

10.—REPORT OF EXPLORATIONS MADE IN ALABAMA DURING 1889, WITH NOTES ON THE FISHES OF THE TENNESSEE, ALABAMA, AND ESCAMBIA RIVERS.

BY CHARLES H. GILBERT.

The present paper is based primarily on collections and observations made during the summer of 1889 for the U. S. Fish Commission, by Philip H. Kirsch, William M. Andrews, and Everett O. Jones, students in the Indiana University. I have also added notes on such additional species as were obtained from the same region by Prof. Joseph Swain and the writer in 1884, and by Jordan, Evermann, and Bollman in 1886.

With the exception of the larger river fishes, which have not been collected by us, the present list is probably approximately complete for the bend of the Tennessee River. The results of the examination have been mainly noteworthy as showing the presence in the clear, cold spring-fed tributaries of this lower portion of the river of an unexpectedly large number of species characteristic of the head waters of the French Broad and the Holston Rivers.

The list from the Alabama River is far from complete, and additional collections are much needed from that region.

The following streams were examined :

A.—The Tennessee River :

1. Pin-hook Creek, Huntsville, Ala.
2. Spring Branch, Huntsville, Ala.
3. Veta Wright Creek, Decatur, Ala.
4. Mallett Creek, Hillsborough, Ala.
5. Spring Creek, Courtland, Ala.
6. Big Nance Creek, Courtland, Ala.
7. Spring Creek and Branch, Tuscum-
bia, Ala.
8. Cypress Creek, Florence, Ala.
- [9. Shoal Creek, Florence, Ala.*]
- [10. Duck River, Columbia, Tenn.*]
- [11. Richland Creek, Pulaski, Tenn.*]
- [12. Pigeon Roost Creeks, Pulaski,
Tenn.*]

B.—The Alabama River :

I. The Black Warrior River :

- [1. Eight-mile Creek, Cullman, Ala.*]
2. Mulberry River, Blount Springs,
Ala.
3. Stone Creek, Blount Springs.
4. Black Warrior at Warrior Station,
and Morris, Ala.*

B.—Alabama River—Continued.

5. Black Warrior, Tuscaloosa, Ala.
6. North River, Tuscaloosa, Ala.*

II. The Coosa River :

1. Cahawba River, Helena, Ala.
2. A small creek at Calera, Ala.
3. Clear Creek, Attalla, Ala.
4. Will's Creek, Attalla, Ala.
5. Choccolo Creek, Oxford, Ala.
6. Chestnut Creek, Verbena, Ala.

C.—The Escambia River :

1. Persimmon Creek, Greenville, Ala.
2. Hawkins Creek, Greenville, Ala.
3. Sand Creek, Evergreen, Ala.
4. Murder Creek, Evergreen, Ala.
5. Little Escambia River, Pollard,
Ala.
6. Will's Creek, Pollard, Ala.
7. Black Creek, Pollard, Ala.
- [8. Escambia River at Flomaton, Ala.*]
- [9. Escambia River at its mouth.†]

* Collections of Gilbert and Swain, 1884.

† Collections of Jordan, Evermann, and Bollman in 1886.

The following account of each of the streams examined is taken from the field notes of Mr. Kirsch :

THE TENNESSEE BASIN.

1. *Pin-hook Creek, Huntsville*, May 28, 1889. Temperature 74° Fah. Water clear, flowing swiftly ; bottom of blue limestone. Stream about 40 feet wide on the ripples and literally full of fishes, but no darters were obtained.

2. *Spring Creek, Huntsville*, May 27. Temperature 65° Fah. This small stream about 18 feet wide is formed by a single spring in the town of Huntsville. It is about one-fourth of a mile long and flows into Pin-hook Creek. Its bottom is similar to that of the former. It is full of fishes, darters being very numerous.

3. *Veta Wright Creek, Decatur*, June 1. A small stream 3 miles south of the town, about 15 feet wide and 3 feet deep, rather sluggish, the ripples covered with loose rocks of limestone and flint. In the deep holes are sticky mud and occasional large rocks. There is much driftwood. This stream flows northward into the Tennessee. Crayfishes are abundant.

4. *Mallett Creek, Hillsborough*, June 8, temperature 70° Fah. This is a small stream about 12 feet wide, with deep holes and many ripples. The bottom is sandy and smooth. Sunfish, pike, and catfish abound ; but few darters and minnows.

5. *Spring Creek, Courtland*, June 7. A cold stream rising in three or four springs. It has few ripples, a channel mostly deep and narrow, water swift. At some places it broadens into wide ponds. Examined at a point 3½ miles northeast of Courtland, Rock bass were especially abundant. Eighteen, taken from a single hole, averaged 2 pounds each.

6. *Big Nance Creek at Courtland*, June 7. A clear, cold, clean stream, about 4 feet wide. Bottom of limestone and flint with much loose rock. From the mill-pond at Courtland down the stream for about a mile there are many ripples. Below that, for 2 miles or more, the water is deep and flows slowly, and fish are very abundant.

7. *Spring Branch, Tusculumbia*, June 6. Temperature 52° Fah. This stream is formed by a single spring, is about one-eighth of a mile long, and flows into Spring Creek. The water is cold, clear, and swift. The bottom is strewn with rocks, and in many places overgrown with weeds. The stream contains little except darters and blob.

8. *Cypress Creek at Florence*, June 5. Temperature 68° Fah. A beautiful stream, about 75 feet wide, the water deep, the bottom a solid bed of flinty rock ; but few ripples. The stream is full of small fish.

THE ALABAMA BASIN.

TRIBUTARIES OF THE BLACK WARRIOR RIVER.

1. *Mulberry River at Blount Springs*, May 25. This stream is about 100 yards wide at the ford 2 miles from the town. It flows over a solid bed of rock, covered with many loose stones. The rocks dip upstream and crop out in large shelves.

2. *Stone Creek, Blount Springs*, May 25. A tributary of Mulberry River, so filled with irregular large rocks that seining is almost impossible.

3. *Black Warrior River, at Tuscaloosa*, May 21. Temperature 70° Fah. Collections were made chiefly on the lower shoals under the bridge; bottom of rock, covered with shingle. A great variety of fishes were taken.

TRIBUTARIES OF COOSA RIVER.

