

Table of measurements.

Species Locality	Caranx beani. Beaufort, N. C.		Caranx cibi. Cuba.	
	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.
Extreme length	6. 85	-----	11. 00	-----
Length to end of caudal armature	5. 48	100	9. 00	100
Body:				
Greatest height		43		33
Greatest width		15		14
Height at ventrals		38		30
Least height of tail		7		4
Length of caudal peduncle		8		10
Head:				
Greatest length		30		30
Distance from snout to nape		27		-----
Greatest width		15		-----
Width of interorbital area		11½		10
Length of snout		10½		10
Length of the operculum		8		8
Length of maxillary		14		11½
Length of mandible		16		15
Diameter of orbit		9		7
Dorsal (spinous):				
Distance from snout		43		40
Length of base		17		-----
Greatest height		9		10
(Soft) length of base		38		34½
Height at longest ray		13		12½
Anal:				
Distance from snout		63		-----
Length of base		38		31
Height at first free spine		4		2½
Height at longest ray		11		-----
Caudal:				
Length of middle rays		8		-----
Length of external rays		27		26
Pectoral:				
Length		30		34
Ventral:				
Length		13		11
Dorsal		VIII-I, 26		VIII-I, 25
Anal		II-I, 22		II-I, 22
Number of plates in lateral line		25		29

INDIANA STATE UNIVERSITY,
Bloomington, Ind., November 10, 1880.

ON A COLLECTION OF FISHES FROM EASTERN MISSISSIPPI.*

By O. P. HAY.

The collection of fishes which it is the object of the present paper to describe was made almost wholly by the author, while on a trip along the eastern side of the State of Mississippi, during the latter part of March and the early part of April of the present year, 1880. The route taken was along the Mobile and Ohio Railroad, and extended from Corinth, near the northern line of the State, to Shubuta, a town about one hundred miles north of Mobile. Stops were made along this line of travel of from a few hours to four or five days. The conditions for col-

*A full series of these has been presented to the National Museum.

lecting were usually very unfavorable, on account of high water and the superabundance of logs and snags. Nevertheless, I succeeded in collecting altogether 53 species. Three additional species, and additional specimens of several species that I had already secured, have since been sent me by Mr. William A. Warner, of Enterprise.

Of the 56 species named in the succeeding pages, I describe 15 as new—7 of them in the family of *Etheostomatidae*, and 8 in *Cyprinidae*. Little has yet been done in the way of determining the fish fauna of this and some of the other Southern States, where so rich a field is offered to the naturalist.

At Corinth a few draws were made with the seine in a little stream that runs near the railway depot. This stream is a branch of the Tuscumbia, which eventually empties into the Mississippi through the Big Hatchee.

At Artesia, in Lowndes County, my collecting was done in Catawba Creek and its branches and ponds. This creek flows into the Tibbyhah, itself an affluent of the Tombigbee. South of this point, I next fished at Macon, in Noxubee County, on the Noxubee River. The river itself was too high to enter, and I had to content myself with working the ponds and Horsehunter Creek, which at this point flows into the Noxubee.

At Narkeeta, in Kemper County, I saw a few "Sunfishes" taken from the Sucarnochee River, a tributary of the Tombigbee.

At Enterprise, in Clarke County, my collecting was done in the Chickasawha River and its branches, near the town. I have in my collection from that place 33 species. One species was caught with a hook from the same stream at Shubuta, in the south part of the same county. Further south this river joins the Leaf, to form the Pascagoula, which flows into the Gulf.

I have not in this paper attempted to discuss the geographical distribution of the species obtained, as this I consider useless until a much more complete survey of the State has been made. This I hope to be able to do at some future time. At the end of this paper I subjoin a list of the species obtained at each of the localities that I have named.

Types of the new species described have been furnished the National Museum, as well as duplicates of most of the others. Duplicates of some of the new species have also been placed in Professor Jordan's collection. The remainder of the collection is the property of Butler University, at Indianapolis, Indiana.

I take pleasure in acknowledging my indebtedness to Prof. D. S. Jordan for various suggestions made in reference to the species herein named, as well as for general aid obtained from his numerous papers on the fresh-water fishes of our country.

FAMILY ETHEOSTOMATIDÆ.

GENUS AMMOCRYPTA, Jordan.

1. *Ammocrypta gelida*, Hay, sp. nov. (No. 27,425, U. S. Nat. Mus.)

General form of the body that of *P. pellucidus* (Bd.) Ag.; terete, slender, and in life almost transparent. Head pointed. Mouth terminal, larger than in *P. pellucidus*, the maxillary bone extending back to a vertical from the anterior of the orbit.

Jaws armed with large, curved teeth. Eyes high up, 4 in the head, less than the length of the snout.

Cheeks and opercles naked. Opercular spine absent, the bone terminating behind in a thin and obtuse process.

Body almost naked; about three rows of pectinated scales along the lateral line, 65 scales in each row.

The rays of the median fins as follows: D. X, 11; A. I, 10 or 9. Dorsals separated. Length of spinous dorsal eight-ninths that of the head, and four-fifths as high as long. Soft dorsal three-fourths the length of the head, and two-thirds as high as long. Anal, in length, slightly less than soft dorsal, and a little less in height than in length.

Head in the length to base of caudal 4; depth in length $7\frac{1}{2}$.

Color of the body in spirits white; in life translucent, with a golden yellow band along each side. Head above dusky, from being thickly sprinkled with black points. A few such points are scattered over the whole dorsal surface. Spinous dorsal with a black spot about half way up in front. Soft dorsal, anal, and caudal slightly dusky. No spots along the sides or dorsal region.

Length to base of caudal $1\frac{4}{5}$ inches.

Found in the Chickasawha River at Enterprise. It seems to prefer a sandy bottom.

The description of this species seems to agree pretty well with that of *Ammocrypta beanii*, published by Professor Jordan in Bulletin No. 10 of the United States National Museum. Judging from his description, however, my species is slenderer and has a head comparatively shorter. *A. beanii* has depth in length 6, head $3\frac{3}{4}$. The fin formula is also different, being in his species D. X, 10; A. I, 9. The coloration of the spinous dorsal is different. Nor do I observe that the soft dorsal and anal fins of my species are notably higher than they are in specimens of *P. pellucidus*.

To the generic characters given by Professor Jordan in his description of *A. beanii* I will add that of the complete absence of an opercular spine. This spine is wanting in no other Etheostomoid fishes known to me, although it is feebly developed in *Microperca punctulata*.

GENUS PERCINA, Hald.

2. *Percina caprodes* (Raf.) Grd. (No. 27,424, U. S. Nat. Mus.)

Percina caprodes, JORDAN, Annals N. Y. Lyc. Nat. Hist. 1877, 312 (Synonymy)

A single specimen of the "Hog-fish", taken from the Chickasawha, has been sent me by Mr. W. A. Warner.

GENUS HADROPTERUS, Agassiz.

3. *Hadropterus spillmani*, Hay, sp. nov. (No. 27,432.)

Body elongated, compressed. Head in the length about 4 times. Depth in the length, exclusive of the caudal fin, 5 times. Eye equal to snout, and one-fourth the length of the head.

Lateral line with from 56 to 60 scales, 6 rows above and 9 below. A row of enlarged, non-deciduous, ctenoid plates along the middle of the belly. Cheeks and opercles scaled. The whole chest covered with small plates or scales.

The fin-rays as follows: D. XII, 12; A. II, 9. Spinous dorsal about nine-tenths as long as the head, and one-half as high as long; soft dorsal three-fifths as long as the head, and five-sixths as high as long; anal equal in length to the soft dorsal, and about as high as long. Ventrals and pectorals reaching back about to the same point, two-thirds the distance from the base of the ventrals to the vent. Caudal fin truncated. Spinous and soft dorsals well separated.

The snout is rather pointed; upper jaw not protractile; mouth moderate, the maxillary reaching back to a vertical from the anterior of the orbit. Teeth on jaws, vomer, and palatines. Mouth slightly oblique.

The general color is dark above, reddish yellow below. The sides are crossed by about a dozen brown bands, which are broadest along the lateral line, where coalescing they form a dark horizontal band. This band becomes narrower and better defined on the head, and is continued along the upper edge of the opercle and cheek, through the eye, to the tip of the snout. A narrow dark line runs downward and forward from the lower edge of the orbit. There are three well-defined spots at the base of the caudal fin.

The vertical fins are blotched more or less with dusky colors; the ventrals are bluish black, while the pectorals are lighter.

The cheeks and the occipital region are pale in color; the snout and interorbital space are bluish black.

Length, exclusive of caudal fin, 3 inches.

This species is allied to *H. nigrofasciatus*, a description of which is given by Professor Jordan in the Ann. N. Y. Lyc. Nat. Hist. 1877, 310. Judging from a comparison of my specimens with his description, I think that they evidently belong to a distinct species.

Several specimens of this handsome fish were caught with small hooks in a branch flowing into the Chickasawha at Enterprise. I dedicate it to my friend Rev. William Spillman, M. D., of Enterprise, who

has spent a long life in scientific labors in the South, and who has thereby done much to increase our knowledge of the geology and natural history of his own and neighboring States.

GENUS BOLEOSOMA, DeKay.

4. *Boleosoma maculatum*, Agassiz. (No. 27, 443.)

