

OCCASIONAL PAPERS OF THE MUSEUM OF
ZOOLOGY

UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

NOTROPIS CALLITAENIA, A NEW CYPRINID FISH
FROM ALABAMA, FLORIDA, AND GEORGIA

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IN the large genus *Notropis* one of the most clearly marked groups is that embracing such well-known and widely distributed species as *lutrensis*, *spilopterus*, and *venustus*, for which the subgeneric name *Cyprinella* Girard is available. The members of this complex are the subject of a revisionary study now in progress by Gibbs. Some authors have subdivided the group into subgenera or even genera based on the number of rows of pharyngeal teeth. *Notropis lutrensis* and a number of related Mexican species commonly, but not invariably, lack the minor row, whereas with two exceptions the numerous species in eastern North America typically have a single tooth in the minor row of one or, usually, both sides. One of the exceptions is the recently described *Notropis leedsi* Fowler, which ranges from the Savannah River system southward to the Ochlockonee in Georgia and Florida. The other, from the Altamaha River drainage, Georgia, is *Notropis callisema* Jordan, which, because of the single row of four teeth, has been associated with *lutrensis* and its relatives either as *Moniana* or as *Cyprinella*. The forms with two rows of teeth have been variously placed in *Cyprinella* and *Erogala*.

That *Notropis callisema* is actually much more intimately related to species having two rows of teeth than to those with one has previously been suspected. That suspicion may now be regarded as proved by the discovery of a new species from the Apalachicola and Escambia river basins that is so strikingly similar to *callisema* as to be separable only with difficulty on the basis of external characters. The new species, however, has a tooth on the minor row of one or both sides. It is apparent that a change in dentition, presumably reduction, has occurred independently at least twice in the group. We see no basis for the separation of *Cyprinella* Girard (1856), *Moniana* Girard (1856), and *Erogala* Jordan and Brayton (1878), either as genera (Jordan, Ever-

mann, and Clark, 1930: 129–32) or as subgenera (Fowler, 1945: 27–28), and adopt the subgeneric name *Cyprinella*, which was preferred by Jordan (1929:80), who apparently qualifies as first reviser for the two names proposed simultaneously by Girard (1856:196–201). The type species of *Cyprinella*, *Leuciscus bubalinus* Baird and Girard (1856), by selection of Jordan and Copeland (1876: 134, 153), is a synonym of *Notropis lutrensis* (Baird and Girard).

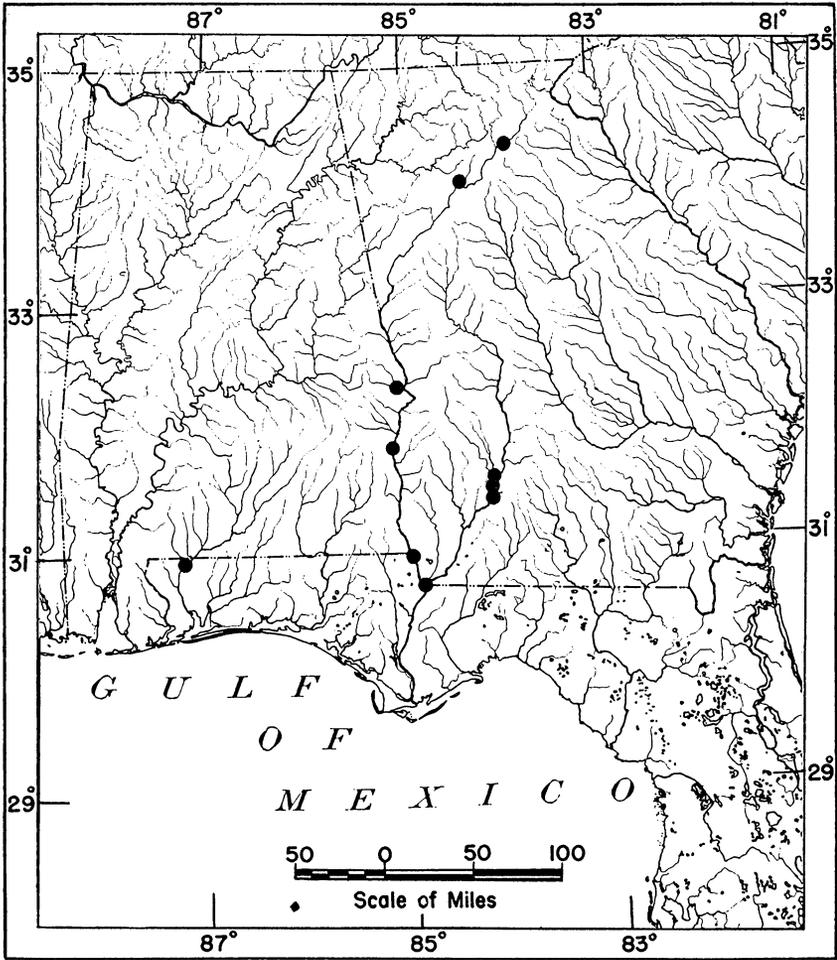
***Notropis callitaenia*, new species**
Bluestripe Shiner

