus interpolated in the middle of the range of *S. m. marginatus:* an example of medial (as opposed to peripheral) differentiation. By individual variation specimens from several river systems to the north and to the south of the Roanoke exhibit a partial intergradation between the subspecies—as already pointed out.

Schilbeodes marginatus atrorus takes its place among the few members of a fauna that transgresses the Alleghenian divide to occur also in the upper Kanawha system. As this montane fish fauna has not been well defined in the literature, we list here the component species (excluding fishes, like *Salvelinus fontinalis* and *Rhinichthys cataractae,* which are widespread in the north and range southward along the two sides of the mountain divide):

1. *Thoburnia rhothoeca* (Thoburn).—This sucker was described (Thoburn, in Jordan and Evermann, 1896*a:* 181) as probably from the French

Broad River at Wolf Creek, Tennessee. It has never been retaken in the Tennessee River system, but was rediscovered in the James system (Hubbs, 1930: 43–44), to which it was then thought to be confined. It has since been taken in the Roanoke system, and one specimen in Cornell University is included in a collection made by Dr. A. H. Wright near White Sulphur Springs, West Virginia, in the upper Kanawha system. In our collecting we have failed to find it in that region. *Thoburnia rhothoeca* is, therefore, doubtfully included in the present list.

2. *Chrosomus oreas* Cope.—This dace has been regarded as confined to the Roanoke and James river systems of the Atlantic drainage, but has also been taken by the junior writer in the upper Kanawha basin (in West Fork of Little River, 5.5 miles east northeast of Willis, Floyd County, Virginia; April 4, 1941).

3. *Nocomis leptocephalus* (Girard).—When it was revalidated (Hubbs, 1926: 28–29, Pl. 1, Fig. 2; Pl. 2, Fig. 2), this chub was thought to be confined to the coastal drainage. Recently, however, it has been found to live also in the upper Kanawha River system. The junior author took it with *Chrosomus oreas* in the West Fork of Little River, and George W. Burton collected it in Spruce Run, a tributary of New River in Giles County, Virginia.

4. *Notropis albeolus* Jordan.—This shiner is listed as confined to the Atlantic coast drainage, from the Roanoke system southward, but we have also indentified it from the upper Kanawha basin, at several localities in Virginia and West Virginia. We suppose that Goldsborough and Clark's record (1908: 35) of *Notropis cornutus* from Horsepen Creek, Virginia (in the Kanawha system) must have been based on the similar species, *N. albeolus,* for *N. cornutus* is one of the common Mississippian species that is seemingly absent in the upper Kanawha waters.

5. *Compostoma anomalum,* subspecies.—This is a fine-scaled montane subspecies that transgresses the Alleghenian divide at several points. In the south *Notropis rubricroceus* occurs on both sides of the divide (Jordan and Evermann, 1896*a:* 286).

On the Mississippi Valley side of the mountains most of these species conform with *S. marginatus* in being confined to the distinctive upper Kanawha fauna, which is separated by the Kanawha Falls from the Ohio River fauna (Hubbs, 1931; Hubbs and Trautman, 1932; Hubbs and Raney, 1939; Raney, 1941).

The Mississippi Valley species, *Schilbeodes insignis,* occurs in the Ohio River system below the Kanawha River. Material from Indiana and from the Tennessee River system is essentially typical of the Mississippi Valley species (*exilis* = *insignis*),

as here distinguished. The record station of *S. insignis* which most closely approaches the range of *S. m. atrorus* is the Guyandotte River, a tributary of the Ohio River, in West Virginia. On being re-examined in the National Museum, the single specimen from this locality (first reported by Evermann and Goldsborough, 1908: 33) is found to be referable to *insignis*. The borders of the anal and caudal are merely dusky. Traces are retained of the dark blotch about the front of the first dorsal fin. Most of the proportions are also typical of *insignis* as listed in Table III: caudal ratio, 1, 1.7; caudal ratio 2, 3.0; pectoral spine in head, 3.1 (shorter than in any other specimen of *insignis* measured); pectoral fin in head, 1.75; pectoral spine in pectoral fin, 1.7; predorsal length in standard length (80.5 mm.), 3.15; head length, 3.8. The head is about as large and deep as in *marginatus,* suggesting either a slight tendency toward intergradation with *marginatus,* or an independent local differentiation.

MATERIAL.—The holotype, 112 mm. in standard length, was seined by Carl L. Hubbs and family on August 22, 1936, in Wolf Creek, at U. S. Highway 52, between Bastian and Novis, Bland County, Virginia; U.M.M.Z., No. 139452.

Fifteen paratypes, like the holotype from the upper Kanawha (New) River system in Virginia, bear the following data:

U.M.M.Z., No. 139453: 8 specimens, taken with the holotype.

U.M.M.Z., No. 138523: 5 specimens, obtained by E. C. Raney, E. A. Lachner, and L. J. Kezer, on March 31, 1940, in Reed Creek, 1 mile southwest of Wytheville, Wythe County.

U.S.N.M., No. 104091: 2 juveniles, collected by L. P. Schultz and Earl D. Reid, on June 17, 1937, in Sinking Creek, 3 miles above its mouth in the New River, Giles County. This is the stream from which Cope first recorded the subspecies (under the name, *Noturus marginatus*).

Specimens from the Roanoke River system are not designated as paratypes. The following series, all from the Roanoke basin in Virginia, were studied:

U.S.N.M., No. 40194: 8 specimens (1 now in Cornell University collection), 63–116 mm. long, secured by Jordan in the Roanoke River, at Roanoke.