1. *Oahawba River, at Helena*, May 20. Temperature 70° Fah. This stream is about 150 feet wide and rather deep, the bottom covered with large rocks and fragments of flint. There are many ripples and some deep holes. Fishes are abundant.

2. *Calera Creek, Calera*, May 18. Temperature 68° Fah. A small stream 20 or 25 feet wide, slow flowing and not deep; the deeper holes with muddy bottom and full of snags. The ripples are covered with sand and loose pebbles. This stream was examined at a point about a mile from town, to the southwest.

3. *Clear Creek, Attalla*, May 24. A small stream about 15 feet wide flowing through a very hilly country. The bottom in the holes is covered with mud, the ripples with coarse gravel and sand. This stream flows into Will's Creek. It abounds in small fish.

4. *Will's Creek, Attalla*, May 24. Temperature 68° Fah. This stream is from 80 to 100 feet wide, rather deep, clear and cool. But few ripples, and these covered with loose rocks and finer gravel and sand. The bottom is flinty at places. Few fishes were taken.

5. *Choccolo Creek, at Oxford*, May 23. Temperature 68° Fah. Examined at a point 2 miles south of the town. This stream is about 60 feet wide, rather deep, clear and cool, with many ripples. On the ripples the water is swift and very shallow, the bottom covered with limestone. Fish are plenty. Shad were placed in this stream some years ago, but are said to be rarely taken.

6. *Chestnut Creek, at Verbena*, May 7. Temperature 70° Fah. This stream is about 30 feet wide and not very deep. The bottom is very rocky, covered with loose bowlders. The ripples are full of loose rocks, pebbles, and sand. Large fish are scarce. Following this stream 2 miles, we found six fish traps.

THE ESCAMBIA RIVER BASIN.

1. *Persimmon Creek, Greenville, Ala.*, May 15. A small stream 3 miles south-east of Greenville, 10 or 15 feet wide, shallow and muddy.

2. *Hawkins Creek, Greenville*, May 15. Temperature 66° Fah. Rather a deep, muddy stream, about 30 feet wide and full of snags. Seined at a point 5 miles south of Greenville.

3. *Sand Creek, at Evergreen*, May 14. A small stream 10 or 12 feet wide, shallow bottom, mostly muddy, sometimes gravelly. Seined at a point 3 miles east of Evergreen.

4. *Murder Creek, at Evergreen*, May 14. Temperature 73° Fah. This stream was visited at a point 2½ miles south of Evergreen. It flows for miles through low woodland, and is consequently full of snags and driftwood. There are many deep holes and few shoals. The shoals are covered with loose stones, the deeper parts full of mud.

5. *Little Escambia River, at Pollard*, May 13. Temperature 70° Fah. At about a mile south of Pollard the Little Escambia is about 50 feet wide, its water deep and

very swift. It flows through the woods, and is in places full of brush and driftwood. The ford is gravelly and sandy.

6. *Mill Creek, at Pollard, May 13.* Temperature 71° Fah. This is a small, dirty, sluggish little stream a mile north of town.

7. *Black Creek, at Pollard, May 13.* This is a small weedy stream 2 miles north of town. Its bottom is very muddy.

8. *Escambia River, at Flomaton, Ala.* Collections of Jordan, Evermann and Bollman, 1886. The stream at this point is clear and swift, the water rather cold, the bottom of sand and fine gravel.

9. *Escambia River, near its mouth in Florida.* Collections obtained from fishermen by Jordan and Bollman, 1886.

The following is in brief an itinerary of the summer's work in 1889 :

May 6.—Left Bloomington, Ind., the party consisting of P. H. Kirsch, E. O. Jones, and Wm. M. Andrews.

May 8.—At New Orleans, seined near West End, on Lake Pontchartrain.

May 9.—At Biloxi, Miss., Biloxi Bay.

May 10.—At Ocean Springs, Miss.

May 11.—At Ocean Springs, Miss., seined at Fort Bayou.

May 13.—At Pollard, Ala.

May 14.—At Evergreen, Ala.

May 15.—At Greenville, Ala.

May 17.—At Verbena, Ala.

May 18.—At Calera, Ala.

May 20.—At Helena, Ala.

May 21.—At Tuscaloosa, Ala.

May 23.—At Oxford, Ala.

May 24.—At Attalla, Ala.

May 25.—At Blount Springs and Huntsville, Ala.

May 27, 28.—At Huntsville.

June 1.—At Decatur, Ala.

June 4.—At Tuscumbia, Ala.

June 5.—At Florence, Ala.

June 6.—At Tuscumbia, Ala.

June 7.—At Courtland, Ala.

June 8.—At Hillsboro, Ala.

June 9.—Returned to Bloomington.

A.—THE BEND OF THE TENNESSEE RIVER.

1. *Lepidosteus osseus* L.

Found abundant in a pond emptying into Richland Creek at Pulaski, Tenn. The species does not often enter the smaller streams.

2. *Noturus miurus* Jordan.

Not abundant. Specimens taken in Duck River and in Cypress Creek.

3. *Noturus exilis* Nelson.

Rare. A few specimens from Richland and Cypress Creek.

4. *Noturus flavus* Raf.

Taken only in Shoal Creek at Florence.

5. *Ameiurus melas* Raf.

From Spring Creek, Huntsville.

6. *Ameiurus natalis* Le Sueur.

Mallett's Creek and Veta Wright Creek.

7. *Ictalurus punctatus* Raf.

Abundant in the Tennessee at Florence. Small specimens taken in Spring Creek at Courtland.

8. *Carpiondes difformis* Cope.

Richland Creek.

9. *Ictiobus bubalus* Raf.

Tennessee River at Florence.