(Pl. I)

Photogenis leucopus (in part).—Jordan and Brayton, 1878: 41–42 (original description; Chattahoochee R., Shallow Ford, NW Gainesville, Ga.).

Notropis sp. (Bluestripe Shiner).—Bailey, Winn, and Smith, 1954: 128 (Escambia R., 5 mi. W Jay, Escambia and Santa Rosa cos., Fla.).

NOMENCLATURE.—Examination of four syntypes, all adults, of *Photogenis leucopus* Jordan and Brayton (1878: 41–42) in the United States National Museum reveals that nominal species to be complex; two specimens are *Notropis venustus* (Girard) and two are *Notropis callitaenia*. In the original description the following statements point clearly to identification with *venustus*: “Snout rather long and somewhat pointed. Mouth large, quite oblique, the intermaxillaries on the level of the pupil . . . a rather inconspicuous dark blotch on last rays of dorsal, as in related species. A round black spot, nearly as large as eye, at base of caudal, precisely as in *Codoma eurystoma* [misidentification of *Notropis zonistius*, cf. Jordan and Evermann, 1896: 277].” In contrast, almost nothing in the original account seems to favor identification with *callitaenia*, so it is obvious that the description was drawn largely or entirely from one or more specimens of the blacktail shiner, *Notropis venustus* (Girard). *Photogenis leucopus* was placed in the synonymy of *Cliola eurystoma* by Jordan and Gilbert (1883: 180), in that of *Notropis eurystomus* by Jordan and Evermann (1896: 276) and most subsequent authors, and in that of *Notropis venustus*, including also *Notropis eurystomus*, by Bailey, Winn, and Smith (1954: 128). In view of these facts, it seems best to retain the association of the name *Photogenis leucopus* with *Notropis venustus*. We therefore designate as lectotype of *Photogenis leucopus* Jordan and Brayton a specimen of *Notropis venustus*, USNM 31124, 77.8 mm. in standard length, from the original series of syntypes. Another syntype, a specimen of *venustus*,



MAP I. Distribution of *Notropis callitaenia* by record stations.

50 mm. in length, is removed as USNM 163963. The remaining two, USNM 163964, are specimens of *Notropis callitaenia*. The lectotype, an adult female, has the following characters that are typical of *Notropis venustus*: A black spot, longer than wide, at the caudal base; origin of dorsal fin equidistant from caudal base and a point between eye and end of snout; mouth straight, relatively oblique; snout not exceeding upper lip; no dark chain of melanophores on lower edge of lachrymal from eye to middle of upper jaw; pigment present on all interradiial membranes of dorsal fin.