U.S.N.M., No. 100182: 4 specimens, 37 to 79 mm. long, collected by Stuart Abraham on April 22, 1935, in West Branch of Cub Creek, 11 miles south of Appomattox Court House.

U.S.N.M., No. 101323: 2 specimens, 46 to 49 mm. long, taken by George S. Myers and Abraham on September 15, 1935, in Wards Fork Creek at Wards Fork, between Madisonville and Cullen, Charlotte County.

U.S.N.M., No. 104096: 2 specimens, 49 to 52 mm. long, seined by Schultz and Reid on June 13, 1937, in Spoon Creek, between Martinsville and Stuart.

U.S.N.M., No. 104110: 2 adults, 100 and 122 mm. long, secured by Schultz and Reid on June 18, 1937, in Roanoke River at Bennett's Mills.

C.U., No. 8353: 4 specimens, 35 to 103 mm. long, collected by Croswell Henderson, in October or November, 1940, in Roanoke River near Roanoke.

C.U., No. 9415: 1 specimen, 97 mm. long, taken by Raney, Lachner, and Kezer, on March 31, 1940, in Roanoke River at Glenvar, Roanoke County.

C.U., No. 9554: 1 specimen, 79 mm. long, seined by Raney, Lachner, and R. A. Pfeiffer, on April 3, 1941, in Angling Creek, 1 mile west of Patrick Springs, Patrick County.

U.M.M.Z., No. 94522: 1 specimen, 39 mm. long, obtained by Donald Ameel on November 10, 1931, in Shiner Creek at Forksville, Mecklenburg County.

U.M.M.Z., No. 95151: 1 specimen, 21 mm. long, secured by Carl L. and Laura C. Hubbs, on September 9, 1928, in a tributary of Little Calfpasture River just above Bell Valley, Rockbridge County.

U.M.M.Z., No. 95323: 7 specimens, 33–97 mm. long, collected by Hubbs and Edwin P. Creaser, on May 16, 1931, in Tinker Creek, just above Cloverdale, Botetourt County.

U.M.M.Z., No. 95346: 2 specimens, 108 and 127 mm. long, secured by Hubbs and Creaser, on May 16, 1931, in the Roanoke River at Salem, Roanoke County.

U.M.M.Z., No. 95401: 12 specimens, 31–107 mm. long, collected by Hubbs and Creaser, on May 17, 1931, in North Mayo River at State Highway 12, Henry County.

U.M.M.Z., No. 95408: 8 specimens, 34–82 mm. long, taken by Hubbs and Creaser, on May 17, 1931, in Blackwater River, 1 mile south of Gogginville, Franklin County.

U.M.M.Z., No. 126243: 1 specimen, 123 mm. long, seined by George W. Burton, on May 5, 1939, in Horsepasture Creek, Henry County.

NOMENCLATURE.—Some doubt exists as to whether the name *marginatus* should be applied to this subspecies rather than to the form occurring farther north in the Atlantic Coast drainage. The brief original proposal of the name *marginatus* (in Cope, 1869: 237) was as follows:

NOTURUS Rafinesque

Three species of this genus are in the museum of the Academy, and may thus be distinguished:

. . . . . .

No palatine teeth; head four times to basis caudal; dorsal higher than long; maxillary barbels reaching beyond basis pectoral; brownish, fins black-edged ..... MARGINATUS

. . . . . .

NOTURUS MARGINATUS BAIRD

One specimen from Sinking Creek of the Kanawha, and one from the head of James River; similar specimens from the Susquehanna.

The name *marginatus* was obviously taken from a manuscript, by Baird, who has been regarded as responsible for the name. Baird's material came from the Susquehanna. The diagnosis, in the key, applies better to *atrorus* than to typical *marginatus* (as this name is here used), but does not wholly exclude either. Jordan and Evermann, by the method they followed in synonymies, restricted the type locality to Pennsylvania and designated [U.S.N.M.] No. 1571 as the type. An 81-mm. specimen from Carlisle, Pennsylvania, collected by S. F. Baird, originally from Smithsonian Institution, No. 1571, and received by the University of Michigan in 1859 (Anonymous, 1861: 23), is obviously a cotype. Fowler (1915: 208) reported that other cotypes, collected by Baird at Carlisle, are in the Academy of Natural Sciences of Philadelphia. It is our opinion that Jordan and Evermann legally restricted the type and that the name *marginatus* must go with the Susquehanna River form.

DIAGNOSIS.—Vertical fins sharply bicolor, pale at base but broadly bordered with black (with a trace of a light edge on extreme margin); caudal fin largely devoid of pigment on basal part; black on caudal especially extensive toward upper and lower posterior angles (see Plate I). Body waxy yellow, without a definite pattern. Anal rays (Table I), counting anterior rudiments, 16 to 20, averaging 18.17. Pectoral spine long and strong; its length from extreme base 1.6 to 1.9 in head, and 1.2 to 1.6 in pectoral fin length (in the typical race).

DESCRIPTION.—An extended description of this form is not deemed necessary, for its characters are indicated in the comparisons, in Plate I, and in the proportional measurements (Table II). It agrees with *S. m. marginatus* in the proportional measurements by which *marginatus* differs from *insignis* (Table III). There is little overlap between *atrorus* and *insignis* in the relative length of the pectoral spine. There is virtually no intergradation between specimens of similar size.