10. *Catostomus teres* Mitchill.
Generally abundant in small tributaries of the Tennessee River.
11. *Catostomus nigricans* Le Sueur.
Abundant.
12. *Erimyzon sucetta* Lac.
A pond-fish. Not often taken in small streams. Found only in Cypress and Veta Wright Creeks.
13. *Minytrema melanops* Raf.
Moderately abundant.
14. *Moxostoma macrolepidotum duquesnei* Le Sueur.
Generally abundant.
15. *Moxostoma anisurum* Raf.
Not abundant. Taken in Richland Creek, Pulaski, and Spring Creek, Courtland.
16. *Lagochila lacera* Jordan and Brayton.
This interesting species was found abundant in Richland and Cypress Creeks.
17. *Campostoma anomalum* Raf.
Generally abundant. This species swarms in the clear cold streams entering the Tennessee, and is usually more slender and darker colored than when found farther north. I am not, however, able to recognize the species (or subspecies) *prolixum*, as the two forms perfectly intergrade.
18. *Chrosomus erythrogaster oreas* Cope.
Found only in Cypress Creek, where it is not abundant. The specimens were much brighter in coloration than is found in typical *erythrogaster*, and the lateral black band is interrupted instead of continuous as in the latter. The coloration is still brighter in typical *oreas* from the Roanoke River, but the pattern of coloration is the same, and *oreas* probably intergrades perfectly with *erythrogaster*.
19. *Hybognathus nelsoni* Agassiz.
Not generally abundant. Found at Tuscumbia, Courtland, and Huntsville.
20. *Pimephales notatus* Raf.
Everywhere abundant.
21. *Cliola vigilax* Baird & Girard.
At Tuscumbia, and in Richland Creek, Pulaski.
22. *Notropis spectrunculus* Cope.
This species, so abundant in mountain streams tributary to the Holston and French Broad Rivers, is very rare along the Lower Tennessee. Two specimens only have been taken, in the Big Nauce Creek at Courtland.
23. *Notropis deliciosus* Girard.
A single specimen from the Big Nauce.
24. *Notropis whipplei* Girard.
Generally abundant.
25. *Notropis galacturus* Cope.
Widely distributed, but less abundant than in mountain streams.
26. *Notropis megalops* Raf.
Everywhere the most abundant species.
27. *Notropis coccogenis* Cope.
Rare along the lower course of the Tennessee. A single specimen from Cypress Creek.

28. *Notropis ariommus* Cope.

Very abundant in Cypress Creek, but not taken elsewhere.

29. *Notropis boops* Gilbert.

Very abundant in Cypress Creek; taken also in the Big Nance and Veta Wright Creeks.

30. *Notropis leuciodus* Cope.

Like *spectrunculus*, *galacturus*, and *coccogenis*, this is a species characteristic of the mountain streams, and infrequently taken along the Lower Tennessee. Specimens were obtained in Cypress and Big Nance Creeks.

31. *Notropis umbratilis fasciolaris*, subsp. nov.

Everywhere abundant.

A comparison of these specimens with others from the Roanoke River (*ardens*), the Pamlico and Neuse (*matutinus*), the Wabash in Indiana (*cycanocephalus*), various streams in Illinois (*atripes*), and the Arkansas River (*umbratilis*), has shown the impossibility of recognizing any of these forms as distinct species. *Matutinus* is smaller and paler than *ardens*, and shows less brilliant coloration, these differences being apparently dependent upon the sluggish character of the streams which it inhabits, with their frequent sandy stretches. The resemblance between specimens from the Roanoke and the Tennessee is very close. Both have larger mouth and eye, more brilliant coloration, and more elongate form than in specimens from the north and west. (Our specimens from the Tennessee, however, average distinctly deeper than typical *ardens*, and are further characterized by the presence, in males, of several (5 to 8) dark steel-blue, vertical bars, irregular in position and shape.) This form I here distinguish provisionally as subspecies *fasciolaris*. In Tennessee and Kentucky it undoubtedly passes insensibly into the form common in tributaries of the Ohio and Mississippi (*cycanocephalus*, *atripes*), which shows usually an evidently deeper body, a smaller eye, and a tendency to the accumulation of black pigment in the tips of the ventrals and the anterior rays of the dorsal and anal. (Typical *umbratilis* from Kansas and Arkansas appears very distinct from the more easterly form.) It has the larger eye of *fasciolaris*, a very deep body, and adult males have all the fins largely black and the sides uniform dusky. Furthermore, the black spot at the base of the anterior dorsal rays, so characteristic of related forms, is here indistinct or wanting. In Iowa and Missouri, however, *umbratilis* appears to pass imperceptibly into *cycanocephalus*, some specimens lacking the dorsal spot, while others from the same locality, and not otherwise differing, have it well developed.

I have thought it best, therefore, to consider all these forms as poorly defined varieties of a single widespread species, which may stand provisionally as *N. umbratilis umbratilis*, *N. umbratilis cycanocephalus*, *N. umbratilis fasciolaris*, *N. umbratilis ardens*, and *N. umbratilis matutinus*. East of the Alleghanies the species has not been recorded north of the Roanoke nor south of the Neuse, and is not known from the Gulf States south of the Tennessee and Arkansas basins.

Rafinesque's *Semotilus diplæmius*, so long identified with this species, is evidently *Semotilus atromaculatus*, as a synonym of which it must appear.

32. *Notropis micropteryx* Cope.

A few specimens taken in Shoal Creek, near Florence, Ala.

33. *Ericymba buccata* Cope.

Not abundant in Cypress Creek.

34. *Phenacobius uranops* Cope.

Very abundant in all small clear tributaries of this portion of the Tennessee. Specimens from Cypress Creek, Big Nance, Shoal Creek, Duck River at Columbia, and Richland Creek at Pulaski, Tenn.

35. *Rhinichthys atronasmus* Mitchill.

Abundant in clear, cold streams fed by springs. Taken in Cypress Creek, Florence, and Pin Hook and Spring Creeks, Huntsville.

36. *Hybopsis kentuckiensis* Raf.

Cypress Creek, Mallett's Creek, and Duck River.

37. *Hybopsis dissimilis* Kirtland.

Rare. A few specimens from Shoal Creek.

38. *Hybopsis amblops* Raf.

Everywhere abundant.

39. *Hybopsis monachus* Cope.

Rare in Shoal Creek, Florence. Not seen elsewhere.

40. *Semotilus atromaculatus* Mitchell.

Generally abundant in ponds and sluggish streams. The lateral line averages about 55, as in specimens from the Alabama basin. I am not able to recognize the subspecies *thoreauianus*.

41. *Phoxinus vittatus* Cope (*Phoxinus flammeus* Jordan & Gilbert).

Found exceedingly abundant in the Huntsville Spring and in the small stream flowing from it. A few specimens also taken in Spring Creek, Tuscombina, and in Veta Wright Creek, Decatur.

42. *Opsopœodus emiliæ* Hay.

A single example from Mallett's Creek.

43. *Notemigonus chrysoleucus* Mitchill.