The name *callitaenia* is a substantive derived from the prefix calli- (καλλι-) beautiful, and taenia (ταινία), a band or ribbon, in reference to the striking appearance of the lateral blue stripe on the posterior half of the body.

MATERIAL.—Holotype, an adult male, UMMZ 168938,¹ 64.4 mm. in standard length, collected in Flint River (Apalachicola River system), about one mile south of the outlet of Radium Springs, 5.5 miles south of Albany, Dougherty County, Georgia, between September 20 and 29, 1952, by Howard Elliott Winn and Ronald R. Rosanio (field No., Ga. W52, Sta. 3). Paratopotypes, UMMZ 163922 (76), 30 to 71 mm., and ANSP 73864 (20), were taken with the holotype.

Additional collections examined are as follows:

Flint River drainage: UMMZ 163926, 37 mm., and ANSP 73865 (9), Flint R., at Rivers Bend, 2 mi. SW Putney, Dougherty Co., Ga., Sept. 26 and 30, 1952, Winn and Rosanio; UMMZ 163956 (13), 37 to 65 mm., Flint R., below power dam, 2 mi. N Albany, Dougherty Co., Ga., Sept. 21, 1952, Winn; UF 1345 (4), 29 to 45 mm., and UMMZ 134609 (14), 26 to 56 mm., mouth of Flint R., Gadsden Co., Fla., Oct. 13, 1941, A. F. Carr, Jr.

Chattahoochee River drainage: USNM 163964 (2), 52 and 63 mm., Chattahoochee R., Shallow Ford, NW Gainesville [Hall Co.], Ga., about 1876, D. S. Jordan and A. W. Brayton (from composite series of syntypes of *Photogenis leucopus* Jordan and Brayton, see p. 2); CU 17137 (16), 39 to 62 mm., Vickery Cr., Roswell, Fulton Co., Ga., Mar. 30, 1950, E. C. Raney, R. D. Suttkus, R. H. Backus, and C. R. Robins; CU 28373 (3), 46 to 60 mm., same locality, Sept. 6, 1953, R. H. and S. P. Gibbs; and CU 28374 (2), 57 and 63 mm., Uchee Cr., 9.2 mi. S Phenix City, Russell Co., Ala., June 12, 1949, R. D. Suttkus, C. F. Cole, and R. H. Gibbs; UMMZ 167871 (15), 28 to 64 mm., Uchee Cr., Nucholls, 3.5 mi. SE U. S. Hwy. 241, Russell Co., Ala., Oct. 2, 1954, J. S. Dendy; UMMZ 168737 (11), 35 to 64 mm., Chattahoochee R., Eufaula, Barbour Co., Ala., Sept. 11, 1954, R. M. and D. M. Bailey; and UMMZ 166278 (4), 41 to 46 mm., Chattahoochee R., at mouth of Mill Cr., above Hwy. 2 crossing, T. 7 N, R. 8 W, secs. 23 and 26, Jackson Co., Fla., May 2, 1952, R. M. and D. M. Bailey.

Escambia River drainage (provisional identification): UMMZ 134620, 26 mm., Escambia R., 5 mi. W Jay, Escambia and Santa Rosa cos., Fla., Oct. 12, 1941, Carr.

DIAGNOSIS.—A species of *Notropis* of the subgenus *Cyprinella* with closely imbricate scales that are pigmented near the margin to form a regular lateral pattern of oblique dark lines so that each scale appears diamond-shaped; a prominent steel-blue midlateral band (lead colored to black in preservation), with a dark basicaudal spot that is slightly wider than band; teeth usually 1, 4-4, 1, often with minor row lacking on one side; anal rays typically 8; body moderately elongate, com-

¹ The following abbreviations are employed: ANSP, Academy of Natural Sciences of Philadelphia; CU, Cornell University; UF, Department of Biology, University of Florida; UMMZ, Museum of Zoology, University of Michigan; and USNM, United States National Museum.

pressed; lateral line complete; dorsal origin slightly nearer tip of snout than caudal base; mouth scarcely oblique, rather small; no pronounced dark on posterior membranes of dorsal fin, melanophores on this fin few or absent (except in large males).