This subspecies resembles *marginatus* and differs from *insignis* in that it typically instead of rarely attains an adult size of more than 100 mm. (standard length).

Another important character in which *atrorus* agrees with *marginatus* and contrasts with *insignis* is the lack of the color pattern of the anterior back that characterizes the Mississippi Valley species.

The life colors of the holotype, and of the paratypes taken with it, were thus described: "Intense sooty black margins on dorsal, anal, and caudal. Soft dorsal, adipose, and caudal olive yellow inside the black margins. Translucent olive with a blue tinge on back; a yellow streak along lateral line." Specimens taken in Reed Creek, also in the Kanawha system of Virginia, were described as follows, after preservation for a night in formalin: "Yellow brown, with the edge of the dorsal, caudal, and anal fin blackish (one lacked the margin on the anal)." The specimen from Roanoke River at Glenvar was orange yellow at the base of the dorsal fin. Jordan (1890: 121) described Roanoke River specimens: "In life, pale yellow, nearly uniform; all specimens, large and small, with the dorsal, anal, and caudal broadly edged with jet-black, the basal part of the fin pale."

That this species agrees with the other madtoms in carrying a pain-producing venom about the pectoral spine was demonstrated beyond doubt by a field experiment, at the type locality.

Like the related forms, *S. m. atrorus* is, according to our experience, a riffle species. The holotype and paratypes from Wolf Creek were collected under stones on a riffle. The Reed Creek paratypes were taken on a rubble and boulder bottom

in water 1.5 to 2 feet deep, where the stream breaks over the remains of an old dam. The specimens taken by the junior author in the Roanoke River, and its tributary Angling Creek, were caught on the stony riffles. The Roanoke was 150 feet wide where a specimen was seined at Glenvar; at Roanoke, where the subspecies also occurs, the river is much larger. Angling Creek, a mountain stream, was only 2 to 10 feet wide. The water inhabited varied from very clear to very silty. Jordan (1890: 121) wrote of the habitat of this form in Roanoke River: "Very common, especially in grassy places."

Etymology: *ater,* black; *orus,* border.

TABLE II

PROPORTIONAL MEASUREMENTS OF *Schilbeodes marginatus atrorus*

Minimum, maximum, and average values are given for specimens other than holotype.

River system	Kanawha	Kanawha	Roanoke
Specimens	Holotype	10 paratypes	10 specimens
Standard length	112	37–127 (66)	68–124 (87)
In standard length			
Body depth	5.6	5.4–6.6 (6.05)	5.2–6.4 (5.86)
Predorsal length	2.8	2.8–3.0 (2.92)	2.8–3.0 (2.91)
Head length	3.8	3.6–3.9 (3.80)	3.6–3.8 (3.74)
In head length			
Head depth	2.1	2.0–2.2 (2.12)	2.1–2.3 (2.18)
Head width	1.3	1.1–1.3 (1.26)	1.2–1.4 (1.30)
Fleshy interorbital	3.1	2.7–3.5 (2.99)	2.5–3.2 (2.82)
Snout length	2.8	2.6–2.9 (2.74)	2.5–2.7 (2.63)
Dorsal spine	3.1	2.4–3.2 (2.69)	2.5–3.3 (2.84)
Pectoral spine	1.9	1.6–1.9 (1.78)	1.6–2.2 (1.95)
Pectoral fin	1.5	1.2–1.6 (1.31)	1.2–1.6 (1.41)
In pectoral fin			
Pectoral spine	1.4	1.2–1.6 (1.42)	1.3–1.6 (1.45)
In snout length			
Orbit length	2.4	1.7–2.4 (2.00)	1.9–2.7 (2.28)
Caudal ratio 1*	1.7	1.4–1.7 (1.53)	1.4–1.7 (1.54)
Caudal ratio 2†	2.5	2.3–2.8 (2.55)	2.2–2.9 (2.48)

* $\frac{\text{Origin of dorsal to adipose notch}}{\text{Adipose notch to tip of caudal}}$

† $\frac{\text{Origin of anal to base of caudal}}{\text{Origin of lower procurrent C. rays to base of C.}}$

SLENDER MADTOM

2. *Schilbeodes insignis* (Richardson)

Pimelodon livrée (French vernacular).—LeSueur, 1819: 155 (description).

Pimelodus insigne.—Richardson, 1836: 132 (name only, as follows: "*Pimelodus* . . . insigne (livrée, Le Sueur)").

Noturus insignis.—Jordan, 1877*b:* 97, 100 (synonymy and nomenclature, in part). Jordan and Gilbert, 1883: 100 (synonymy, in part). Swain and Kalb, 1883: 638, 640, 643–44 (comparisons, range, and synonymy, in large part; *exilis* a synonym; "Nebraska" and "Platte River" included by error). Bean, 1892: 20 (copied synonymy, in part).

Schilbeodes insignis.—Jordan and Evermann, 1896*a:* 147, Bean, 1903: 95, and Smith, 1907: 70 (copied synonymy, in part). Fowler, 1915: 209 (Carthage, Missouri).

Rabida insignis.—Jordan, Evermann, and Clark, 1930: 156 (copied synonymy, in part).

Pimelodus lemniscatus.—Valenciennes, *in* Cuvier and Valenciennes, 1840: 144–45 (original description; name from LeSueur, MS; no locality). De Kay, 1842: 187, and Storer, 1846: 405 (characters; range—"Southern States," assigned by fancy).