B. brevipinne, COPE, Proc. Amer. Phil. Soc. 1870, 268.

A single specimen of a *Boleosoma* was obtained in Horsehunter Creek at Macon. An examination indicates that it is *B. maculatum*, although it does not agree wholly with descriptions of that species. It is much paler than specimens of that species obtained in the streams about Indianapolis. There are no dark bars on the back, and the spots usually found along the lateral line are not as conspicuous as common. The fin formula is D. VIII, 12; A. I, 8. Lateral line 50.

I do not believe that the separation of *B. olmstedii* and *B. maculatum* as distinct species can be maintained. The characters most relied on in distinguishing them are the difference in length of the soft dorsal, the difference in the number of scales along the lateral line, and the smoothness or scaliness of the cheeks. I have examined specimens in the State collection at Normal, Ill., labeled *B. maculatum*, that appear to combine these characters in all sorts of ways. Some have scaled cheeks, 55 vertical rows of scales, and dorsal fin-rays X, 12. Another specimen noted has scaled cheeks, 48 rows of scales, and dorsal rays VIII, 11. Another has bare cheeks, 53 scales, dorsal IX, 12. Another, bare cheeks, 46 scales, dorsal rays IX, 13. Specimens there labeled *B. olmstedii* seem to be in no way different.*

As to color, I have specimens from Western Illinois that are almost black, especially the head, the vertical and the ventral fins. These are males in their breeding dress, but they appear to be unusually dark.

GENUS NANOSTOMA, Putnam.

5. *Nanostoma zonale* (Cope) Jordan. (No. 27, 417.)

Pæcilichthys zonalis, COPE, Journ. Acad. Nat. Sci. Phila. 1869, 212.

Nanostoma zonale, JORDAN, Bull. U. S. Nat. Mus. No. 10, 6, 1877.

Two specimens of this beautiful species were seined in a shallow and sandy creek flowing into the Chickasawha River at Enterprise. They differ in no way from described specimens, except that none of the transverse bands anterior to the anal fin pass around the lower part of the body. Even in this respect they are like a specimen mentioned by Cope from the Miami River, in Indiana. The belly, throat, and spaces between the bars below the lateral line are, in spirits, pure white.

* Since the above lines were penned I have received the October number of the American Naturalist, from which I learn that Prof. S. A. Forbes, of the Illinois State Laboratory of Natural History, in his interesting article on "The Food of the Darters", regards the two so-called species as identical. Professor Jordan also informs me that he now considers the two forms as merely "subspecies".

6. *Nanostoma elegans*, Hay, sp. nov. (No. 27,445.)

Body stout and somewhat compressed. Head short and deep, with swollen cheeks. The snout is turned abruptly downward. The mouth is subterminal, horizontal, and small, the maxillary not reaching back to the vertical from the anterior of the orbit. Upper jaw not protractile. Eye in the head 4 times.

Head in the length to caudal (as in all measurements in this paper) 4 times; depth in length 5. Depth of caudal peduncle twice in its length; this equal to three-tenths of the length of the body.

Rows of scales 5-42-6. Lateral line complete, nearly straight.

The formula of the vertical fins is D. X, 12; A. II, 8. The spinous dorsal slightly longer than the head, and half as high as long. Soft dorsal five-sixths as long as the head, and two-thirds as high as long. Anal three-fourths the length of the head, and as high as long, the posterior rays being the longest.

The pectoral fins are very wide and long, reaching beyond the tips of the ventrals and to the vent. Caudal fin emarginate.

Cheeks, opercles, and back of the neck scaly; the chest and the region just behind the ventrals naked. Gill-membrane broadly connected across the breast.

The general color of the body, after lying in spirits, is purple. Along the back are six large square blotches of black, and along the sides about eight broad transverse bars of the same color, but fainter; these least distinct forward. Along the lateral line, alternating with the transverse bars, are a number of spots, which, in the case of my largest specimen, are of a more intense color than the bars. These spots connect the bars, and with them form a dark lateral band.

Besides these markings, many of the scales, both within and outside the dark bars, principally above the lateral line, but also below, have at their base a jet-black dot. These dots are so arranged as to form somewhat regular longitudinal lines. At the extremity of the caudal peduncle there is a small black spot just above the last transverse bar, and another below it. There are a few black spots behind the eye; a dark bar running from the eye downward, and another from the eye forward to the snout.

Ventral and anal fins indigo-blue. Some of the same color on the pectorals. In life there is a bar of deep orange or red running along the base of both dorsals. The tips of the ventral rays in some specimens, males perhaps, are swollen.

Length of longest specimen $2\frac{1}{2}$ inches.

Taken in a shallow, rocky, and sandy branch of the Chickasawha River at Enterprise.

The small, subinferior mouth, little compressed body, and widely connected gill-membrane ally this species to *Nanostoma*. The dorsal fins are separated as in *Nothonotus*.

GENUS *PÆCILICHTHYS*, Agassiz.7. *Pæcilichthys artesiae*, Hay, sp. nov. (No. 27,434.)

In this species the body is more elongated than usual, and considerably compressed. The head is large and contained in the length to caudal fin $3\frac{3}{4}$ times; depth in length 5 times. Caudal peduncle contained in the length of the body $4\frac{1}{2}$; its depth one-half its length.

Mouth large, the maxillary reaching to a vertical from the pupil, terminal, nearly horizontal; the lower jaw slightly shorter than the upper. Gill-membrane rather broadly connected across the breast.

The eye equal to the snout, and contained in the head $4\frac{1}{2}$ times. The cheeks are wholly covered with small scales, resembling in this respect *P. asprigenis*, Forbes, from Central Illinois. The opercles are covered with large scales. The scales on the region between the occiput and the dorsal fin are very small.

There are along the sides about 56 vertical rows of scales, 8 horizontal rows above the lateral line and 11 below. The lateral line extends slightly behind the posterior end of the soft dorsal, being absent on about 10 or 12 scales. Just above the base of the pectoral fin, on each side, there is an enlarged black scale.

The two dorsals are contiguous, the membrane of the first reaching the second. The fin-rays are, D. XI, 13; A. II, 7. The length of the first dorsal, measured from the first to the last spine, equal to the length of the head; its height less than half its length. The soft dorsal seven-ninths the length of the head; its height about four-fifths its length. The anal is in length a little more than one-half the length of the head; its height also one-half the head.

The pectoral and ventral fins reach backward to the same point. The pectorals are much smaller than in *P. cæruleus* (Stor.) Ag., reaching back only three-fifths the distance from their origin to the vent, while in that species they extend backward four-fifths this distance.

Color.—Sides yellowish olive, with indications of transverse and oblique bars of dark, and sprinkled with many small blotches of carmine. Pectorals and ventrals dull blue. Dorsals with a broad band of carmine running along the middle, bordered on each side with orange. The tips of the dorsals dull blue, as is also the base of the soft dorsal. Base of the spinous dorsal with several blotches of carmine. Anal mostly crimson, tipped with blue. Caudal first blue, then orange, then carmine, followed by orange, and tipped with blue. The iris is yellow.

Length of the only specimen obtained $2\frac{5}{8}$ inches.

From a small branch flowing into the Catawba, itself tributary to the Tombigbee.

A brilliant little fish, attracting by its bright colors the eye at a distance of many feet.

The palatine teeth of this species form a broad band, whereas in *P. cæruleus* they are few in number and in a single row.

8. *Pæcilichthys saxatilis*, Hay, sp. nov. (No. 27,433.)

In my collection there is a single specimen of another *Pæcilichthys* that appears to be undescribed. It measures but $1\frac{3}{8}$ inches in length. The lateral line is incomplete, but extends as far back as the posterior rays of the soft dorsal, being found on 35 scales and not arched over the pectorals. There are about 50 vertical rows of scales and 11 horizontal rows, 5 above the lateral line and 6 below.

The opercula have a few large scales, but the cheeks are naked. The breast and throat are bare.

The dorsal and anal fin-rays are as follows: D. XI, 10; A. II, 7. The spinous dorsal equals the head in its length, and is one-half as high as long.

The soft dorsal is two-thirds as long as the head, and as high as long. The dorsals are separated by a space equal to one-half the head. The anal, in height and length, is equal to nearly one-half the length of the head.

The head is contained 4 times in the length of the body, the depth 5 times, and the caudal peduncle $3\frac{1}{2}$ times. The head is narrow and pointed; the profile descends in a gradual curve. The mouth is horizontal, terminal, and large, the maxillary extending back to a vertical from the anterior edge of the pupil. The eye is equal to the snout, and is contained in the head 4 times. Upper jaw non-protractile.

In color the specimen in my possession rather resembles a *Boleosoma* or a *Boleichthys* than a typical *Pæcilichthys*. Above, the ground color is yellowish olive, below pale. On the dorsal region are about six square brown spots. Along the sides there are about eight somewhat W-shaped spots of the same color, between which and the dorsal blotches are many specks of brown arranged in zigzag lines. A black streak before the eye and another below it. Opercle mostly black. An enlarged black humeral scale on each side. All the fins, except the anal, more or less barred with dusky.

Found at Enterprise in a rocky and sandy stream flowing into the Chickasawha.

GENUS VAILLANTIA, Jordan.

9. *Vaillantia chlorosoma*, Hay, sp. nov. (No. 27,428.)