Veta Wright Creek.

44. *Fundulus catenatus* Storer.

Cypress, Shoal, Pin Hook, and Richland Creeks.

45. *Fundulus albolineatus*, sp. nov. (Plate XLIII, fig. 1.)

Males blackish brown, the sides plumbeous, the rows of scales with interrupted whitish streaks, most conspicuous on hinder half of body. A black streak along middle line of back. Vertical fins dusky, the caudal becoming translucent on distal half, its margin abruptly and narrowly black-edged.

Females olivaceous, dusky on back, silvery below, the back and sides with narrow black lines following the rows of scales. Fins translucent, the dorsal sometimes with fine black specks at base, the caudal black-edged.

Head $3\frac{1}{2}$ to $3\frac{3}{8}$ in length; depth 4 to $4\frac{1}{2}$; least depth of caudal peduncle equals snout and two-thirds eye. Lat. 1. 42; D. 10 or 11; A. 10 or 11; B. 5.

Teeth sharp, wide-set, in a broad band on premaxillaries, a narrow band on mandible. Snout one-third length of head. Width of interorbital space $2\frac{1}{4}$ to $2\frac{3}{8}$ in head.

Dorsal and anal opposite, or the dorsal slightly in advance, their bases equal and short, equaling length of snout and half eye. In males both fins become elevated, the longest anal ray equaling two-thirds head, and the anal rays become covered with prickles. In males the pectorals reach the ventrals, and the ventrals to or nearly to vent. Both are much shorter in females.

Several specimens, the longest $3\frac{1}{8}$ inches, from Spring Creek, Huntsville, Ala.

46. *Zygonectes notatus* Raf.
Everywhere abundant.
47. *Lucius vermiculatus* LeSueur.
Courtland, Hillsborough, and Decatur, Ala.
48. *Lucius reticulatus* LeSueur.
Cypress and Nance Creeks.
49. *Labidesthes sicculus* Cope.
Abundant at Florence, Tuscumbia, and Courtland.
50. *Aphredoderus sayanus* Gilliams.
A single specimen from Cypress Creek.
51. *Pomoxys sparoides* Lacépède.
Mallett's, and Veta Wright Creeks.
52. *Ambloplites rupestris* Raf.
Florence, Courtland, and Pulaski.
53. *Chænobryttus gulosus* C. & V.
Cypress, and Mallett's Creeks.
54. *Lepomis pallidus* Mitchill.
Generally abundant.
55. *Lepomis megalotis* Raf.
Everywhere abundant.
56. *Micropterus dolomieu* Lacépède.
Cypress Creek.
57. *Micropterus salmoides* Lacépède.
Abundant; generally distributed.
58. *Etheostoma nigrum* Raf.
Cypress Creek, and Spring Creek at Tuscumbia.
59. *Etheostoma stigmæum* Jordan. (= *Etheostoma saxatile* Hay).
This species is widely distributed throughout the basins of the Cumberland, Tennessee, Escambia, Alabama, and Pascagoula Rivers, and will doubtless be found in other Gulf rivers. It has also been taken in Arkansas. Comparison of *saxatile* with the type of *stigmæum*, and with additional material from the Coosa River, has shown their identity. Specimens are in the present collection from Cypress Creek and Big Nance.
60. *Etheostoma simoterum* Cope.
Everywhere very abundant. Along this portion of the Tennessee the most widely distributed and generally abundant of the darters.
61. *Etheostoma blennius* Gilbert and Swain.
Three additional specimens of this species were secured in Cypress Creek, and disagree with the original description in the following details: The dark bar before dorsal is narrower and does not cover all of nape. The eye in these smaller specimens is $4\frac{1}{2}$ in head. The width of branchiostegal membranes equals two-thirds distance from its anterior attachment to tip of lower jaw. The profile from nape to middle of interorbital space is gently declined, and the dorsal outline of body is more strongly arched than the ventral.
62. *Etheostoma blennioides* Raf.
Cypress and Shoal Creeks at Florence, and the Big Nance at Courtland.

63. *Etheostoma caprodes* Raf.
Generally abundant.
64. *Etheostoma scierum* Swain.
Three specimens from Spring Creek, Courtland.
65. *Etheostoma aspro* Cope & Jordan.
Not abundant. Taken at Tuscumbia and Hillsborough.
66. *Etheostoma evides* Jordan.
Rare. Two specimens from Duck River at Columbia, Tenn.
67. *Etheostoma zonale* Cope
Not abundant in tributaries of the Bend of the Tennessee. Taken in Cypress and Shoal Creeks and in the Big Nance.
68. *Etheostoma maculatum* Kirtland.
A few small specimens from Cypress Creek and Duck River.
69. *Etheostoma rufolineatum* Cope.
Not common. Taken in Cypress and Shoal Creeks, Florence.
70. *Etheostoma flabellare* Raf.
Huntsville and Florence; rare.
71. *Etheostoma squamiceps* Jordan.
Generally abundant and reaching a large size.
72. *Etheostoma cœruleum* Storer.
Very rare. Found only in Cypress Creek and at Tuscumbia.
73. *Etheostoma tuscumbiæ* Gilbert & Swain.
Very abundant at Tuscumbia. A few specimens found in Veta Wright Creek, Decatur.
74. *Cottus bairdi* Girard.
Generally abundant in clear cold streams.

Distribution of the species taken in the tributaries of the Bend of the Tennessee River.