Noturus lemniscatus.—Girard, 1859: 158–59 (nomenclature; Pennsylvania suggested as probable locality). Gill, 1862: 45 (synonymy). Günther, 1864: 104 (synonymy; description, from Valenciennes; North America). Jordan, 1876: 303 (characters; "rivers S. & W."). Jordan and Copeland, 1876: 160 ("Southern States").

Noturus exilis.—Nelson, 1876: 51 (description; McLean County, Illinois). Jordan and Copeland, 1876: 160 (Illinois; Wisconsin). Jordan, 1877*a:* 371–72 (detailed comparison with *marginatus;* Illinois; Wisconsin); 1877*b:* 97, 100 (comparisons; range; variation). Jordan and Gilbert, 1877: 2 ("Lake [Michigan] and Illinois R."—in Indiana list). Klippart, 1877 (after Jordan and Gilbert, 1877). Jordan, 1878*a:* 118 ("Wabash R., Illinois R., L. Michigan"); 1878*b:* 67 (McLean County, Illinois; Root River, Wisconsin;[1] Kansas); 1878*c:* 368 (after Jordan and Gilbert, 1877); 1878*d:* 335–36 (description; range); 1878*e:* 414 (range). Jordan and Brayton, 1878: 87, 93–94 (distribution). Jordan, 1880: 335–36 (diagnosis; range). Bean, 1880: 112 (South Grand River, Missouri). Jordan, 1882: 799–800 (description; thought probably to be in Ohio). Hoy, 1883: 434 (Fox River, Wisconsin). Jordan

[1] This record, overlooked by Hubbs, 1926: 52, and Greene, 1935: 145–46, was obviously the basis for the "Lake Michigan" and "Lake" records of 1877–78 (see also legend of Map 1).

and Gilbert, 1883: 100 (description; range). Forbes, 1884: 84 (Illinois records). Cragin, 1885: 107 (Kansas). Graham, 1885: 71 ("Neosho, Osage, etc.," Kansas). Jordan, 1885: 802 (range; *elassochir* as synonym). Eigenmann and Fordice, 1886: 410 (Bean Blossom Creek, Indiana). Call, 1887: 79 (Hinkson Creek, Missouri). Evermann and Jenkins, 1888*a:* 44, 52, 54, and 1888*b:* 110, 120, 123 (Tippecanoe River, Indiana). Jordan, 1889: 353 (comparison). Meek, 1890: 168 (characters; range); 1891: 117, 120, 124, 126, 129, 141 (description; records, Ozark region). Gilbert, 1891: 146 (records). Call, 1892: 46 (Raccoon River, Perry, Iowa). Meek, 1892*a:* 12; 1892*b:* 223, 225; and 1892*c:* 108 (Iowa records); 1894: 75, 86, 92 (Arkansas records). Hay, 1894: 172, 174 (description; Indiana records compiled). Evermann and Kendall, 1895: 470 (records, vicinity of Neosho, Missouri). Kirsch, 1895: 327, 334–35 (Tiffin River, Manitou Beach, Michigan). Jordan, 1899: 42 (diagnosis; range).

Schilbeodes exilis.—Eigenmann and Beeson, 1894*a:* 81, and 1894*b:* 44 (Indiana records). Eigenmann, 1896: 253 (Indiana). Jordan and Evermann, 1896*a:* 145, 147 (comparisons; description; range); 1896*b:* 234 (range; synonymy). Evermann and Cox, 1896: 365, 373, 388 (records compiled, Missouri River basin). Cox, 1896: 608 (Blue Earth River at Mankato, Minnesota); 1897: 20 (same record; characters). Jordan and Evermann, 1900: 3236, Pl. 28, Fig. 65 (Ozark Fork of Gasconade River, Marshfield, Missouri). Evermann, 1902: 95 (Great Lakes region). Large, 1903: 9–10 (characters; Illinois records). Eigenmann and Beeson, 1905: 120 (Indiana records reprinted). Michael, 1906: 9 (misspelled "*exiles*"; range; Tiffin River, Michigan). Goldsborough and Clark, 1908: 33 (Guyandotte River, West Virginia). Meek, 1908: 141 (Indiana records repeated). Forbes, 1909: 387, 398, 404 (range; distribution in Illinois). Forbes and Richardson, 1909 (and ed. 2, 1920): 196, 199–200, 1 fig. (comparisons; description; range; Illinois records). Meek and Hildebrand, 1910: 246, Fig. 21 (description; range; Hickory Creek, New Lenox, Illinois). Hankinson, 1913: 109 (Kaskaskia River, Illinois). Fowler, 1915: 209 (Brook River, Iowa). Surber, 1920: 21 (after Cox, 1897). Pratt, 1923: 96 (compiled). Hubbs, 1926: 51–52 (comparisons; Tiffin River, Michigan, record doubted). Cahn, 1927: 42, 57, 59 (food and habits; records, Waukesha County, Wisconsin). Hubbs and Greene, 1928: 390 (Great Lakes basin). Potter and Jones, 1928: 355 (Iowa records compiled). Thompson and Hunt, 1930: 27 (habitats, Champaign County, Illinois). Greene, 1935: 145–46 (distribution; Wisconsin records). Ait-

ken, 1936: 33 (Iowa). Schrenkeisen, 1938: 167 (range; comparison). Kuhne, 1939: 68 (Tennessee). Hubbs and Lagler, 1939: 26 (characters; range); 1941: 63, 65 (comparisons; range and habitat; probably a complex of subspecies referable to *S. insignis;* exclusive of "Kanawha River system of West Virginia (subspecies?)"). Eddy and Surber, 1943: 162–63 (characters; range; Minnesota record doubted).