Notropis callitaenia is very similar to *N. callisema*, but differs in the presence of a minor row of teeth, the dark, crescent-shaped line of melanophores between eye and angle of gape, and usually in the darker basicaudal spot.

DESCRIPTION.—Pharyngeal teeth 1, 4-4, 1 or the minor row lacking on one side, strongly hooked, the grinding surface poorly developed, the cutting edge entire or crenate. Dorsal rays 8; anal rays 8, seldom 7 (2 of 69 counted); pelvic rays 8; pectoral rays 14 or 15 (range 13 to 17). Dorsal placed slightly behind pelvic insertion, its origin usually slightly nearer tip of snout than base of caudal fin. Dorsal fin moderate in size in nonbreeding specimens, the rays decreasing regularly in length posteriorly, the posterior rays exceeding the anterior in the depressed fin. Lateral line complete, moderately decurved from slightly behind opercle to below middle of dorsal. Scales (37) 38 or 39 (40) along lateral line, usually in 26 (13 + 2 + 11) rows around body before the dorsal fin, and in 14 (7 + 2 + 5) rows around caudal peduncle. Lateral scales with their exposed surfaces higher than wide, most pronounced predorsally and along lateral line. Predorsal scales not crowded; breast and throat scaled. Mouth slightly inferior; upper lip longer than lower; slope of upper jaw becoming somewhat steeper behind angle at anterior end of lachrymal. Angle of closure, measured between a line from the most anterior to the most posterior points on the gape and the horizontal axis of the body, usually 25° or less. Snout blunt, usually extending beyond upper jaw. Head rather short, 4.0 to 4.3 in standard length; body elongate, its depth 4.2 to 5.0 in standard length. Measurements of the holotype and 7 paratopotypes are given in Table I. These were taken as described by Hubbs and Lagler (1947: 8-15). Gillrakers of first arch much reduced in size, few (2 or 3 + 3 or 4). Cephalic canals complete except the supratemporal which is interrupted mesially. None of our specimens has well-developed nuptial tubercles. Those few with pearl organs seem to have a concentration on the snout, scattered moderate-sized tubercles on the top of the head, and a prominent single row on the middorsal line from the occiput to the origin of the dorsal. This is a provisional description, awaiting the collection of breeding males.

Vertebrae were counted from X rays of the holotype and 15 paratopotypes (UMMZ 163922). One of the latter was eliminated from the

TABLE I

Proportional Measurements of Notropis callitaenia
and a Hybrid, Notropis callitaenia x Notropis venustus

Proportions are expressed in thousandths of the standard length. The specimens of N. callitaenia are from the type locality, Flint River, Georgia; the hybrid is from the Chattahoochee River, Alabama.

Measurement	<u>Notropis callitaenia</u>										Hybrid UMMZ 168939
	UMMZ 163922	Holotype UMMZ 168938	UMMZ 163922								
			60.3	59.5	56.6	50.2	45.1	38.8			
Standard length, mm.	68.2	65.1	60.3	59.5	56.6	50.2	45.1	38.8			71.0
Dorsal origin to snout tip	500	504	509	511	500	510	488	505			518
Dorsal origin to caudal base	507	522	516	521	523	526	519	515			510
Dorsal origin to occiput	311	312	312	314	315	305	290	299			324
Pelvic insertion to snout tip	479	498	491	493	491	488	481	484			501
Anal origin to caudal base	356	355	348	343	337	373	364	363			342
Body, greatest depth	236	240	209	217	210	239	186	188			244
Body, greatest width	138	134	136	134	131	141	120	126			146
Dorsal origin to lateral line	147	146	134	138	133	155	124	124			158
Pelvic insertion to lateral line	97	95	90	91	87	94	86	80			99