	Pin-Hook Creek and Spring Branch, Huntsville.	Veta Wright Creek, Decatur.	Mallett's Creek, Hillsborough.	Spring Creek, and Big Nance, Courtland.	Spring Creek, Tusculumbia.	Cypress Creek, Florence.	Shoal Creek, Florence.	Duck River, Columbia, Tenn.	Richland and Pigeon Roost Creeks, Furbasski, Tenn.
Lepidosteus osseus.....									
Noturus minurus.....								+	+
Noturus exilis.....									
Noturus flavus.....						+			+
Ameiurus melas.....	+								
Ameiurus natalis.....		+	+						
Ictalurus punctatus.....				+				+	
Ictiobus bubalus*.....									
Carpoides difformis.....									+
Catostomus teres.....	+	+	+	+	+	+			+
Catostomus nigricans.....	+	+	+	+	+	+			+
Erimyzon succetta.....		+	+	+	+	+			+
Minytrema melanops.....			+	+	+	+			+
Moxostoma macrolepidotum.....	+		+	+	+	+		+	+
Moxostoma anisurum.....				+					+
Lagochila lacera.....									+
Campostoma anomalum.....	+	+	+	+	+	+			+
Chrosomus erythrogaster.....									+
Hybognathus nuchalis.....	+	+	+	+	+	+			+
Pimephales notatus.....	+		+	+	+	+			+
Chiola vigilax.....					+				+
Notropis spectrunculus.....									+
Notropis deliciosus.....									+
Notropis whipplei.....			+	+		+		+	+
Notropis galacturus.....					+				+
Notropis megalops.....	+	+	+	+	+	+		+	+
Notropis coccoegenis.....					+				+
Notropis ariommus.....									+
Notropis boöps.....		+		+		+			+
Notropis leuciodus.....				+		+			+
Notropis umbratilis fasciolaris.....	+		+	+	+	+		+	+
Notropis micropteryx.....							+		+
Ericymba buccata.....						+			+
Phenacobius uranops.....				+		+		+	+
Rhinichthys atronaso.....	+					+		+	+
Hybopsis kentuckiensis.....			+			+		+	+
Hybopsis dissimilis.....						+		+	+
Hybopsis amblops.....				+	+	+		+	+
Hybopsis monachus.....						+		+	+
Semotilus atromaculatus.....	+	+			+				+
Phoxinus vittatus.....	+	+	+		+				+
Opsopöodus emilia.....			+						+
Notemigonus chrysoleucus.....		+							+
Fundulus catenatus.....	+					+			+
Fundulus albolineatus.....	+								+
Zygonectes notatus.....		+	+	+	+	+			+
Lucius vermiculatus.....		+	+	+	+	+			+
Lucius reticulatus.....				+	+	+			+
Labidesthes sicculus.....				+	+	+			+
Aphredoderus sayanus.....						+			+
Pomoxys sparoides.....		+	+			+			+
Ambloplites rupestris.....			+	+		+	+		+
Chaenobryttus gulosus.....			+	+		+			+
Lepomis pallidus.....	+	+	+	+	+	+			+
Lepomis megalotis.....	+	+	+	+	+	+			+
Micropterus dolomieu.....				+	+	+			+
Micropterus salmoides.....		+	+	+	+	+			+
Etheostoma nigrum.....				+	+	+			+
Etheostoma stigmæum.....				+	+	+			+
Etheostoma simoterm.....	+	+	+	+	+	+		+	+
Etheostoma bienniis.....						+			+
Etheostoma biennioides.....				+	+	+	+		+
Etheostoma caprodes.....			+			+		+	+
Etheostoma scierum.....				+	+	+			+
Etheostoma aspro.....			+		+			+	+
Etheostoma evides.....							+		+
Etheostoma zonale.....				+		+			+
Etheostoma maculatum.....						+		+	+
Etheostoma rufolineatum.....						+			+
Etheostoma flabellare.....	+						+		+
Etheostoma squamiceps.....	+	+	+	+	+	+			+
Etheostoma coeruleum.....				+	+	+			+
Etheostoma tuscumbia.....		+			+	+			+
Cottus bairdi.....	+		+	+	+	+			+

* Tennessee River at Florence.

B.—THE ALABAMA BASIN.

1. *Lepidosteus osseus* L.
Black Warrior River, Tuscaloosa.

2. *Noturus leptacanthus* Jordan.
Oxford and Helena.

3. *Noturus funebris* Gilbert & Swain, sp. nov.

Body elongate, the head slender, comparatively little depressed, not tapering rapidly towards tip of snout. Mouth of moderate size, the cleft very convex forwards, the upper lip heavy and projecting distinctly beyond it. Width of gape, $1\frac{1}{2}$ in head. Premaxillary band of teeth short and broad, without lateral backward processes. Barbels all slender and threadlike, that of maxillary extending beyond base of pectoral spine. Outer mental barbels extending much beyond margin of branchiostegal membranes, equaling length of head anterior to preopercle. Nasal barbels when laid back reach to posterior point of opercle. Eyes very small, two-fifths length of snout, one-third width of interorbital space, which is slightly less than one-half head. Eye about 7 in head.

Spines slender and short. The pectoral spines one-half longest pectoral ray, and one-third length of head; they are roughened without and have three or four small weak teeth on inner margin. Distance from snout to front of dorsal, $2\frac{2}{3}$ in length. Dorsal spine less than half longest ray, which is about half length of head. Caudal rounded, its rudimentary rays very strongly developed, extending along under side of tail to base of anal fin, and along upper side to slightly beyond this point. Adipose fin well developed, forming a conspicuous notch where it joins rudimentary caudal rays. Ventrals to beyond front of anal.

Head 4 in length; depth $5\frac{1}{2}$. D. I, 6; A. 23 (in four specimens), its base two-sevenths length; length $3\frac{1}{2}$ times.

Color of body and fins uniform brownish-black, the belly uniform dusky. Barbels black.

Four specimens of this species were taken during the summer of 1884 in a spring run tributary to North River, near Tuscaloosa, Ala.

4. *Ameiurus melas* Raf.
Black Warrior River, Tuscaloosa.

5. *Ameiurus natalis* LeSueur.
Abundant in a pond fed by springs at Tuscaloosa.

6. *Ictalurus punctatus* Raf.
Clear Creek, Attalla, and Hoglan's Creek at Warrior Station.

7. *Catostomus nigricans* LeSueur.
Generally abundant.

8. *Moxostoma macrolepidotum duquesnei* LeSueur.
Abundant.

9. *Moxostoma pœcilurum* Jordan.
A single specimen from Clear Creek, Attalla.

10. *Placopharynx carinatus* Cope.
Tuscaloosa. Apparently not rare.

11. *Erimyzon sucetta* Lacépède.
Calera and Cullman, Ala.