Rabida exilis.—Jordan, 1929: 93 (characters; Wisconsin to Kansas). Jordan, Evermann, and Clark, 1930: 156 (range; synonymy). O'Donnell, 1935: 484 (Illinois records). Pratt, 1935: 90 (compiled). Blatchley, 1938: 67 (diagnosis; Indiana records compiled). Driver, 1942: 254 (compiled).

Noturus elassochir.—Swain and Kalb, 1883: 638–44 (original description; comparisons; Illinois River, Napierville [presumably Naperville, on West Branch of Du Page River, tributary to Illinois River], Illinois).

Pimelodon insignarius.—Vaillant, 1896: 28, Pl. 24 (name and plate from LeSueur, MS; synonymy; nomenclature; plate first published).

Range and Geographical Variation.—*Schilbeodes insignis,* as we now call the species which has generally been known as *S. exilis,* has a wide range in the Mississippi Valley system (Map 1). It is the only representative of this species group in the interior basin, excluding the upper Kanawha system which is occupied by *S. marginatus atrorus.* It probably ranges (or has probably ranged) from the southern part of the Great Lakes basin, in Wisconsin and Michigan, and from southeastern Minnesota, southward through Indiana, Illinois, and Iowa to the Tennessee River system in Alabama and the Arkansas River system in Arkansas and Oklahoma. One specimen is known from the upper Ohio system, from Guyandotte River, tributary to the Ohio River below the mouth of the Kanawha (p. 13). Throughout most of its range this species seems to be rare or local, perhaps on the verge of extirpation. Over much of this territory it is represented only by old literature records. Its present center of abundance is the Ozark Upland of southern Missouri, northwestern Arkansas, northeastern Oklahoma, and southeastern Kansas. In that well-consolidated region it is usually common under stones and dead leaves and is represented by a large number of recent records.

That this species is subject to geographical variation was early noted by Jordan (1877*b*: 100) and recently by Hubbs and Lagler (1941: 65). The Ozark population is particularly flat-muzzled, the specimens appearing to have been pinched between thumb and forefinger. In this respect they are quite unlike *S. marginatus.* In some regions, however, as in the Guyandotte River of West Virginia, *insignis* has the head shaped much like that of *marginatus.* There is considerable variation in the intensity of the dark fin borders. The differences are not very tangible, however, and further study is needed before any subspecific separations should be attempted.

Hubbs and Lagler (1941: 65) suggested that *exilis* (= *insignis*) might be a complex of subspecies referable to *insignis* (= *marginatus*). We now find evidence, however, that the two named forms are specifically distinct.

COMPARISON.—The Mississippi Valley species, here called *S. insignis,* differs from *S. marginatus* (both subspecies) in several characters:

1. Instead of being unicolor the back bears a definite though rather faint color pattern: about the base of the dorsal fin there is a dark blotch, preceded and followed by a light saddle. In some poorly preserved specimens these features of coloration are not apparent.

2. The adult size is smaller, very seldom instead of typically more than 100 mm. in standard length. The largest known specimen, from the Tennessee River system, is only 108 mm. long, whereas a considerable number of *marginatus* at hand are longer than 120 mm., and that form is reputed by some authors to reach the over-all length of 12 inches.

3. The caudal fin is usually more rounded, with less evident posterior angles.

4. The procurrent caudal rays are less developed, the adipose notch is more posterior, and the caudal fin is smaller. These differences, showing little or no overlap, are expressed as caudal ratios 1 and 2 in Table III. On the average the pectoral fin and the pectoral spine are shorter as compared with the head. The pectoral spine is definitely shorter, as

measured into the pectoral fin, and on the average the head is shorter. The predorsal length is less, with a little overlap. These differences are also indicated in Table III. As the differential measurements are not very closely correlated, it is easy to identify each specimen by the ensemble of its measurable characters.

NOMENCLATURE.—As already mentioned we are compelled by the evidence to shift the name *insignis* from the eastern species, *marginatus,* to the western form, *exilis.* The sole basis for the name *Pimelodus insigne* Richardson (for references see synonymy) was LeSueur's account[2] of "Pimelodon livrée," described without locality. The description of the fins as having a very black border indicates that he had either *marginatus* or *exilis.* This item fits *S. m. atrorus* best, but it is unlikely that LeSueur would have encountered that subspecies; it fits *exilis* better than *S. m. marginatus.* The description of the caudal as rounded and of the pectoral spine as short point toward *exilis.* So also does the number of anal rays (20), which LeSueur would hardly have counted in *S. m. marginatus,* for he surely would have missed at least one rudimentary ray (see Table I).