Body slender, compressed, and the dorsal region much arched. At the vent the body is suddenly contracted into the long and slender caudal peduncle, which (measured from the posterior anal ray to base of caudal fin) is contained in the whole length of the body $3\frac{1}{3}$ to $3\frac{1}{2}$ times, and has a depth one-third its length. The head is small, pointed, and contained in the length from $4\frac{1}{2}$ to $4\frac{3}{4}$ times. Eye in the head 4. Upper jaw protractile. Mouth horizontal, moderate, subinferior, the upper jaw overlapping the lower. The depth of the body in its length from 5 to $5\frac{1}{2}$ times.

There are from 50 to 60 vertical rows of scales, and about 12 horizontal rows between the soft dorsal and anal. The lateral line is found on

from 4 to 20 or more of the scales. Cheeks and opercles scaled. Region in front of pectoral and ventral fins sometimes scaled and sometimes naked.

The fin-rays are, D. IX, 11 (10); A. I, 7 or 8. The dorsals are separated by a distance equal to one-half the length of the head, or more. The spinous dorsal is five-sevenths as long as the head, and four-fifths as high as long. The soft dorsal has about the same dimensions. The anal is equal to one-half the head in length and height.

In color this species is of a pale greenish yellow, with many blotches and zigzag markings of brown. There is a row of about ten of these blotches on each side, most distinct on the caudal peduncles. Also there are about eight square brown spots along the dorsal region. Top of the head, a spot on the operculum, and another below the eye, dark; a line of the same color, but more distinct, from the eye to the snout.

Length of the largest specimen $1\frac{7}{8}$ inches.

This species appears to be widely distributed, as I obtained it at Corinth in a small stream that flows into the Tuscumbia, at Artesia in Sandy Creek, and at Macon in Horsehunter Creek.

The characters of this species appear to agree in many respects with those of *Boleosoma gracile*, Girard, described in the Proc. Acad. Nat. Sci. Phila. 1859, 103. Girard's specimens were from Southwest Texas. In *B. gracile*, however, the spinous dorsal is described as being longer and lower than the soft dorsal, and the anal as being much deeper than long, which statements do not well apply to *Boleichthys chlorosoma*. I am also informed by Professor Jordan that the jaw of *B. gracile* is non-protractile.

The species that I have above described belongs to Professor Jordan's genus *Vaillantia* (Bull. U. S. Nat. Mus. No. 12, 89), the type of which is *Boleosoma camurum*, Forbes. From that species it differs, among other things, in having the two dorsals widely separated. In *B. camurum* they are contiguous.

GENUS MICROPERCA, Putnam.

10. *Microperca prœliaris*, Hay, sp. nov. (No. 27,418.)

The species about to be described may possibly belong to the genus *Boleichthys*. I have but a single specimen, which has a total length of $1\frac{1}{2}$ inches. It was obtained at Corinth, and was at first supposed to be a specimen of *V. chlorosoma*.

The body is rather short and stout, the depth being contained in the length a little more than 4 times. Behind the vent the body becomes contracted into the caudal peduncle, which is compressed and contained in the length of the body 3 times. Its median depth is one-third its length.

The head is contained in the length 4 times. The snout conical and pointed. The jaws are equal, the upper not protractile; the mouth

terminal, slightly oblique, and rather small. The maxillary reaches back to a vertical from the anterior of the orbit. The eye is small, 4 in head, and greater than the snout. Cheeks and opercles covered with large scales. Opercular spine well developed.

The scales of the body are large, there being only 36 vertical and 11 horizontal rows, the latter counted between the dorsal and anterior of anal. The lateral line is found on but two scales anteriorly. Fin-rays, D. VIII, 11; A. I, 6. Anal II, 6, in a specimen of the same species from Alabama in the U. S. Nat. Mus. (*fide* Jordan). The two dorsals are well separated. Spinous dorsal two-thirds the length of the head, its height a little more than one-half the head. Soft dorsal with about the same dimensions. Anal spine slender and of moderate length. Length of anal 3 times in the head; its height twice its length. Pectorals and ventrals reaching nearly to the vent.

Color greenish olive, with many specks of brown. These brown specks somewhat in rows above the place for the lateral line. About ten oblong spots of brown along the sides, most distinct above the anal fin. Below, white. The usual black streaks below and in front of the eye. Dorsal fins somewhat barred.

The general appearance of this little fish is that of a *Boleichthys*, but the very short lateral line, large scales, equal jaws, &c., seem to ally it most closely to *Microperca*. From the latter it differs in having but a single anal spine and the beginnings of a lateral line. Since, however, this "lateral line" is found on the opercle of *M. punctulata*, it would not be surprising if it should be sometimes, even in that species, found on one or two of the anterior scales.

FAMILY CENTRARCHIDÆ.

GENUS MICROPTERUS, Lacépède.

11. *Micropterus pallidus* (Raf.) Gill & Jor. (No. 27,450.)

Huro nigricans, DEKAY, Fauna N. Y. Fishes, 1842, 15.

Micropterus nigricans, COPE, Proc. Acad. Nat. Sci. Phila. 1865, 83.

Dioplites nuceensis, GIRARD, U. S. Pac. R. R. Surv. vol. x, 4.

Micropterus pallidus, JORDAN, Annals N. Y. Lye. Nat. Hist. 1877, 314.

This species is abundant everywhere, and is esteemed as one of the best food-fishes. It is called "Trout", instead of "Bass", as at the North.

The young are conspicuously marked by a dark, sometimes interrupted, lateral band. This is sometimes found also in the adults. There is often a small patch of feeble teeth on the tongue of both this species and *M. salmoides*.

Specimens were obtained in the Catawba at Artesia, and in the Chickasawha at Enterprise.

GENUS AMBLOPLITES, Raf.

12. *Ambloplites rupestris* (Raf.) Gill. (No. 27,451.)*Centrarchus pectacanthus*, DEKAY, Fauna N. Y. Fishes, 1842, 30.*Ambloplites aeneus*, GIRARD, Pac. R. R. Surv. vol. x, 8, pl. i.

A fine specimen of this species was taken in the Chickasawha at Enterprise. Another has since been sent me by Mr. Warner.

GENUS CHÆNOBRYTTUS, Gill.

13. *Chænobryttus gulosus* (C. & V.) Gill. (No. 27,459.)*Calliurus melanops*, GIRARD, Pac. R. R. Surv. vol. x, 11, pl. iii.*Chænobryttus gulosus*, COPE, Proc. Acad. Nat. Sci. Phila. 1865, 84.—JORDAN, Annals N. Y. Lyc. Nat. Hist. 1877, 361.

A single specimen of this was obtained at Enterprise. It has many of the characteristics assigned by Professor Jordan to *Ch. viridis*. This latter species is attributed by him to the region from Virginia to Florida.

In the specimen which I caught the coloration is quite dark, being a reddish brown. Most of the scales have a dark spot in the center. This spot, on a few of the scales along the sides, is quite conspicuous. The fins are dark in color, the soft dorsal, especially behind, being marked with spots. The base of the anal is also obsoletely spotted. Tips of soft dorsal and anal in life bright red. Lower jaw and snout livid blue. The specimen agrees well with Girard's *Calliurus melanops*. I think it not unlikely that *Ch. gulosus* and *viridis* will turn out to be varieties of the same species.

GENUS APOMOTIS, Rafinesque.

14. *Apomotis cyanellus* (Raf.) Jordan. (No. 27,449.)*Calliurus formosus*, GIRARD, Pac. R. R. Surv. vol. x, 14, pl. v, figs. 1-4.*Apomotis cyanellus*, JORDAN, Bull. U. S. Geol. Surv. vol. iv, No. 2, 398.

I obtained specimens of this widely distributed species from Catawba Creek at Artesia, and from the Noxubee at Macon.

GENUS LEPOMIS, Rafinesque.

15. *Lepomis pallidus* (Mitchill) Gill & Jordan. (No. 27,457.)*Pomotis incisor*, DEKAY, Fauna N. Y. Fishes, 1842, 33.*Pomotis speciosus*, GIRARD, Pac. R. R. Surv. vol. x, 23, pl. viii, figs. 5-8.*Lepiopomus pallidus*, JORDAN, Bull. U. S. Geol. Surv. vol. iv, No. 2, 397.*Lepiopomus incisor*, GOODE & BEAN, Proc. U. S. Nat. Mus. 1879, 139.

Numerous specimens of the above species were obtained in Catawba Creek at Artesia, Noxubee River at Macon, and in the Chickasawha at Enterprise.

16. *Lepomis obscurus* (Ag.) Jordan. (No. 27,458.)*Pomotis obscurus*, AGASSIZ, Amer. Journ. Sci. and Arts, 1864, 302.*Lepiopomus obscurus*, JORDAN, Annals N. Y. Lyc. Nat. Hist. 1877, 317.

A fine example of this species, 6 inches long, was obtained with the hook from Sucarnochee Creek at Narkeeta, a station on the Mobile and Ohio Railroad.

This species is distinct from *L. pallidus*, although closely related to it. The color is much darker. Each scale has in its center a dark spot, longest up and down. The opercular flap is longer and more abruptly formed than in *L. pallidus*. The opercular flap, measuring from where the scales cease, is equal to the diameter of the eye, while in *L. pallidus* it is equal to only two-thirds the eye's diameter. The pectoral and ventral fins reach fully to the first anal spine.

17. *Lepomis fallax* (B. & G.) Hay. (No. 27,456.)