12. *Minytrema melanops* Raf.
Choccolo Creek, Oxford.
13. *Campostoma anomalum* Raf.
Generally distributed.
14. *Hybognathus nuchalis* Agassiz.
Tuscaloosa. I am unable to distinguish *hayi* from *nuchalis*.
15. *Pimephales notatus* Raf.
Hoglan's Creek, Warrior.
16. *Cliola vigilax* Baird and Girard.
Tuscaloosa and Attalla; not abundant.
17. *Notropis venustus cercostigma* Cope.
Exceedingly abundant. There is a recognizable difference between Texan and Alabamian specimens of *venustus*. The latter have a more elongate body, darker coloration, and the caudal spot more elongate, extending farther back on median caudal rays. The scales average a trifle smaller, 40 or 41 instead of 38 or 39, the range of variation being from 37 or 38 to 42 in both forms. Typical *venustus* have the caudal spot nearly circular.
18. *Notropis callistius* Jordan.
This species is abundant throughout the Alabama basin, of which it is apparently characteristic.
19. *Notropis trichroistius* Jordan and Gilbert.
Everywhere accompanying *callistius*, which this species very strongly resembles. It may apparently be distinguished by its larger oblique mouth and sharp nose.
20. *Notropis cœruleus* Jordan.
This beautiful species is seemingly not abundant. Specimens were secured at Attalla and Oxford.
21. *Notropis megalops* Raf.
Generally abundant.
22. *Notropis chrosomus* Jordan.
Found abundant in a small creek tributary to the Black Warrior River near Tuscaloosa. Not taken elsewhere.
23. *Notropis xænocephalus* Jordan.
Generally abundant, and easily distinguished by the conspicuously checkered appearance of the back, owing to the darker margins of the scales. Adults show a well-marked lateral band, which may pass around the snout.
24. *Notropis stilbius* Jordan.
Everywhere abundant. Always showing a cluster of black dots at base of caudal, which may form a conspicuous black spot. To specimens with such a spot, was given the manuscript name *Notropis spilurus*, Gilbert and Swain, in Jordan's Catalogue of Fishes N. A., page 26.
25. *Phenacobius catostomus* Jordan.
Big Cahawba at Helena. Very close to *P. uranops*, with which it agrees in size of head ($4\frac{1}{2}$ to 5 in length) and in width of isthmus ($2\frac{1}{2}$ to 3 in head). It differs in its deeper head and body, and in its much thinner lips.
26. *Hybopsis kentuckiensis* Raf.
At Chestnut Creek, Verbena; not abundant.

27. *Hybopsis amblops rubrifrons* Jordan.
Attalla, Oxford, and Helena; apparently not abundant.
28. *Hybopsis hyostomus* Gilbert.
Abundant at Tuscaloosa and at Oxford. Agreeing perfectly with types of the species from Indiana.
29. *Semotilus atromaculatus* Mitchill.
Abundant. Scales 55 and 56.
30. *Notemigonus chrysoleucus* Mitchill.
Tuscaloosa and Calera.
31. *Fundulus stellifer* Jordan.
Attalla, Oxford, and Helena. Adult males with very conspicuous broad jet-black margins to vertical fins.
32. *Zygonectes notatus* Raf.
Black Warrior River at Tuscaloosa and Morris, and Hoglan's Creek, Warrior.
33. *Lucius reticulatus* LeSueur.
Tuscaloosa and Helena.
34. *Tylosurus marinus* Bloch and Schneider.
A specimen, measuring about a foot long, was taken in the Black Warrior River at Tuscaloosa.
35. *Lepomis pallidus* Mitchill.
Generally distributed, but less abundant than the next.
36. *Lepomis megalotis* Raf.
Everywhere common.
37. *Micropterus salmoides* Lacépède.
38. *Micropterus dolomieu* Lacépède.
39. *Etheostoma beani* Jordan.
Tuscaloosa.
40. *Etheostoma asprellum* Jordan.
Choccolo Creek, Oxford. A single specimen.
41. *Etheostoma stigmæum* Jordan.
Generally abundant.
42. *Etheostoma simoterum* Cope.
Abundant in the Alabama basin, and varying more or less from the typical form.
43. *Etheostoma blennioides* Raf.
Big Cahawba, Helena. The form is somewhat more slender in these Southern specimens, and the V-shaped markings are less distinct and regular than in Northern specimens.
44. *Etheostoma copelandi* Jordan. (= *Etheostoma putnami* Jordan & Gilbert.)
Abundant in the Black Warrior at Tuscaloosa. Specimens of this species recently collected by Dr. J. A. Henshall at Put-in-Bay, Ohio, have scales varying from 47 to 52; others from New Harmony, Indiana, vary from 46 to 51. In the Alabama specimens the lateral line averages 53. I am thus unable to longer distinguish *putnami* (characterized by its larger scales) from *copelandi*.
45. *Etheostoma caprodes* Raf.
Everywhere abundant.
46. *Etheostoma nigrofasciatum* Agassiz.
Generally abundant.

47. *Etheostoma rupestre* Gilbert & Swain.

North River near Tuscaloosa.

48. *Etheostoma* (*Nothonotus*) *jordani*, sp. nov. (Plate XLIII, fig. 2.)

Closely related to *E. rufolineatum*, from which it differs conspicuously in form and coloration.

Body rather deep, compressed, the caudal peduncle slenderer than in related forms, the anterior profile much more convexly decurved, the snout blunter.

Mouth terminal, oblique, rather small, the maxillary scarcely reaching vertical from front of pupil, $3\frac{2}{5}$ in head. Premaxillaries on level of lower margin of orbit, the jaws about equal. Eye equaling snout, $4\frac{1}{3}$ to $4\frac{1}{2}$ in head, twice interorbital width. Preopercle entire. Gill membranes not united.

Spinous dorsal high, the spines strong, the membrane from last spine not joining base of soft dorsal; highest dorsal spine slightly more than half length of head. Base of soft dorsal $1\frac{1}{2}$ in base of spinous dorsal. Anal shorter than soft dorsal, and inserted more anteriorly, the first spine longer and stronger than the second, two-thirds the height of longest anal ray, and one-third length of head. Caudal fan-shaped when widely spread. Pectorals reaching beyond tips of ventrals, $1\frac{1}{4}$ in head; ventrals extending half way to base of second anal spine.

Scales large, strongly ctenoid, present on nape, the breast naked; opercles scaly, head otherwise naked. No enlarged black humeral scale. Lateral line complete, or wanting on occasional scales in its course, straight.

Head $3\frac{1}{2}$ to $3\frac{3}{4}$ in length; depth $4\frac{3}{4}$ to 4. D. x or xi-10 to 12; A. I. 7 or 8; Lat. l. 43 to 55 (averaging 48).