In describing *Pimelodus lemniscatus* on the basis of LeSueur's drawing and of a specimen furnished by LeSueur, Valenciennes further indicated that LeSueur described *exilis* rather than *marginatus.* Valenciennes attributed the scien-

[2] The paper by LeSueur (1819), in which this name was proposed, has apparently not been seen by most ichthyologists. The failure of authors to note LeSueur's use of the generic name *Pimelodon* has already been noted (p. 2). Other items in this paper have been misquoted. Thus, the type locality for *Pimelodus nebulosus* was given as Lake Ontario by Jordan and Evermann (1896: 140), whereas LeSueur mentioned only Philadelphia and the Delaware. *Pimelodus aeneus* (synonym of *Pilodictis olivaris*) was accredited by Jordan and Evermann (1896*a:* 143) to Cuvier and Valenciennes (1840: 135), with the type locality of New Orleans, but it was well described by LeSueur (1819: 150–52), who gave the habitat as "l'Ohio." Jordan and Evermann (1896*a:* 135) quoted *Pimelodus caudafurcatus* in the synonymy of *Ictalurus punctatus,* with the localities, "Wabash River, Mississippi River," but LeSueur (1819: 153) cited only "l'Ohio" and "Pittsbourg" for his *P. cauda-furcatus.*

tific name to LeSueur and quoted his name, *Pimélode* [*sic*] *livrée*. Since Richardson's *Pimelodus insigne* had in the meantime been proposed on the basis of LeSueur's name, Valenciennes' action helped fix the status of Richardson's name, too. Valenciennes obviously had *exilis* rather than *marginatus*. He described the fins as bordered with blackish, the caudal as rounded, the pectoral spine as short ("de moitié plus courtes que les nageoires"), and the anal rays as 21. Even more diagnostic is his remark that the procurrent caudal rays occupy the

TABLE III

DIFFERENCES BETWEEN *Schilbeodes marginatus* AND *S. insignis* IN PROPORTIONAL MEASUREMENTS

Based on half-grown to adult specimens from various parts of the range of each species. Both subspecies of *marginatus* included. Numbers measured: 20 of *insignis*, 31 of *marginatus* (54 for the ratio, pectoral spine in head). Averages in parentheses.

	S. marginatus	*S. insignis*
Caudal ratio 1*	1.3–1.7 (1.5)	1.6–2.4 (2.0)
Caudal ratio 2†	2.2–2.9 (2.6)	3.0–3.9 (3.4)
Pectoral spine in head	1.6–2.8 (2.0)	1.9–2.8 (2.5)
Pectoral fin in head	1.2–1.6 (1.4)	1.4–1.8 (1.65)
Pectoral spine in pectoral fin	1.2–1.6 (1.4)	1.5–1.8 (1.65)
Head length	3.6–3.9 (3.8)	3.8–4.3 (4.05)
Predorsal length	2.7–3.0 (2.9)	2.9–3.3 (3.1)

* $\frac{\text{Origin of dorsal to adipose notch}}{\text{Adipose notch to end of caudal}}$

† $\frac{\text{Origin of anal to base of caudal}}{\text{Origin of lower procurrent C. rays to base of C.}}$

posterior third of the length of the tail. LeSueur's figure, reproduced by Vaillant, confirms these interpretations. It shows the dorsal, caudal, and anal fins with a black margin (fitting *exilis* better than either *marginatus marginatus*, which has less sharply bicolored fins, or *marginatus atrorus*, which has the border wider, particularly toward the angles of the fins). All of the critical measurements (Table III) made on the figure check much better with *exilis* than with either subspecies of *marginatus;* caudal ratio 1, 1.7; caudal ratio 2, about 3.3; pectoral spine in head, about 3.3 (too short even for

exilis—far too short for a three-inch *marginatus*); pectoral fin in head, 1.8; pectoral spine in pectoral fin, 1.8; head length, 4.0; predorsal length, 2.8 (from side-view figure) or 3.1 (from top-view figure). We assume that LeSueur obtained the type specimen of *Pimelodon livrée* and hence the type of *Pimelodus insigne, Pimelodus lemniscatus,* and *Pimelodon insignarius,* at some locality in the Mississippi River system, rather than in the "Southern States" as supposed by De Kay (1842: 187), or in Pennsylvania as suggested by Girard (1859: 159).

ROANOKE MADTOM

3. *Schilbeodes gilberti* (Jordan and Evermann)

Noturus gilberti.—Jordan and Evermann, *in* Jordan, 1888: 351–53, Pl. 43, Fig. 2 (original description; comparisons; Roanoke River at Roanoke, Salem, and Alleghany Springs). Jordan, 1890: 97, 122, Pl. 13, Fig. 2 (Roanoke River records).

Schilbeodes gilberti.—Jordan and Evermann, 1896*a:* 145, 148 (comparisons; description; range); 1896*b:* 234 (range; synonymy); 1900: 3236, Pl. 28, Fig. 67 (type from Roanoke River, Salem, Virginia). Schrenkeisen, 1938: 167 (characters; Virginia). Pratt, 1923: 97 (characters; range).

Rabida gilberti.—Jordan, 1929: 93 (characters; range; statement "widely distributed" unwarranted). Jordan, Evermann, and Clark, 1930: 156 (range). Pratt, 1935: 90, and Driver, 1942: 254 (compiled).

This species, of the Roanoke River system, has been known only from the original types of *Noturus gilberti.* Fowler (1935: 19, Fig. 36) did report and figure "*Rabida gilberti,*" from South Carolina, but the figure certainly does not represent *gilberti,* and the 2 young from Great Cypress Swamp prove on re-examination to be *S. m. marginatus* (Director E. Milby Burton of the Charleston Museum kindly loaned these specimens for study). We therefore synonymize Fowler's *Rabida gilberti* with *S. m. marginatus.*

Four specimens of *S. gilberti* were collected by E. C. Raney, E. A. Lachner, and L. J. Kezer, on March 31, 1940, in Roanoke River at Glenvar, Roanoke County, Virginia. They were secured with *S. m. atrorus* on a rubble riffle. These specimens agree well with the types, which have been examined in the National Museum.