Pomotis fallax and *convexifrons*, B. & G. Proc. Acad. Nat. Sci. Phila. 1854, 24.

Pomotis fallax, GIRARD, Pac. R. R. Surv. vol. x, 27, pl. ix, fig. 5.

While at Enterprise I obtained some small specimens of a Sunfish which belongs to Professor Jordan's genus *Xenotis*. I saw several adult specimens, but could procure none from their captors, who took professional pride in their long "strings". My attention was especially attracted to this fish by its immense opercular flap. Since returning home, Mr. William A. Warner, of Enterprise, has kindly sent me additional material, and, among other things, a specimen of this fish, having a total length of 6 inches. After a careful study of this species my conclusion is that it is the *Pomotis fallax* of Baird and Girard, described from Northern Texas. The agreement with the description and figures given in the Pacific Railroad Survey Report is very close indeed. Fig. 5, pl. ix, gives a very good although somewhat reduced representation of my largest specimen.

Xenotis solis, Gill & Jor. (Bull. U. S. Nat. Mus. No. 10, 22), not *Pomotis solis*, C. & V. (see Proc. U. S. Nat. Mus. 1879, 225), is a more elongate species, the greatest depth being contained $2\frac{1}{3}$ times in the length instead of 2, as in my specimens. The eye of that species is contained in the flap $1\frac{1}{2}$ times instead of 2, as in this. The flap of that is contained $2\frac{1}{2}$ times in the rest of the head instead of 2 times, as in this. In that there are "about 5 rows [of scales] above and 11 below" the lateral line; in this there is one more both above and below.

From *P. breviceps*, B. & G., it appears to differ in having a larger eye, a more anterior dorsal fin, and longer ventral fins; from *X. megalotis*, in that the body is not so heavy anteriorly.

I cannot give a description of the colors in life, except that they are brilliant. In spirits the body above is yellowish brown, the scales being dark-edged; fins dusky, narrow blue stripes on the cheeks; flap jet-black, with a pale edge.

Professor Jordan informs me that he now regards *L. fallax* as simply a variety of *L. megalotis*. I have not had the opportunity to examine enough material to enable me to satisfy myself of the correctness of this conclusion. He also discards the genus *Xenotes*.

GENUS CENTRARCHUS, Cuvier.

18. *Centrarchus irideus* (Lac.) C. & V.

C. irideus, JORDAN, Bull. U. S. Nat. Mus. No. 10, 31.

At Narkeeta, on the Mobile and Ohio Railroad, I saw a specimen of *Centrarchus* taken from the Sucarnochee River, but was not able to procure it. From an examination made at the time I regard it as being *C. irideus*. It appeared, however, to have some of the characters of *C. macropterus*; there being, for instance, 8 anal spines instead of 7, the usual number.*

GENUS POMOXYS, Rafinesque.

19. *Pomoxys nigromaculatus* (Le S.) Girard. (No. 27,461.)

Centrarchus hexacanthus, DEKAY, Fauna N. Y. Fishes, vol. iv, 1842, 31.

Pomoxis nigromaculatus, GIRARD, Pac. R. R. Surv. vol. x, 6.

Numerous specimens of this were taken from Horsehunter Creek at Macon. Both this and the next are much sought after as food and to stock fish-ponds.

20. *Pomoxys annularis*, Rafinesque. (No. 27,460.)

Pomoxis annularis and *nitidus*, GIRARD, Pac. R. R. Surv. vol. x, 6.

Same locality as above.

FAMILY ELASSOMATIDÆ.

GENUS ELASSOMA, Jordan.

21. *Elassoma zonatum*, Jordan. (No. 27,452.)

Elassoma zonatum, JORDAN, Bull. U. S. Nat. Mus. No. 10, 50; Bull. Ill. Lab. Nat. Hist. No. 2, 47.

Two specimens of this interesting species were secured in a pond along the Noxubee River at Macon. The largest was 1½ inches in length, somewhat larger than the specimens hitherto found. After careful search I have been unable to find any evidences of the existence of vomerine teeth in this species. The fin-formula is, D. I; V, 10; A. III, 5 or 6. The scales are very small and difficult to count. As nearly as I could make out, there are 42 vertical rows and 18 or 20 horizontal rows between anal and dorsal. The pseudobranchiæ are obsolete.

* Since this paper has gone to press, Professor Jordan writes me that he is now satisfied that *C. macropterus* and *C. irideus* are identical, and that as the term *macropterus* has the priority, it must be accepted as the name of the species. He had already, in his "Catalogue of the Fishes of Illinois," published in Bull. No. 2, Ill. Lab. Nat. Hist., expressed the opinion that they might have to be merged into one.

FAMILY APHREDODERIDÆ.

GENUS APHREDODERUS, Le Sueur.

22. *Aphredoderus sayanus* (Gilliams) DeKay.

Aphredoderus sayanus, DEKAY, Fauna N. Y. Fishes, 35.

Aphododerus isolepsis (NELS.) JORDAN, Bull. Ill. Lab. Nat. Hist. No. 2, 48.

Aphrodederus cookianus, JORDAN, Proc. Acad. Nat. Sci. Phila. 1877, 60.

A single small specimen was obtained at Macon. All the names cited above belong to varieties of the same species. DeKay mentions that this species occurs at New Orleans.

FAMILY CYPRINODONTIDÆ.

GENUS ZYGONECTES, Agassiz.

23. *Zygonectes notatus* (Raf.) Jordan. (No. 27,444.)

Zygonectes notatus, JORDAN, Bull. U. S. Nat. Mus. No. 9, 47.

Many fine specimens of this species were taken. I have them from Corinth, Artesia, Macon, and Enterprise. This and the succeeding species are seen almost everywhere, especially in quiet waters, swimming near the surface. One of my specimens from Enterprise is 3 inches long to the caudal, or a total of 3½ inches.

The color is translucent yellowish green above, silvery white below, with a broad, dentate, lateral band of black. There are four or five longitudinal rows of black dots above the lateral band, especially conspicuous in specimens from Enterprise. The fins are golden, the dorsal and caudal dotted with black.

24. *Zygonectes melanops* (Cope) Jordan. (No. 27,427.)

Haplochilus melanops, COPE, Proc. Amer. Phil. Soc. 1870, 457.

Zygonectes melanops, JORDAN, Bull. Ill. Lab. Nat. Hist. No. 2, 52.

Many of these little fishes were seined in the ponds and rivulets along Catawba Creek in the vicinity of Artesia, and in Horsehunter Creek near Macon. They correspond closely with Professor Cope's description cited above. This species appears to have a very wide distribution. It was originally described by Professor Cope from the Neuse River, in North Carolina. It was next discovered in Southern Illinois by Prof. S. A. Forbes, the accomplished superintendent of the Illinois State Laboratory of Natural History. I have now the pleasure of announcing its occurrence at points much farther south.

FAMILY HYODONTIDÆ.

GENUS HYODON, Le Sueur.

25. *Hyodon selenops*, Jordan & Bean. (No. 27,455.)

Hyodon selenops, JORDAN, Bull. U. S. Nat. Mus. No. 10, 67.

This beautiful species appears to be abundant in the Chickasawba River. At Enterprise, where I saw a number taken from the water

with hooks, they are called "Hickory Shad". They are not esteemed very highly as a means for gratifying the palate. This species is reported from the Tennessee and Cumberland Rivers.

FAMILY CLUPEIDÆ.

GENUS CLUPEA, Artedi.

26. *Clupea chrysochloris* (Raf.) Jor. (No. 27,453.)

Pomolobus chrysochloris, RAFINESQUE.

A single specimen of this species has been sent me by Mr. William A. Warner, of Enterprise.

GENUS DOROSOMA, Rafinesque.

27. *Dorosoma cepedianum* (Le S.) Gill. (No. 27,454.)

Dorosoma cepedianum, JORDAN, Proc. Acad. Nat. Sci. Phila. 1877, 69; subsp. *heterurum*, Bull. U. S. Nat. Mus. No. 10, 65.

Several specimens of this species were caught while seining a deep pond along the Noxubee River near Macon. I do not find that the characters assigned by Professor Jordan to the variety *heterurum* exist in my specimens, unless it be that of the long filamentous ray of the dorsal fin. Even this distinction does not always hold good. I find no particular differences between my largest specimen, $8\frac{1}{2}$ inches long, and a specimen of the same size from the Potomac.

FAMILY CYPRINIDÆ.

GENUS HYBORHYNCHUS, Agassiz.

28. *Hyborhynchus notatus* (Raf.) Ag. (No. 27,441.)

Hyborhynchus notatus, COPE, Trans. Amer. Phil. Soc. 1869, 392.

A single specimen obtained at Corinth; many in the waters about Artesia and Macon. In their coloration some of the specimens that I obtained are different from any that I have seen from other localities and from any descriptions that have fallen under my eye. These peculiarities of color are observed only in the largest individuals, those $2\frac{1}{2}$ inches in length. Some of these are quite brown, this color being produced by each scale having a black border. The head is blue-black, of varying degrees of intensity, being in some cases almost jet-black. There is a deep black band occupying the whole upper half of the dorsal fin. The greater part of the caudal fin is also black, the base and tip only being light. There is sometimes a black spot near the tip of the posterior rays of the anal fin. In many of these dark-colored specimens the dark lateral band usually seen in this species is either obsolete or indistinct. These highly colored individuals are, no doubt, males in their wedding suits of black. The other party does not dress so gorgeously.