Caudal peduncle, length	236	224	225	230	221	237	242	245	220
Caudal peduncle, least depth	103	106	95	101	99	110	98	98	113
Head, length	242	246	234	235	230	249	239	235	239
Head, depth	155	155	153	148	145	163	155	155	155
Head, width	123	121	126	124	118	127	120	119	125
Interorbital, least fleshy width	86	95	91	92	87	88	80	85	100
Snout, length	76	78	76	71	74	80	64	72	75
Orbit, length	65	68	68	74	72	78	78	75	70
Upper jaw, length	67	68	65	64	65	72	69	67	70
Suborbital, least width	29	29	25	29	25	24	31	26	27
Dorsal fin, depressed length	262	275	222	229	223	259	217	214	224
Anal fin, depressed length	202	207	191	188	186	205	180	180	186
Caudal fin, length from base to tip of longest ray	220	212	222	220	228	237	246	237	235
Pectoral fin, length	164	174	161	168	166	171	175	191	172
Pelvic fin, length	163	177	153	148	148	165	146	144	149

tabulation because of two aberrations in the precaudal region. The Weberian apparatus is presumed to consist of four vertebrae, which are included in the total enumeration as is the urostylar vertebra. The transverse process of the last precaudal vertebra is considerably shorter than the hemal spine of the first caudal vertebra, the tip of which lies behind and close to the proximal end of the first interhemal spine. The precaudal vertebrae number 15 (in 6) or 16 (in 9, including the holotype); the caudal vertebrae are 18 (in 1), 19 (in 12, including the holotype), or 20 (in 2). The total vertebral count is 38 (in 5) or 39 (in 10). Long, well-developed ribs are attached to the anterior precaudal vertebrae, beginning with the first behind the Weberian apparatus. Posteriorly the ribs are shorter and weaker so that the last pair show only faintly on the X rays. The last precaudal vertebra bears no ribs, and in some specimens the penultimate one also lacks them. When there are 15 free precaudal vertebrae, usually only one lacks ribs; when there are 16 most often two bear no ribs. Thus, the typical number of ribs, 14 pairs, is more constant than the number of precaudal vertebrae.

COLORATION.—The most striking characteristic of this species is the lateral stripe, which is deep metallic blue in living fish, lead-colored to black in preserved specimens. It extends from the caudal base to a point below the front of the dorsal fin, the upper part narrowing to continue as a less intense streak to the opercle. A somewhat broadened anterior continuation of the stripe is represented by a moderate concentration of melanophores extending to the opercle between the dark streak and the lateral line. A basicaudal spot is slightly longer than wide and slightly darker than the lateral stripe, but the spot is not notably separated from the stripe, and they do not contrast greatly. The general tone of the body is pale; above the lateral line the scale pockets are narrowly margined with black, giving the scales a diamond-shaped appearance; below this a row or two of scales may be indistinctly outlined. The underparts are immaculate except for the melanophores which usually line the sides of the anal base. A dark, rather broad middorsal stripe is of constant width from the occiput to the dorsal origin; behind the dorsal fin it is lighter and narrows to a streak to continue to the basal procurrent caudal rays or to disappear before reaching them. The head is plumbeous above, white below, the dark reaching the upper lip and the lower edge of the lachrymal; behind the eye the uniform coloration grades into scattered melanophores laterally which reach about to the level of the middle of the eye and the upper one-third to one-half of the opercle. There is a prominent, dark heart-shaped area anterior to the occiput. The lower edge of the lachrymal is bordered by a narrow

line of dark melanophores that extend from the lower half of the orbit to a point near the middle of the upper jaw. A heavy concentration of deep-lying melanophores is present on the lachrymal above the line, often appearing on close examination as a bar from eye to mouth. The lower jaw bears scattered melanophores laterally, but is not distinctly darkened at the symphysis.