S. gilberti is a species of very distinctive appearance. The characters by which it differs from *marginatus* are as follows: the head is short and broad; the pectoral spine is extremely short; the adipose fin is very low and short (it is developed along much less than half the distance between the rudimentary caudal rays and the end of the dorsal base); the first dorsal fin has a blackish base, but is otherwise pale (*marginatus* on the contrary has a pale fin with a blackish border); the caudal fin has an orange border, which is broader above than below; the tail fin is truncate and slightly emarginate; the barbels are unusually short and stubby; the eye is extremely small.

4. *Schilbeodes mollis* (Hermann)

It seems necessary to change the name of *Schilbeodes gyrinus* (for synonymy see Jordan and Evermann, 1896*a:* 146) to *S. mollis* (Hermann, 1804: 309). Attention has been called (Hubbs, 1936) to a generally overlooked volume by Johannes Hermann in which names were given in proper binomial form to several American fishes. Among these was *Silurus mollis,* which was treated as follows:

SILURUS MOLLIS. Nobis.

Pinna dorsali postica adiposa, cirris maxillae superioris quatuor, pinna anali radiis duodecim, radio primo dorsali pectorialiumque adjacenti spinae capitis similium mollibus candidis.

Venter valde mollis et flaccidus.

Ex America. Musei Humphrediani p. 131. No. 33.

It was first thought that this description was unrecognizable, but on further consideration it seems reasonably sure that Hermann had the species generally known as *Schilbeodes gyrinus* (Mitchill, 1818). The name *Silurus,* the locality "America" (to be considered in connection with the brief description, according to Opinion 52 of the International Commission on Zoological Nomenclature), and especially the statement that there are four superior maxillary barbels, renders it undeniable that Hermann had a species of the Ameiuridae. An ameiurid described in 1804 would almost certainly have

come from the Atlantic coast. Among the species occurring there the only ones in which 12 anal rays could conceivably have been counted are the species of *Schilbeodes:* a larger number would surely have been seen and recorded for any species of *Ictalurus* or *Ameiurus* occurring on the Atlantic coast. *Schilbeodes marginatus* has 15 to 20 anal rays, very seldom fewer than 17 (Table I), and of these all but 2 or 3 are readily visible. Therefore it would be extremely improbable that one would count only 12 anal rays in this madtom. The species heretofore known as *Schilbeodes gyrinus* is the only one in which the 12 count would likely have been made. In 20 specimens from southern New York and New Jersey the anal ray count averages only 15.50 (Table I). If rudiments are excluded, a count of 12 or 13 would be obtained in most of the specimens. A very diagnostic feature of *gyrinus* is stated by Hermann, "venter valde mollis et flaccidus." *S. marginatus* could hardly be said to have a very soft and flabby belly. The trim *S. leptacanthus,* which ranges north to South Carolina and has about as few anal rays as *gyrinus* (Table I), would certainly never have been so characterized.

The conclusion seems inescapable that Hermann described the tadpole madtom as *Silurus mollis* 14 years before Mitchill named it *Silurus gyrinus.* The name should therefore stand as *Schilbeodes mollis* (Hermann).

Greeley (1936: 84) used the trinomial, *S. gyrinus gyrinus,* for the Eastern form, "because of the probable validity of the form *sialis.*" It remains to be proved, however, that this species breaks up into definable subspecies over its wide range.

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Anonymous

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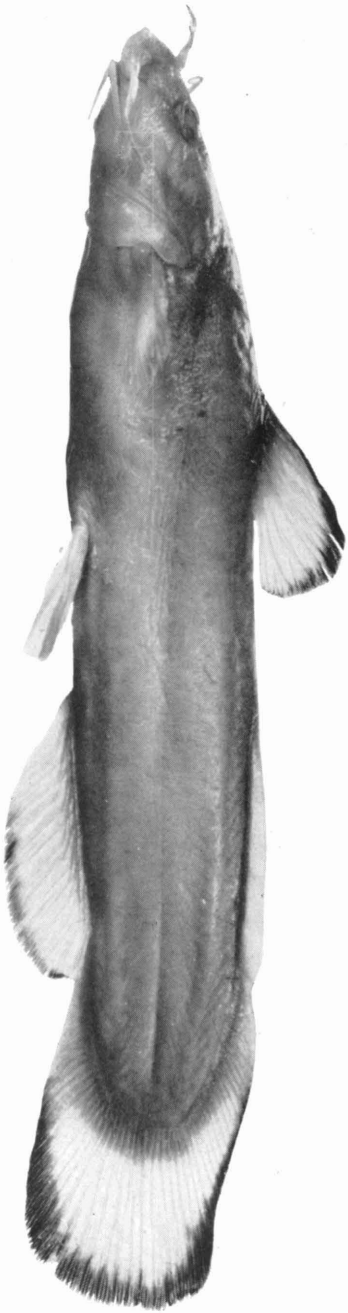
PLATE I

Schilbeodes marginatus atrorus, new subspecies

Holotype, 112 mm. in standard length, collected by Carl L. Hubbs and family, on August 22, 1936, in Wolf Creek, New River system, between Bastian and Novis, Bland County, Virginia.

Photographed by Clarence Flaton.



MAP 1. Distribution of *Schilbeodes insignis* and *Schilbeodes marginatus*, as indicated by record stations.

Solid marks represent localities of specimens examined. Hollow symbols are unconfirmed locality records.