GENUS HYBOGNATHUS, Agassiz.

29. *Hybognathus argyritis*, Girard. (No. 27,431.)

Hybognathus argyritis, GIRARD, Pac. R. R. Surv. vol. x, 235; Proc. Acad. Nat. Sci. Phila. 1856, 182.

Specimens of this species were seined in Horsehunter Creek at Macon, and in the Chickasawha River at Enterprise. Some of these have a total length of $4\frac{1}{2}$ inches.

GENUS ALBURNOPS, Girard.

30. *Alburnops taurocephalus*, Hay, sp. nov. (No. 27,439.)

This very interesting species resembles much *Hyborhynchus notatus*, and therefore recalls strongly Professor Cope's description of *Hybopsis tuditanus*, from Northern Indiana. (See Trans. Amer. Phil. Soc. 1869, 381.) It is a true *Hybopsis*, or *Alburnops*, as indicated by the short alimentary canal and the close union of the spinous dorsal ray to the first soft dorsal. The teeth are 4-4, hooked, compressed, and provided with a masticatory surface.

The body is stout, somewhat compressed, broad and flat above, with a deep and angulated caudal peduncle. The latter is contained in the body about $3\frac{2}{3}$ times. Its depth is one-half its length. The head is broad and flat above, and at the temporal region forms an angle with the cheeks. The breadth of the head behind the eyes is equal to the distance from the muzzle to the back of the orbit, and nearly two-thirds the length of the head. The muzzle is broad and obtuse; but not so truncate as that of *Hyborhynchus notatus*, since the profile rounds gradually into the snout.

The mouth is rather small, horizontal, and terminal; the jaws about equal, the upper heavy. The maxillary hardly reaches a perpendicular from the anterior margin of the orbit. Eye large, $3\frac{1}{2}$ in the head. Head in the length, exclusive of the caudal, $4\frac{1}{2}$ times. Depth about equal to the length of the head.

Dorsal I, 8; A. I, 7. The dorsal begins above the ventrals, is longer than high, and has on the anterior rays, rather below the middle, a black spot. This fin commences nearer the snout than the caudal. The anal is small.

The scales along the lateral line are rather large and silvery; the formula is 8-43-4. The scales in front of the dorsal fin are small, especially on the nape.

In color this species is pale yellow, with a dusky tinge given it by numerous black punctulations on each scale. The sides are silvery, as are also the cheeks and opercles. There is an obsolete dusky band along the lateral line, terminating at the base of the caudal in a small but distinct black spot. The top of the head and snout brown.

Length of the largest specimen 3 inches, exclusive of caudal.

From the Chickasawha at Enterprise. Caught for bait for larger fishes, and called "Bull Heads".

While this species must resemble *H. tuditanus*, it evidently is distinct from it. The dorsal fin of that species is said to be markedly nearer to the caudal than to the end of the muzzle, while the contrary is true in my species. If the horizontal rows of scales have been counted correctly, and in the same way in both species, there is one more row above the lateral line in mine than in Professor Cope's species. The mouth in *H. tuditanus* is said to be very small and inferior, as in *Hyborhynchus notatus*. The latter feature certainly does not belong to the present species.

31. *Alburnops longirostris*, Hay, sp. nov. (No. 27,440.)

The general appearance of this species is much like that of small specimens of *Ericymba buccata*.

Head rather small, contained in the body $4\frac{1}{2}$ times. Eye small, being contained in the head 4 times; not equaling the snout, which is one-third the length of the head. The upper jaw is rounded and much overlaps the lower jaw. The mouth, therefore, inferior, rather large, horizontal. The maxillary attains a vertical from the anterior of the orbit. Teeth 4-4, hooked, and having a triturating surface.

Lateral line somewhat decurved. Scales large, there being 36 along the lateral line, 4 horizontal rows above, and only 3 below. About 12 large scales in front of the dorsal. Depth in length $4\frac{3}{4}$ to 5.

Origin of the dorsal fin midway between the tip of the snout and the base of the caudal and directly over the insertion of the ventrals. Rays of dorsal I, 8; anal I, 7. Dorsal nearly twice as high anteriorly as long; anal short and low. Caudal deeply forked, nearly one-fourth the length of the body. Pectorals far from reaching the ventrals; these extending fully to the vent.

Caudal peduncle in body $3\frac{3}{4}$ times; its greatest width nearly one-half its length.

This fish is of a pale straw-color, slightly dusky from the brown edges of the scales. There is a very narrow, dark dorsal line; also an obsolete lateral band just below the lateral line. Top of the head brown; the vertical fins dusky.

Length of the largest specimen 2 inches. Seined in considerable numbers at Enterprise. The females teem with eggs.

32. *Alburnops xænocephalus*, Jor. (No. 27,435.)

Hybopsis xænocephalus, JORDAN, Annals N. Y. Lye. Nat. Hist. 1877, 335.

Alburnops xænocephalus, JORDAN, Bull. U. S. Geol. Surv., vol. iv, No. 2, 420

Several specimens of a dark-colored minnow were seined at Enterprise the resemblance of which to *H. xænocephalus* is so close that I have referred them to that species, so well described by Professor Jordan in his "Fishes of Upper Georgia". There are some differences, however, that I have thought worthy of mention.

The body in my specimens is deeper, the depth being contained in the length but $4\frac{1}{2}$ times or less. The back does not seem to be so broad nor the caudal peduncle so deep. The dark band that occurs on the caudal peduncle of typical specimens from Georgia is, in these from Mississippi, continued forward along the side to the snout; being, however, slightly broader and less perfectly defined anteriorly.

I do not, however, think that the differences form sufficient grounds for establishing a new species. My largest specimens have a total length of 3 inches.

Professor Jordan's specimens were obtained in the upper tributaries of the Alabama River.

GENUS HEMITREMIA, Cope.

33. *Hemitremia maculata*, Hay, sp. nov. (No. 27,438.)

Body long and slender, slightly elevated at the dorsal, somewhat compressed. Depth in the length 5 times. Head flattened above; snout, looked at from above, obtuse. Mouth small, the maxillary falling considerably short of the anterior border of the orbit, terminal, slightly oblique. Teeth 4-4, with grinding surface.

Head in the length $4\frac{1}{2}$ times. Eye in head $3\frac{1}{2}$, about equal to the snout.

The fin-rays are, D. I, 8; A. I, 8. The dorsal begins slightly behind the ventrals. Its length three-fifths, its height four-fifths, of the head. Anal, in length, one-half, in height two-thirds, the head. Caudal peduncle one-fourth the length of the body. Dorsal situated nearer to the snout than to base of caudal.

The pores of the lateral line are found on but 8 or 10 scales, anteriorly. Scales 5-38-3.

This fish is of a straw-color above, with the scales brown-edged. There is a faint, narrow dorsal band, and another narrow, dark line running from the vent on each side of the anal fin to the base of the caudal. A leaden band runs along the sides, which is rendered dusky by numerous black punctulations on the scales within this band. Besides these minute punctulations there is on each scale along the center of the band a pair of larger black points. Posteriorly the lateral band ends in a black spot nearly as large as the eye. Snout and top of the head dusky.

A single specimen, $2\frac{1}{2}$ inches long, and a few young, were obtained at Enterprise.

Three other species of *Hemitremia* are recorded. *H. vittata*, Cope, has teeth 4-5, with a black lateral band, and other paler ones above this. *H. heterodon* and *H. bifrenata*, described by the same author, both have teeth 4-4. They both appear to be less elongated species than the one described above, and neither are mentioned as having the conspicuous caudal spot of *H. maculata*, which is exhibited in all the specimens that I secured. In *H. heterodon* the "lateral line is posteriorly imperfect". In *H. bifrenata* there are 12-13 rows of scales in front of dorsal, and

there are 7 rays in the anal fin. In *H. maculata* there are about 16 scales in front of the dorsal, and the anal rays are I, 8.

This species will come under Professor Jordan's genus *Chriope*. (Bull. U. S. Geol. Surv. vol. iv, No. 4, 787.)

GENUS LUXILUS, Rafinesque.

34. *Luxilus cornutus* (Mitch.) Raf.

Hypsilepis cornutus, COPE, Trans. Amer. Phil. Soc. 1869, 372.

Three specimens of the young of this widely diffused species were obtained at Corinth, and many others at Enterprise.

35. *Luxilus chickasavensis*, Hay, sp. nov. (No. 27,419.)

This species closely resembles *Codoma stigmatura*, Jordan, from the Alabama River, originally described as *Photogenis stigmaturus*. (Annals N. Y. Lyc. Nat. Hist. 1877, 337.) If *Codoma* is to be regarded a valid genus, and if *Ph. stigmaturus* belongs to that genus, then the present species will be *Codoma chickasavensis*. I do not, however, believe that there is sufficient grounds for putting *Photogenis stigmaturus* and *Luxilus analostanus* into different genera. So far as I can determine with the aid of a good microscope, the masticatory surface as truly exists on the teeth of *Ph. stigmaturus* as on those of *Lux. analostanus*. Sometimes in the former species one edge is serrated; and in some species of *Codoma*, as this genus is limited by Professor Jordan, occasionally both boundaries of the concave surface are serrated. I hope, at no distant period, to be able to discuss this subject still further. For the present I adopt the name *Luxilus* for both this species and *Luxilus analostanus* (Grd.) Jor.