The dorsal fin is often immaculate except for some pigment at its extreme base and a file of melanophores just behind each ray. In the few nonbreeding specimens that have dorsal pigment, it is not dense and is concentrated in the basal half of each membrane. In specimens near breeding condition the dorsal is densely pigmented on all its membranes. On the membranes between the first and third principal rays the pigment is concentrated in the distal two-thirds and absent from the basal third. In the remaining membranes it is most dense in the basal part but is also present distally. The pigment extends to the anterior ray of each membrane, but usually not to the posterior, leaving a narrow clear space behind. There is a tendency for all fins, but particularly the dorsal and anal, of most larger specimens to contain the milky pigment which is characteristic of *Cyprinella*.

Those parts of the color pattern which owe their presence to melanophores are subject to reduction, approaching absence, in individuals from turbid waters. In such cases the lateral band may become quite inconspicuous, but the basicaudal spot remains noticeable, though much lighter. Preservation may also affect the color intensity.

COMPARISONS.—Within the known range of *Notropis callitaenia* the only other species of *Cyprinella* is *N. venustus*. These two species are common associates and bear a marked superficial resemblance. On close inspection, however, they are seen to differ in numerous characters (Table II), notably in the size and form of the mouth and snout, the relative position of the dorsal fin, scale size, and several features of pigmentation.

Notropis callisema, from the Altamaha River drainage, is obviously the closest relative of *N. callitaenia*. The similarity is so striking that for a time we were dubious about their systematic separation. They differ sharply and consistently, however, in pharyngeal dentition. Tooth counts on 15 specimens of *N. callitaenia* from the Apalachicola system number as follows: 1, 4-4, 1 in nine, 1, 4-4, 0 in three, and 0, 4-4, 1 in three. Even when a tooth of the minor row is lacking, the arch is rather broad and heavy and a shelf is present where the tooth should be. The single fish from the Escambia has the formula, 1, 4-4, 1. In contrast, the teeth number 4-4 in 15 specimens of *N. callisema*. Since the arch is

TABLE II

Comparison of Notropis venustus, N. callitaenia,
and a Hybrid, N. callitaenia x N. venustus

Based on specimens (UMMZ 168739, 168737, and 168939, respectively) taken in the Chattahoochee River at Eufaula, Alabama.

Character	<u>venustus</u>	hybrid	<u>callitaenia</u>
Number measured	3	1	4
Standard length (mm.)	65-92	71	60-63
Configuration of upper jaw . . .	Almost straight	Slightly curved	Broadly curved
Length of upper jaw (per cent of standard length)	7.9 to 8.8	7.0	6.8 to 7.0
Angle of mouth	About 30°	26°	About 20° to 25°
Snout	Rather sharp, does not exceed upper lip	Fairly sharp, slightly exceeds upper lip	Blunter, usually exceeds upper lip
Head length (per cent of standard length)	25.3 to 26.6	23.9	24.1 to 24.9
Distance from dorsal origin to caudal base projected forward reaches:	Nostril, occasionally to middle of snout	Almost to tip of snout	Usually slightly beyond tip of snout

Predorsal length/ postdorsal length	1. 068 to 1. 097	1. 017	. 941 to . 987
Dorsal circumferential scales	Usually 14 or 15	13	Usually 13
Lateral band	Lighter; caudal spot contrasting markedly	Intermediate; caudal spot contrasting moderately	Dark; caudal spot contrasting slightly
Caudal spot	Larger; usually considerably longer than wide	Intermediate; slightly longer than wide	Smaller; usually about as long as wide
Pigment on lachrymal	Uniform, no dark crescent	A mere suggestion of a dark crescent	Crescent of dark pigment along lower edge from eye to middle of upper lip
Anterior end of lower jaw	Almost as dark as front of upper lip; much dark pigment	Much lighter than upper lip; some concentration of pigment	Much lighter than front of upper lip; few scattered melanophores
Pigmentation of dorsal fin (nonbreeding fish)	Usually with many melanophores on all or on last 4 to 6 membranes, denser posteriorly; more concentrated distally	Present on all membranes, becoming denser posteriorly; more concentrated in middle third of each membrane	Often immaculate; if present sparse and concentrated basally