Colors probably brilliant in life. In spirits, the males are olivaceous, darker above, the sides, with faint, narrow longitudinal dark lines running between the rows of scales. Back with 8 black cross-bars wider than the interspaces; the first on nape, the second under and in advance of origin of spinous dorsal, the fifth under first rays of soft dorsal. The first bar is continued downwards into axil of pectorals, the others usually not reaching lateral line. Middle of sides with irregular bars usually formed of disconnected blotches, and 9 or 10 in number. A pair of black blotches at base of median caudal rays, and sometimes a pair at base of outer rays. Fin rays all blackish, the membranes lighter. Basal half of anterior portion of spinous dorsal black, its margin narrowly white, a narrow submarginal dark line below it. Soft dorsal and caudal with a wide white (probably orange in life) submarginal band, the tips narrowly black. Anal and ventrals similar, but without black margin. Pectorals uniform dusky, with light membranes. Snout and top of head blackish; a small black spot behind eye. Fins probably blue and orange in life. Females mottled, with fins barred. Abundant in Choccolo Creek, Oxford, and Chestnut Creek, Verbena.

49. *Etheostoma squamiceps* Jordan. (= *Etheostoma parvipinnis* Gilbert & Swain.)

This widely distributed species varies extremely in appearance, in number of fin-rays, and in squamation. Specimens from the Alabama basin (*parvipinnis*) are usually smaller, with less elevated fins and fewer fin-rays, but seem to vary perfectly into the typical form.

From Calera.

50. *Etheostoma whipplei alabamæ* Gilbert & Swain.

Abundant in tributaries of the Black Warrior River. Also taken in the Big Cahawba, at Helena.

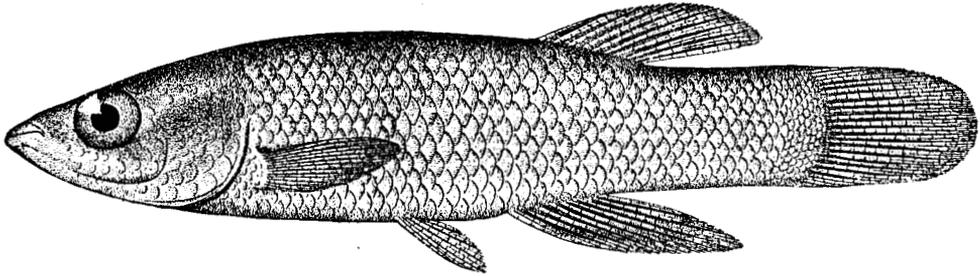


FIG. 1. *FUNDULUS ALBOLINEATUS*. (About twice natural size.)

(See page 149.)

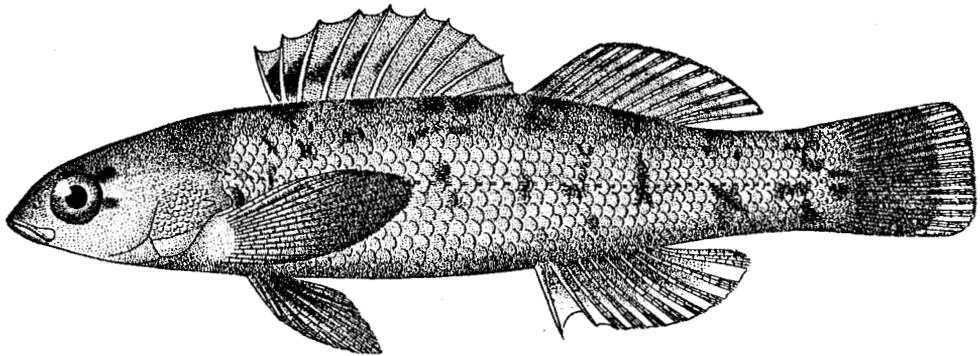


FIG. 2. *ETHEOSTOMA JORDANI* Gilbert. (About 2½ times natural size.)

(See page 156.)

51. *Cottus bairdi* Girard.

Big Cahawba River at Helena; Clear Creek and Will's Creek, Attalla; Chochole Creek at Oxford.

Distribution of the species taken in the tributaries of the Alabama River.

	Eight-mile creek, Cullman.	Mulberry Fork, Blount Springs.	Black Warrior River at Warrior Station and Morris.	Black Warrior River and North River, Tuscaloosa.	Big Cahawba River, Helena.	A small creek at Calera.	Clear Creek, Will's Creek, Attalla.	Chochole Creek, Oxford.	Chestnut Creek, Verbena.
<i>Lepidosteus osses</i>				+					
<i>Noturus leptacanthus</i>				+					
<i>Noturus funebris</i>				++				+	
<i>Ameiurus melas</i>				++					
<i>Ameiurus natalis</i>				+					
<i>Ictalurus punctatus</i>			+				+++		
<i>Catostomus nigricans</i>		+						++	+
<i>Moxostoma macrolepidotum duquesnoi</i>	+		+	+	++		+++	++	
<i>Moxostoma pæcilurum</i>		✓							
<i>Placopharynx carinatus</i>				+					
<i>Erimyzon sucetta</i>	+					+			
<i>Minytrema melanops</i>				+				+	
<i>Campostoma anomalum</i>	+	+		+	+				+
<i>Hybognathus nuchalis</i>				+					
<i>Pimephales notatus</i>									
<i>Oliola vigilax</i>									
<i>Notropis venustus cercostigma</i>	+	++		++	++		++	++	+
<i>Notropis callistius</i>		++	+	++	++		++	++	++
<i>Notropis trichroistius</i>			+	++	++		++	++	++
<i>Notropis œaruleus</i>				++	++		++	++	++
<i>Notropis megalops</i>				++	+	+	++	++	+
<i>Notropis chrosomus</i>				++	++		++	++	++
<i>Notropis xanoccephalus</i>	+		+	++	++	+	++	++	++
<i>Notropis stilbius</i>	+		+	++	++		++	++	++
<i>Phenacobius catostomus</i>				++	++		++	++	++
<i>Hybopsis kentuckiensis</i>				++	++		++	++	++
<i>Hybopsis amblops rubrifrons</i>				++	++		++	++	++
<i>Hybopsis hyostomus</i>				++	++		++	++	++
<i>Semotilus atromaculatus</i>	+	+		++	++	++	++	++	++
<i>Notomigonus chrysoleucus</i>				++	++		++	++	++
<i>Fundulus stellifer</i>				++	++		++	++	++
<i>Zygonectes notatus</i>			+	++	++		++	++	++
<i>Lucius reticulatus</i>				++	++		++	++	++
<i>Tylosurus marinus</i>				++	++		++	++	++
<i>Lepomis pallidus</i>	+		+	++	++		++	++	++
<i>Lepomis megalotis</i>	+		+	++	++		++	++	++
<i>Micropterus salmoides</i>		++		++	++		++	++	++
<i>Micropterus dolomieu</i>				++	++		++	++	++
<i>Etheostoma beani</i>				+	+		+	+	+
<i>Etheostoma asprellum</i>				+	+		+	+	+
<i>Etheostoma stigmaeum</i>				+	+		+	+	+
<i>Etheostoma simoterum</i>		+		+	+		+	+	+
<i>Etheostoma biennioides</i>				+	+		+	+	+
<i>Etheostoma copelandi</i>				++	++		++	++	++
<i>Etheostoma caprodes</i>				++	++		++	++	++
<i>Etheostoma nigrofasciatum</i>	+	+		++	++	+	++	++	++
<i>Etheostoma rupestre</i>				+	+		+	+	+
<i>Etheostoma jordani</i>				+	+		+	+	+
<i>Etheostoma squamicops</i>				+	+	+	+	+	+
<i>Etheostoma whipplei alabama</i>			+	+	+	+	+	+	+
<i>Cottus bairdi</i>					+				