In a close comparison of the present species with *Codoma stigmatura*, I find the following differences to exist: There are fewer scales along the lateral line, 38 to 40 instead of 45. The eye is also considerably larger, being contained in the head $3\frac{1}{2}$ times instead of $4\frac{1}{2}$, and about equal to the snout. The caudal spot is as intensely black as in *C. stigmatura*, but considerably smaller. It is about as large as the eye, sometimes smaller; whereas in that species it is nearly always larger, being in length "usually about one-third of the head". In this species it is about one-fourth of the head. Neither does it extend so far on the rays of the caudal fin. The form of the head and body, and the position and size of the fins, are apparently the same as in *C. stigmatura*, unless it be that the body is a little deeper, the depth being contained in the length from 4 to $4\frac{1}{4}$ times.

The black spot on the posterior rays of the dorsal fin is obsolete or wanting, while there is a narrow dark line running up on one or two of the anterior dorsal rays.

There are, on the heads of a few of my specimens, some evidences of the existence of tubercles.

This species appears to be quite abundant in the Chickasawha at Enterprise. The largest individuals obtained have a total length of 4 inches.

GENUS ERICYMBA, Cope.

36. *Ericymba buccata*, Cope. (No. 27,421.)

Ericymba buccata, COPE, Proc. Acad. Nat. Sci. Phila. 1865, 87; Trans. Amer. Phil. Soc. 1869, 361.

Several individuals of this species were seined in the Chickasawha River at Enterprise. Its geographical distribution is stated by Professor Jordan, in his "Catalogue of the Fresh Water Fishes of North America" (Bull. U. S. Geol. Surv. vol. iv, No. 2), to be from Pennsylvania to Illinois. Judging from the numbers taken at Enterprise, the species is quite as common in the South as farther north. Some of the specimens taken were 3 inches long, exclusive of the caudal.

GENUS OPSOPŒODUS, Hay, gen. nov.

(Ὀψοποτός + ὀδούς.)

Body fusiform, moderately elongated, slightly compressed. Mouth very small, very oblique, peculiar. Teeth raptorial, with a well-developed masticatory surface, both bounding edges of which are conspicuously serrated, standing in a single row of 5-5 on a prominent process of the pharyngeals. Dorsal somewhat behind the anterior line of the ventrals. Barbels none. Lateral line complete. Intestine short. Anal fin short.

This genus is apparently related to *Myloleucus*, Cope, and it is possible that the species that I describe below will have to be put under that genus. For the present, however, I think that the peculiar form of the mouth and the teeth, as well as the general organization of the animal, will serve to separate it from *Myloleucus*. The name is given in allusion to the thoroughness with which the food is prepared by the numerous serrated pharyngeal teeth.

37. *Opsopœodus emiliæ*, Hay, sp. nov. (No. 27,429.)

Form of the body as given above. Depth in the length $4\frac{1}{3}$ times. Head in the length $4\frac{1}{2}$. Muzzle blunt and rounded. Mouth very small, very oblique, the lower jaw in the closed mouth fitting within the upper. In this case the cleft is nearly vertical. The length of the mandible equal to the distance from the tip of the snout to the anterior margin of the orbit; while in *Notemigonus chrysoleucus*, which has a small mouth, the mandible reaches to the middle of the pupil. Eye greater than the snout, 3 in the head.

Dorsal and anal fin-rays as follows: D. I, 9; A. I, 8. Dorsal beginning over the posterior rays of the ventrals, nearer the snout than to the base of the caudal; length two-thirds the head; its height equal to the length of the head. The anal fin in its length one-half the head; its height a little less than the length of the head.

Pectorals not reaching the ventrals; the latter attaining the anal. The caudal is furcated for more than one-half its length. Caudal peduncle slender, $3\frac{1}{2}$ times in the length of the body.

Scales in very regular rows, anteriorly somewhat higher than long; the rows 5 or 6-40-3.

Color in spirits pale yellow above, sides silvery, and golden yellow below. Above and on the caudal peduncle the scales with a narrow dusky edge, giving these parts of the body a regularly checkered appearance. A dusky band runs along the lateral line, back on the rays of the caudal, and forward over the opercle, through the eye, to the snout. Sometimes this band is almost black. Just above this band are two or three longitudinal rows of black dots, one of which dots is located at the tip of each scale. Below the lateral line is another similar row of dots. There is also a row of black points along the lateral line. The anterior rays of the dorsal fin are largely black, and there is also a black spot on the posterior rays.

This is an elegant and very interesting species. Its oblique mouth and rounded muzzle give it a peculiar appearance. It appears to be widely distributed through the State. I have one specimen from Artesia, several from Macon, and one from Enterprise.

GENUS MINNILUS, Rafinesque.

38. *Minnilus dilectus* (Girard) C. & J.

Minnilus dilectus, JORDAN, Proc. Acad. Nat. Sci. Phila. 1877, 80.

Alburnus dilectus, GIRARD, Proc. Acad. Nat. Sci. Phila. 1856, 193.

Alburnellus dilectus, GIRARD, Pac. R. R. Surv. vol. x, 259.

Notropis atherinoides, JORDAN, Bull. Ill. Lab. Nat. Hist. No. 2, 69; Bull. U. S. Geol. Surv. vol. iv, No. 2, 422.

A single specimen of a *Minnilus*, or *Alburnellus*, answering well enough to Girard's description cited above, was obtained at Enterprise.

Subgenus LYTHRURUS, Jordan.

39. *Minnilus punctulatus*, Hay, sp. nov. (No. 27,430.)

Body short, deep, and compressed. The back elevated in front of the dorsal. Depth in the length $4\frac{1}{3}$. The head is short and deep, $4\frac{2}{3}$ in the length. The profile is straight, or even a little concave; the snout pointed. Mouth large and quite oblique; the lower jaw longer than the upper. The maxillary reaches back to a perpendicular from the anterior rim of the orbit.

The eye is of medium size, being contained in the length of the side of the head $3\frac{1}{2}$ times.

The scales are very small. There are 10 to 12 horizontal rows above the lateral line, and 3 below it; 48 to 50 scales along the lateral line, and 25 or more in front of the dorsal. The lateral line is much decurved above the ventrals.

Teeth, 2, 4-4, 2, usually with an evident triturating surface.

Fin-rays as follows: D. I, 8; A. I, 10-11. Dorsal beginning midway between the muzzle and the base of the caudal; its length one-half, its height two-thirds, the head. Anal in length three-fifths, in height four-fifths, the head. Caudal peduncle compressed, and contained in the length of the body $4\frac{1}{2}$ times.

The body is of a straw-color above, silvery along the sides and below. The scales above the lateral line are dark-edged from a succession of black dots, which are large enough to be seen by the unaided eye. A dark dorsal line of similar, but a little larger, black points. Along the sides anteriorly are a few such dots; posteriorly they increase so much that on the caudal peduncle they form a dark band. The head, and especially the snout, are sprinkled with similar dots. There is a black spot at the base of the dorsal fin anteriorly. Opercles silvery. Size of largest specimens 2 inches. Corinth.

This minnow resembles somewhat *Notropis lirus*, Jord., but is a less slender species, has a smaller eye, and has not the conspicuous band of metallic blue of that species. *Notropis matutinus* (Cope) Jord., also appears to be a much slenderer species, the depth being contained in the length 6 times. Also there are said to be but 7 rows of scales above the lateral line.

I do not think that there are sufficient differences in the teeth of the species of *Notropis*, or *Minnilus*, and those of *Lythrurus* to justify the separation of these species into two genera. If there is such difference, *Notropis lirus* ought to be written *Lythrurus lirus*, for the masticatory surfaces of its teeth are as plain, to me at least, as in *L. diplæmius*.

40. *Minnilus rubripinnis*, Hay, sp. nov. (No. 27,420.)

Body long and slender, somewhat compressed, the depth in the length $4\frac{2}{3}$ times. Head arched transversely above; muzzle very pointed. Mouth oblique, large; the lower jaw slightly longer than the upper; the maxillary reaching to a vertical from the front of the eye. The eye is large, being contained in the length of the side of the head 3 times, and its diameter slightly greater than the snout. Head contained in the length $4\frac{1}{2}$ times.

Scales small, especially in front of the dorsal fin, somewhat higher than long, but not so densely imbricated as in the next species. Rows of scales represented by the formula 7 to 9-45 $\pm$ -3. Lateral line much decurved anteriorly.

The dorsal is situated far back, midway between the pupil of the eye and the base of the caudal, and considerably posterior to the ventrals; its rays, I, 8; its length one-half the head, its height three-fourths. The anal is long, being three-fourths the length of the head, height one-half the head; its rays, I, 12.

The pectorals do not reach the ventrals; the latter attain the vent.

The coloration of this species is dark in spirits, all the scales above the lateral line being covered with black points. Along the sides is a

broad leaden band, which narrows behind on the caudal peduncle and becomes a dusky band, ending in an ill-defined caudal spot. There is a narrow dorsal band. The top of the head and snout, as well as the lower jaw, are dusky. The belly is pale.