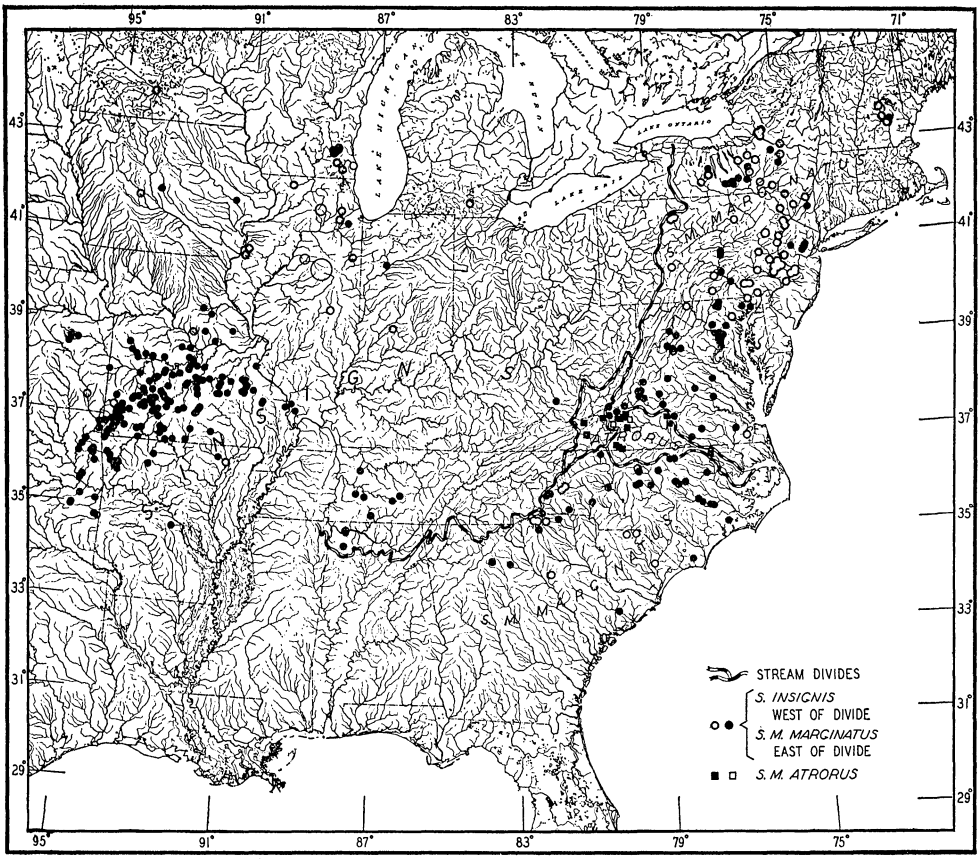
The Roanoke River system of the coastal drainage in Virginia and North Carolina and the upper Kanawha (New) River system, in the Mississippi drainage adjacent to the Roanoke system, are outlined, to enclose the known range of *Schilbeodes marginatus atrorus*. Otherwise all records for the Atlantic coast drainage are referred to *S. marginatus marginatus*, and all those for the Mississippi River system are allocated to *S. insignis*. From the Potomac system to the Neuse River some specimens approach and a few equal *S. m. atrorus*.

Some doubt is attached to the two records for the Great Lakes drainage, assigned to *S. insignis*. The record for "Root River, Wisconsin" (Jordan, 1878*b*: 67), obviously the basis for 1877–78 records for Lake Michigan (see synonymy and footnote on p. 18), is unconfirmed, and was possibly a slip for Oconomowoc River at Lac La Belle, Wisconsin, for there is an old specimen in the National Museum from that locality, collected by Hoy and identified as *exilis* by Jordan, and no material from Root River seems to be preserved. The one Michigan record (Kirsch, 1895: 327, 334–35) has been accepted with much doubt (Hubbs, 1926: 51–52, and subsequent treatises). Efforts to confirm this record by examining museum series and by collecting at the same locality have failed.

The one record for Minnesota (Cox, 1896: 608; 1897: 20; Surber, 1920: 21) has been doubted by Eddy and Surber (1943: 162–63), who have not collected any specimens in the state.

The largest circle in Illinois covers the streams of McLean County, the type locality of *Noturus exilis* Nelson (1876: 51). Forbes and Richardson (1909 and 1920: 398) indicated that the original specimens came from "Illinois River," but perhaps they meant Illinois River system. The two circles of intermediate size in Illinois refer to two other county records for *exilis*, namely De Kalb and Woodford counties. A few other records without precise location, like that of Graham (1885: 71) for Neosho River, Kansas, are approximately spotted on the stream named. Fowler's (1915: 209) record for "Brook River, Iowa," could not be located. A few reports for Atlantic coast streams, in regions well represented by other records, are not included. Probably some of Fowler's papers have been missed. The numerous collections of the New York Biological Survey, which have not been reported in detail, are mostly represented by single dots arbitrarily placed on the stated streams. The far eastern record for *S. insignis* is for the Guyandotte River, West Virginia (Goldsborough and Clark, 1908: 33). The exact location on the river is unknown. The one specimen taken is discussed on p. 13.

The record stations were spotted by Clark Hubbs and Laura C. Hubbs.


95°
91°
87°
83°
79°
75°
71°
43°
41°
39°
37°
35°
33°
31°
29°
LAKE MICHIGAN
LAKE ERIE
LAKE ONTARIO
STREAM DIVIDES
S. INSIGNIS
WEST OF DIVIDE
S. M. MARCINATUS
EAST OF DIVIDE
S. M. ATRORUS

MAP 1