more delicate and narrower than in *callitaenia*, there is usually inadequate surface to support a tooth in a minor row. The most evident distinguishing pigmentary character involves the area on and below the lachrymal. In *callitaenia* the melanophores over the lachrymal are larger, more intense, and more or less aggregated and fused; along the ventral edge of the bone there is a chainlike series of deep macromelanophores extending from the anteroventral edge of the eye forward in a crescentic line to the angle of the gape. In *callisema* the lachrymal is uniformly and lightly dusted with small, discrete melanophores, and there is no line of enlarged pigment cells along the lower edge of the lachrymal. In *callitaenia* the basicaudal spot is at least as dark as the lateral band on the peduncle; in *callisema* it is much lighter than the band. There appear to be no consistent differences in body proportions.

From *Notropis callistius*, the most similar species in the Alabama River basin, *callitaenia* differs abundantly in the deeper scales that are clearly edged with dark, the presence of a dark stripe on the peduncle, the fewer (14 instead of 16) rows of caudal-peduncle scales, the higher number (26 instead of 24) of rows of body-circumference scales, and in other characters.

From *Notropis leedsi* the new species differs in the presence of a tooth in the minor row of the pharyngeal arch, in the diamond-pattern of scale pigmentation, and in the larger number of lateral-line scales (usually 38 or 39 instead of 36 or 37).

HABITAT.—The collection stations for *Notropis callitaenia* are chiefly in large rivers with a sandy bottom. In Vickery Creek, Georgia, the species was taken just above the junction of the creek with the Chattahoochee River. The collections in Uchee Creek, Alabama, a moderate-sized stream, were obtained in the lower course a few miles from the Chattahoochee River. *Notropis callitaenia* is commonly associated with *N. venustus*, but unlike that species it appears not to enter small creeks or to occur over a soft, organic bottom.

RANGE.—*Notropis callitaenia* (Map 1) is apparently a characteristic inhabitant of the two primary affluents of the Apalachicola River, the Chattahoochee and Flint rivers, and the lower reaches of their larger tributaries. Elsewhere the species is known only from the provisional identification of a single small specimen from the Escambia River. This specimen agrees well with *N. callitaenia* and is clearly not referable to *Notropis venustus*, the only other species of the subgenus *Cyprinella* known from the Escambia basin. The occurrence of a previously undescribed but apparently not uncommon minnow in large rivers of the

Gulf drainage emphasizes the need for thorough ichthyological investigation in this habitat and region.

HYBRIDIZATION.—A single specimen, UMMZ 168939, a male 71.0 mm. in standard length from the Chattahoochee River at Eufaula, Alabama, is identified as a hybrid, *Notropis callitaenia* × *N. venustus*. Series of both parent species were also taken in the collection. The intermediacy of the presumed hybrid between the two species is indicated by the comparison in Table II, and proportional measurements are given in Table I. Almost nothing is known of the breeding ecology of these species, or of the species of *Cyprinella* generally. For a few northern forms spawning time has been noted, but the place and method of oviposition remain largely unknown. Hankinson (1930) observed *N. spilopterus* spawning about the submerged part of a log in the Huron River, Michigan. Eggs were found on the exposed part of the log and particularly under the bark. Stone (1940: 289) reported *N. analostanus* spawning at Ithaca, New York, in quiet water, the eggs being laid in cracks or on the surface of submerged logs or branches. When the reproductive habits of *callitaenia* and *venustus* are known and the isolating mechanisms have been determined, it may be possible to recognize how these mechanisms are occasionally circumvented, as evidenced by this structurally intermediate specimen that is interpreted as an interspecific hybrid.

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Received for publication March 26, 1956

PLATE I

Notropis callitaenia. Photograph of the holotype, an adult male, 64.4 mm. in standard length.

PLATE I