The dorsal and caudal are red, with more or less dusky. There is no dark spot at the base of the dorsal, as in some species of *Lythrurus*; but there is a distinct black spot on the upper part of the anterior rays of the dorsal. There is a similar black spot at the distal ends of the anterior anal rays. The anterior rays of the pectorals are dusky.

Large numbers of this species were collected at Enterprise. The largest specimens have a total length of $2\frac{1}{4}$ inches.

41. *Minnilus bellus*, Hay, sp. nov. (No. 27,426.)

Adults of this species resemble much the young individuals of *Notemigonus chrysoleucus*.

The body is short, deep, and considerably compressed. The dorsal region is elevated. Depth contained in the length about $3\frac{3}{4}$ times. Head short, in length of body from 4 to $4\frac{1}{3}$ times. Muzzle short, rather pointed; the profile in adults concave; mouth quite oblique, large, the maxillary reaching back to the anterior rim of the orbit; the lower jaw rather longer than the upper. The eye moderate, $3\frac{1}{2}$ in the head.

The lateral line is much decurved anteriorly. Scales 7 or 8-40 to 42-3, crowded forward, higher than long, about 25 in front of the dorsal. Teeth 2, 4-4, 2, "sharp-edged", but *with* a "masticatory surface".

Fin-rays, D. I, 8; A. I, 10-11. Dorsal situated midway between the tip of the snout and the origin of the caudal, wholly posterior to the ventrals, nearly twice as high as long, its length being contained in the head $1\frac{2}{3}$ times. Anal contained in the head $1\frac{1}{2}$ times, a little higher than long, ventrals reaching the vent, the pectorals not extending to the ventrals. Caudal peduncle very little longer than the head, and rather slender.

Color (in spirits) somewhat dusky above, with a narrow, dark dorsal line; sides silvery, with a dull, leaden line along the caudal peduncle. Occasionally, in some of the most highly colored specimens, a few scales on the side are widely margined with black, so that the sides appear splotted. The lower part of the body is in life almost flame-color. All the fins orange, at least at their bases. At least the tips of the dorsal, ventral, and caudal jet-black. No spot at the base of dorsal. In some adults the whole dorsal has black pigment mingled with the orange, besides having the rays tipped with black, and the distal half of the ventrals and anal black. Very few specimens are without the black tips to the fins, so that this becomes a distinctive character. Evidences of the existence of tubercles were observed on the heads of a few specimens.

Thirty-six individuals were captured at Artesia and four at Macon.
Length from 2 to $2\frac{3}{4}$ inches.

This species must be closely allied to *Lythrurus atripes*, Jordan, found by Prof. S. A. Forbes in Southern Illinois. The differences are, however, sufficiently evident. The larger eye, shorter head, fewer scales along the lateral line, and the fewer soft rays in the dorsal fin will distinguish my species from that. The peculiar coloration of the fins and the lack of the dorsal spot will furnish the most obvious differences.

This species illustrates well the little value of the character most relied on for separating the *Lythruri* as a genus from the species of *Minnilus*. While the external characters are all, or nearly all, those of a typical *Lythrurus*, the teeth are decidedly "sharp-edged", as that term must be defined in order to be applicable to other species with "sharp-edged" teeth.

Under the subgenus *Lythrurus* I would arrange the following species. There may be others that ought to be included:

Minnilus diplæmius (Raf.) Hay.—Cope, Proc. Acad. Nat. Sci. Phila. 1867, 162. Pennsylvania to Illinois.

M. cyanocephalus (Copeland) Hay.—Jordan, Proc. Acad. Nat. Sci. Phila. 1877, 70. Michigan to Minnesota.

M. atripes (Jord.) Hay.—Jordan, Bull. Ill. Lab. Nat. Hist. No. 2, 59. Southern Illinois.

M. rubripinnis, Hay.—Mississippi.

M. ardens (Cope) Hay.—Cope, Proc. Acad. Nat. Sci. Phila. 1867, 163. Virginia and North Carolina to Kentucky.

M. bellus, Hay.—Mississippi.

M. lirus, Jordan.—Jordan, Annals N. Y. Lyc. Nat. Hist. 1877, 342.

M. punctulatus, Hay.—Mississippi.

As an aid to the identification of the species given above, I insert the following analytical table:

I. Elongated species; depth in length $4\frac{1}{2}$ or more times.

1. Color pale, with a lateral metallic blue band.....M. LIRUS.

2. Colors conspicuous—steel-blue, red, and purplish.

a. A black spot at the base of the dorsal; first ray of dorsal opposite the ventrals;

A. I, 11.....M. ARDENS.

b. A black spot at the tips of the anterior dorsal rays; first dorsal ray behind the ventrals; A. I, 12.....M. RUBRIPINNIS.

II. Deep and compressed species; depth $4\frac{1}{3}$ times or less in the length.

1. Species with a distinct black spot at the base of dorsal.

a. Species with conspicuous hues; the dorsal surface dusky; sides and fins with more or less crimson.

* Eye small, 4 in head; depth $3\frac{1}{3}$ in length; D. I, 7; A. I, 11.....M. ATRIPES.

** Eye in head $3\frac{1}{3}$; depth in length $3\frac{1}{3}$; D. I, 9; A. I, 11.....M. DIPLEMUS.

*** Eye in head $3\frac{1}{3}$; depth in length 4; D. I, 8; A. I, 11 or 12.....M. CYANOCEPHALUS.

b. Color pale; scales coarsely punctulated, small, 10 to 12—48 to 50—3; spot small.
M. PUNCTULATUS.

2. No distinct spot at the base of the dorsal; fins tipped with black.....M. BELLUS.

GENUS NOTEMIGONUS, Rafinesque.

42. *Notemigonus chrysoleucus* (Mitch.) Jor. (No. 27,423.)*Stilbe americana*, COPE, Trans. Amer. Phil. Soc. 1869, 389.*Notemigonus chrysoleucus*, JORDAN, Bull. U. S. Nat. Mus. No. 2, 404 (Synonymy).

Specimens of this fish were obtained at Corinth, Artesia, and Macon.

GENUS SEMOTILUS, Rafinesque.

43. *Semotilus corporalis* (Mitch.) Put.*Semotilus corporalis*, COPE, Trans. Amer. Phil. Soc. 1869, 363.

A single young specimen was seined from the ponds along Catawba Creek at Artesia.

GENUS CERATICHTHYS, Baird.

44. *Ceraticthys biguttatus* (Kirt.) Bd. (No. 27,422.)*Ceraticthys biguttatus*, COPE, Trans. Amer. Phil. Soc. 1869, 366.

A few immature individuals from the Chickasawha River at Enterprise.

45. *Ceraticthys amblops* (Raf.) C. & J. (No. 27,436.)*Ceraticthys amblops*, JORDAN, Annals N. Y. Lyc. Nat. Hist. 1877, 328.

An individual of this species, having a total length of five inches, and differing in no important respect from a specimen of the same size caught in Indiana, has been sent to me by Mr. Warner.

46. *Ceraticthys winchelli* (Grd.) Jor.*Hybopsis winchelli*, GIRARD, Proc. Acad. Nat. Sci. Phila. 1856, 211.*Ceraticthys hyalinus*, COPE, Journ. Acad. Nat. Sci. Phila. 1869, 226.*Nocomis winchelli*, JORDAN, Annals N. Y. Lyc. Nat. Hist. 1877, 330.A single specimen of a fish answering well enough to the descriptions of this species was obtained at Enterprise. It is probably but a variety of *C. amblops*.

The dark lateral band is very decided the whole length of the body. It is continued from the front of the eye around the snout, and is here quite black.

FAMILY CATOSTOMIDÆ.

GENUS MOXOSTOMA, Rafinesque.

47. *Moxostoma macrolepidotum* (Le Sueur) Jordan, var. *duquesnii*.*Catostomus duquesnii*, DEKAY, Fauna N. Y. Fishes, 203.*Teretulus duquesnii*, COPE, Journ. Acad. Nat. Sci. Phila. 1869, 236.*Ptychostomus duquesnii*, COPE, Proc. Amer. Phil. Soc. 1870, 476.*Myxostoma macrolepidotum*, subsp. *duquesnii*, JORDAN, Bull. U. S. Nat. Mus. No. 12, 120.

Several individuals of the widely spread "Red Horse" were obtained at Enterprise.

48. *Moxostoma pæcilurum*, Jordan. (No. 27,463.)

One specimen from Enterprise.

GENUS ERIMYZON, Jordan.

49. *Erimyzon sucetta* (Lac.) Jordan. (No. 27,448.)

Catostomus sucetta, DEKAY, Fauna N. Y. Fishes, 203.

Moxostoma clariformis, GIRARD, Pac. R. R. Surv. vol. x, 219.

Erimyzon sucetta, JORDAN, Bull. U. S. Nat. Mus. No. 12, 144.

A specimen of this species, a female, was obtained at Corinth. Another female was caught in a shallow branch of Catawba Creek whilst depositing her spawn, in company with the male. Another very young specimen was seined at Macon.

GENUS CATOSTOMUS, Le Sueur.

50. *Catostomus nigricans*, Le Sueur. (No. 27,447.)

Hypentelium nigricans, JORDAN, Bull. U. S. Nat. Mus. No. 9, 34.

Catostomus nigricans, JORDAN, Bull. U. S. Nat. Mus. No. 10, 162.

One specimen from Enterprise.

FAMILY SILURIDÆ.

GENUS ICTALURUS, Rafinesque.