C.—ESCAMBIA RIVER.

1. *Noturus leptacanthus* Jordan.

Little Escambia, Hawkins Creek, and Sandy Creek.

2. *Erimyzon sucetta* Lacépède.

Black Creek and Escambia River at Flomaton.

3. *Minytrema melanops* Raf.
Sandy Creek and Escambia River at Flomaton.
4. *Pimephales notatus* Raf.
Persimmon Creek.
5. *Ericymba buccata* Cope.
Sandy Creek and Escambia River at Flomaton.
6. *Notropis longirostris* Hay.
Persimmon Creek. Several specimens of a small blunt-headed silvery minnow, agreeing perfectly with Hay's description, excepting the dentition, which is 1—4—4—1, or 1—4—4—0.
7. *Notropis venustus cercostigma* Cope.
Little Escambia, Hawkins Creek, Persimmon Creek, Sandy Creek, and Escambia River at Flomaton.
8. *Notropis xænocephalus* Jordan.
Sandy Creek and Escambia River at Flomaton.
9. *Notropis roseipinnis* Hay.
Hawkins Creek, Persimmon Creek, and Sandy Creek.
10. *Notropis metallicus* Jordan & Meek.
Sandy Creek. A single specimen of this interesting species, not previously seen since its original description from the Altamaha River, Georgia.
11. *Notemigonus chrysoleucus* Cuv. & Val.
Hawkins Creek and Escambia River near its mouth.
- [12. *Clupea chrysochloris* Raf.]
Escambia River near its mouth.
- [13. *Clupea sapidiissima* Wilson.]
Escambia River near its mouth.
- [14. *Dorosoma cepedianum* Le Sueur.]
Escambia River near its mouth.
15. *Gambusia patruelis* B. & G.
Black Creek.
16. *Fundulus stellifer* Jordan. W.
Will's Creek.
17. *Zygonectes notatus* Raf.
Little Escambia, Will's Creek, Hawkins Creek, Persimmon Creek, and Sandy Creek.
18. *Zygonectes guttatus* Agassiz. (= *Zygonectes escambiae* Bollman.)
Black Creek and Escambia River at Flomaton.
19. *Zygonectes cingulatus* Cuv. & Val.
Little Escambia, Black and Will's Creek, Escambia River at Flomaton and near its mouth.
I follow Mr. Bollman in his identification of this species with the *Fundulus cingulatus* of Cuvier and Valenciennes, on the strength of notes taken by Dr. Jordan from the original types. The original description of *cingulatus* would be insufficient identification.
20. *Lucius americanus* Gmelin.
Hawkins Creek. The easternmost record for this species.

21. *Lucius reticulatus* Le Sueur.
Little Escambia and Escambia River at Flomaton.
22. *Lucius vermiculatus* Le Sueur.
Black and Sandy Creeks.
23. *Anguilla anguilla chrisypa* Raf.
Will's Creek.
24. *Labidesthes sicculus* Cope.
Will's Creek.
- [25. *Pomoxys sparoides* Lacépède.]
Escambia River near its mouth.
26. *Chaenobryttus gulosus* Cuv. & Val.
Hawkins Creek and Escambia River near its mouth.
27. *Lepomis pallidus* Mitchill.
Black, Will's, Hawkins and Sandy Creeks; Escambia River near its mouth.
28. *Lepomis megalotis* Raf.
Little Escambia; Black, Will's, Hawkins, Persimmon, and Sandy Creeks; Escambia River near Flomaton.
- [29. *Lepomis holbrooki* Cuv. & Val.] E.
Escambia River near its mouth.
30. *Micropterus salmoides* Lacépède.
Little Escambia; Black, Will's, Hawkins and Sandy Creeks; Escambia River near its mouth.
31. *Etheostoma beani* Jordan.
Little Escambia; Hawkins, Persimmon, and Sandy Creeks; Escambia River at Flomaton.
32. *Etheostoma simoterum* Cope.
Sandy Creek.
33. *Etheostoma uranidea* Jordan & Gilbert.
Several specimens from the Little Escambia at Pollard. These are slender and pale, but do not otherwise differ from northern specimens.
34. *Etheostoma nigrofasciatum* Agassiz.
Little Escambia; Will's, Hawkins, Persimmon, and Sandy Creeks; Escambia River at Flomaton.
35. *Etheostoma squamiceps* Jordan.
Little Escambia; Will's and Sandy Creeks; Escambia River at Flomaton.
36. *Etheostoma procliaris* Hay. L.
Little Escambia. Lateral line developed on 3 or 4 scales. Anal spines two.
- [37. *Roccus lineatus* Bloch.]
Escambia River near its mouth.
38. *Cottus bairdi* Girard.
Will's Creek.

INDIANA UNIVERSITY,
Bloomington, Ind., April 23, 1891.