51. *Ictalurus punctatus* (Raf.) Jordan. (No. 27,448.)

Ictalurus cærulescens, COPE, Proc. Amer. Phil. Soc. 1870, 489.

Pimolodus olivaceus, GIRARD, Pac. R. R. Surv. vol. x, 211.

Ichthælurus punctatus, JORDAN, Bull. U. S. Nat. Mus. No. 10, 76.

I obtained specimens of this Catfish from the Noxubee River at Macon; others have since been sent me from Enterprise, on the Chickasawha, by Mr. Warner.

GENUS AMIURUS, Rafinesque.

52. *Amiurus vulgaris* (Thomp.) Nelson. (No. 27,437.)

Pimolodus ailurus, GIRARD, Pac. R. R. Surv. vol. x, 210.

Amiurus vulgaris subsp. *ailurus*, JORDAN, Bull. U. S. Nat. Mus. No. 10, 88.

Two Catfishes were purchased from a young negro, who had caught them in Sand Creek near Artesia. One of these, having a total length of 10 inches, I identify as above. It is, I have no doubt, Girard's *P. ailurus*, and if this is, as Professor Jordan in his "Synopsis of the Fresh Water Siluridæ of the United States" affirms, identical with Thompson's *P. vulgaris*, the latter name will be the proper one to employ.

The discovery of this specimen reveals a much greater range southward in this species than was previously suspected. Hitherto it has not been known to occur further south than Saint Louis, and has been supposed to be peculiar to our northern lakes and rivers.

The other Catfish purchased was—

53. *Amiurus melas* (Raf.) Jord. & Copeland. (No. 27,462.)

Amiurus melas, JORDAN, Bull. U. S. Nat. Mus. No. 10, 89.

One specimen from Sand Creek, Artesia, and two from Noxubee River at Macon.

GENUS PILODICTIS, Rafinesque.

54. *Pilodictis olivaris* (Raf.) Gill. & Jor.

Hopladelus olivaris, GILL, Proc. Bost. Soc. Nat. Hist. 1862, 45.—COPE, Journ. Acad. Nat. Sci. Phila. 1869, 237.

Pelodichthys olivaris, JORDAN, Bull. U. S. Nat. Mus. No. 10, 95.

The skin of a fine specimen of this species was obtained at Shubuta, the fish having been hooked from a branch of the Chickasawha.

GENUS NOTURUS, Rafinesque.

55. *Noturus leptacanthus* ? Jordan. (No. 27,442.)

Noturus leptacanthus, JORDAN, Annals N. Y. Lyc. Nat. Hist. 1877, 352; Bull. U. S. Nat. Mus. No. 10, 102.

I have in my collection a specimen of a *Noturus* which agrees pretty well with the descriptions given by Professor Jordan of his *N. leptacanthus*, as above cited. There are, however, some important differences which I am not able to account for satisfactorily. My specimen is not quite 2 inches long to the base of the caudal, and is, therefore, most probably a young one. Hence, the differences noted below may be due either to its being immature or to its being a different species. It seems that Professor Jordan knew of but a single specimen, and therefore his description may not be applicable to every individual belonging to the species.*

The head is small and narrow, widening gradually from the narrow snout to the shoulders; the lateral outlines of the head, therefore, straight; its length $4\frac{1}{5}$ times in the body. Upper jaw projecting, *spines rather long and slender*, instead of being short as in the type, the pectoral spine being one-half the length of the head. *The color is quite dark.*

In other respects the characters assigned by Professor Jordan to his species apply reasonably well to my specimen. I think, therefore, that until more material is collected it will be better to assign the specimen as above.

Collected at Enterprise.

56. *Noturus gyrinus* (Mitchill) Raf.

Noturus gyrinus, COPE, Journ. Acad. Nat. Sci. Phila. 1869, 237.—JORDAN, Bull. U. S. Nat. Mus. No. 10, 102.

Another *Noturus*, 2 inches long, collected at Macon, belongs to the above species.

I append the following list of species collected at each of the localities visited:

1. CORINTH. Water flowing toward the Mississippi.

- | | |
|-----------------------------------|--------------------------------------|
| 1. <i>Vaillantia chlorosoma</i> . | 5. <i>Luxilus cornutus</i> . |
| 2. <i>Microperca præliaris</i> . | 6. <i>Minnilus punctulatus</i> . |
| 3. <i>Zygonectes notatus</i> . | 7. <i>Notemigonus chrysoleucus</i> . |
| 4. <i>Hyborhynchus notatus</i> . | 8. <i>Erimyzon sucetta</i> . |

* Professor Jordan informs me that he has additional specimens of his *N. leptacanthus*, in all of which the spines are short, less than one-third the length of the head. The skin, however, is said to be dark, as in my specimen.

2. ARTESIA. Catawba Creek, into Tombigbee.

- | | |
|-----------------------------------|---------------------------------------|
| 1. <i>Pæcilichthys artesiæ</i> . | 9. <i>Opsopæodus emiliæ</i> . |
| 2. <i>Vaillantia chlorosoma</i> . | 10. <i>Minnilus bellus</i> . |
| 3. <i>Micropterus pallidus</i> . | 11. <i>Semotilus corporalis</i> . |
| 4. <i>Apomotis cyanellus</i> . | 12. <i>Notemigonus chrysoleucus</i> . |
| 5. <i>Lepomis pallidus</i> . | 13. <i>Erimyzon sucetta</i> . |
| 6. <i>Zygonectes melanops</i> . | 14. <i>Amiurus vulgaris</i> . |
| 7. <i>Zygonectes notatus</i> . | 15. <i>Amiurus melas</i> . |
| 8. <i>Hyborhynchus notatus</i> . | |

3. MACON. Noxubee River, into Tombigbee.

- | | |
|------------------------------------|---------------------------------------|
| 1. <i>Boleosoma maculatum</i> . | 11. <i>Dorosoma cepedianum</i> . |
| 2. <i>Vaillantia chlorosoma</i> . | 12. <i>Hyborhynchus notatus</i> . |
| 3. <i>Apomotis cyanellus</i> . | 13. <i>Hybognathus argyritis</i> . |
| 4. <i>Lepomis pallidus</i> . | 14. <i>Opsopæodus emiliæ</i> . |
| 5. <i>Pomoxys nigromaculatus</i> . | 15. <i>Minnilus bellus</i> . |
| 6. <i>Pomoxys annularis</i> . | 16. <i>Notemigonus chrysoleucus</i> . |
| 7. <i>Elassoma zonatum</i> . | 17. <i>Erimyzon sucetta</i> . |
| 8. <i>Aphredoderus sayanus</i> . | 18. <i>Ictalurus punctatus</i> . |
| 9. <i>Zygonectes melanops</i> . | 19. <i>Amiurus melas</i> . |
| 10. <i>Zygonectes notatus</i> . | 20. <i>Noturus gyrinus</i> . |

4. NARKEETA. Sucharnochee River, into Tombigbee.

- | | |
|------------------------------|-------------------------------------|
| 1. <i>Lepomis obscurus</i> . | 2. <i>Centrarchus macropterus</i> . |
|------------------------------|-------------------------------------|

5. ENTERPRISE. Chickasawha River.

- | | |
|--------------------------------------|---------------------------------------|
| 1. <i>Ammocrypta gelida</i> . | 18. <i>Alburnops xanocephalus</i> . |
| 2. <i>Percina caprodes</i> . | 19. <i>Hemitremia maculata</i> . |
| 3. <i>Hadropterus spillmani</i> . | 20. <i>Luxilus cornutus</i> . |
| 4. <i>Nanostoma elegans</i> . | 21. <i>Luxilus chickasavensis</i> . |
| 5. <i>Nanostoma zonale</i> . | 22. <i>Eriocymba buccata</i> . |
| 6. <i>Pæcilichthys saxatilis</i> . | 23. <i>Opsopæodus emiliæ</i> . |
| 7. <i>Micropterus pallidus</i> . | 24. <i>Minnilus dilectus</i> . |
| 8. <i>Ambloplites rupestris</i> . | 25. <i>Minnilus rubripinnis</i> . |
| 9. <i>Chænobryttus gulosus</i> . | 26. <i>Ceraticthys biguttatus</i> . |
| 10. <i>Lepomis pallidus</i> . | 27. <i>Ceraticthys amblops</i> . |
| 11. <i>Lepomis fallax</i> . | 28. <i>Ceraticthys winchelli</i> . |
| 12. <i>Zygonectes notatus</i> . | 29. <i>Moxostoma macrolepidotum</i> . |
| 13. <i>Hyodon selenops</i> . | 30. <i>Moxostoma pæcilurum</i> . |
| 14. <i>Clupea chrysochloris</i> . | 31. <i>Catostomus nigricans</i> . |
| 15. <i>Hybognathus argyritis</i> . | 32. <i>Ictalurus punctatus</i> . |
| 16. <i>Alburnops taurocephalus</i> . | 33. <i>Noturus leptacanthus</i> ? |
| 17. <i>Alburnops longirostris</i> . | |

6. SHUBUTA. Chickasawha River.

1. *Pilodictis olivaris*.

BUTLER UNIVERSITY,
Irvington, Ind., October, 1880.



Hay, Oliver Perry. 1881. "On a collection of fishes from eastern Mississippi." *Proceedings of the United States National Museum* 3(179), 488–515.
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