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NOTROPIS ALBORUS, A NEW CYPRINID
FISH FROM NORTH CAROLINA AND VIRGINIA

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THE most speciose group of eastern North American fresh-water fishes is the complex that has generally, and we think wisely, been classed in a single genus *Notropis*. There seems to be no end in sight to the new species that are being added to this already large genus. We here define *Notropis alborus*, a new species from the coastal drainage basins of southern Virginia and of North Carolina. It is a Piedmont form, of the Roanoke, Cape Fear, and Peedee river systems. Its distribution (Map 1) corresponds interestingly with that of *Notropis scepticus* and of *N. altipinnis* (Hubbs, 1941: Fig. 1).

WHITEMOUTH SHINER

Notropis alborus, new species
(Pl. I; Fig. 1; Map 1)

Notropis procyne (misidentification).—Jordan, 1890: 132 (size; color; near Greensborough, North Carolina).

The only specimens of this species that seem to have been recorded in the literature were taken by Jordan near Goldsborough, North Carolina (Jordan, 1890: 131). These were

collected in South Buffalo Creek about 5 miles southeast of Greensborough and in Little Allemanee Creek about 9 miles southeast of the same town. The collection from Goldsborough in the United States National Museum¹ contains 25 specimens of *Notropis alborus* (No. 40347) and 1 specimen of *N. procne longiceps* (No. 117390). Pending further information we assume that most of Jordan's series of "*procne*" from near Goldsborough comprised *alborus*. His specimens from Fulk's Mills were not located.

RELATED SPECIES OF ATLANTIC COAST

Among all species of *Notropis* known to occur in the Atlantic drainage south of the St. Lawrence River system, there are only 5 with 4—4 pharyngeal teeth, and *alborus* is one of these. The others are *N. heterolepis*, *N. volucellus*, *N. procne*, and *N. bifrenatus*. Recent discussions of the status and characters and figures, of these species are as follows:

N. heterolepis.—Hubbs, 1926: 36–37, 41–42; Greeley, 1934, Pl. 8; Hubbs and Lagler, 1941: 52, 59–60, Fig. 75.

N. volucellus.—Hubbs and Greene, 1928: 375–80; Hubbs and Ortenburger, 1929: 67–70; Hubbs and Brown, 1929: 31–32; Trautman, 1931; Greeley and Greene, 1931: Pl. 7; Hubbs and Lagler, 1941: 52, 59, Fig. 74.

N. procne.—Fowler, 1906: 140–41, Pl. 12; Greeley, 1936: Pl. 1; Hubbs and Lagler, 1941: 52, 59.

N. bifrenatus.—Fowler, 1906: 138–40, Pl. 2; Hubbs, 1926: 36, 40–41; Hubbs and Brown, 1929: 30; Greeley and Greene, 1931, Pl. 6; Bailey, 1938: 169; Hubbs and Lagler, 1941: 52, 60.

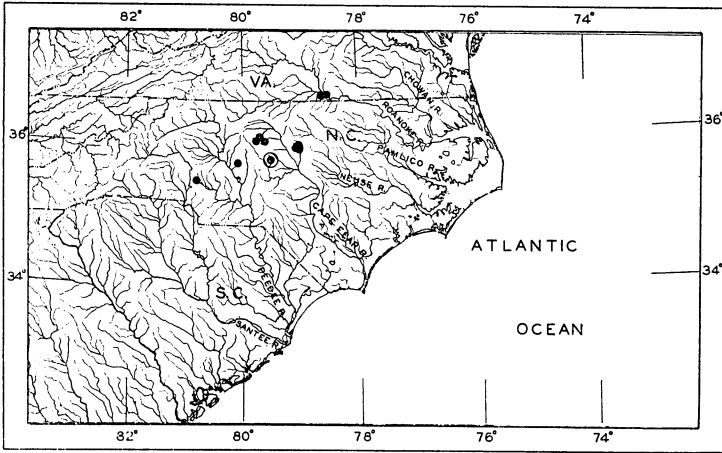
The known Atlantic Coast distribution of these 4 species (in large part indicated by Hubbs and Lagler, 1941: 59–60) is as follows:

Notropis heterolepis Eigenmann and Eigenmann: New York and northern New England (primarily a north-central species).

Notropis volucellus volucellus (Cope): Roanoke and Neuse river systems. These records are based on our collections,

¹ Specimens examined by courtesy of Curator Leonard P. Schultz.

made respectively in the Roanoke River at Salem, Roanoke County, Virginia (May 16, 1931), and in Flat River 3 miles north-northwest of Timberlake, Person County, North Carolina (April 2, 1941).



MAP 1. Record stations for types of *Notropis alborus*. The type locality is ringed.

Notropis procne (Cope): from the Delaware and Susquehanna river systems to the James River basin of Virginia (*N. p. procne*), and from the Roanoke system in Virginia to the Santee drainage in South Carolina (*N. p. longiceps*).

Notropis bifrenatus (Cope): from southern Maine to the Potomac River drainage of Virginia, generally in sluggish waters.

Thus, *N. alborus* occurs south of the southern limit of the range of *N. bifrenatus* and far south of any *heterolepis* record for the Atlantic drainage. It overlaps the distribution of *N. v. volucellus*, though the two have not yet been taken together. The range of *N. alborus* lies within that of *N. procne longiceps*, and these forms have been taken together, as in Morgan Creek, near Chapel Hill, North Carolina.

COMPARISONS.—*Notropis alborus* differs from *N. heterolepis*

and *N. volucellus* in having 7 instead of 8 anal rays. It contrasts further with *heterolepis* in having the dorsal fin larger (depressed length equal to or nearly as long as distance between dorsal and occiput, instead of being about two-thirds that distance). The dorsal is more sharply pointed, and is situated farther forward: its origin lies over instead of behind the pelvic insertion, nearer the tip of the snout than the base of the caudal (the reverse is usually true of *heterolepis*). *N. alborus* lacks the elevated lateral line scales and the black pigment about the anus that characterize *N. v. volucellus* and it is much more strongly black-banded.

Close comparison discloses numerous characters by which *alborus* can be distinguished from *N. procne* and from *N. bifrenatus*, the 2 Atlantic Coast species with 4—4 teeth and 7 anal rays. These differences are brought out in the following comparisons (supplemented by Figs. 1—3). We add comparative statements for *Notropis atrocaudalis* Evermann, a species of Texas with 4—4 teeth and 7 anal rays, and otherwise very similar to *alborus*, *procne*, and *bifrenatus*. Most of the material of *atrocaudalis* was collected and made available by Kelshaw Bonham.

LATERAL LINE

N. alborus, *procne*, and *atrocaudalis*: complete or very nearly so.

N. bifrenatus: typically incomplete, but becoming nearly or quite complete at southern end of range.

DORSAL CONTOUR AT NAPE

N. alborus: slightly convex to almost straight.

N. procne: almost straight.

N. atrocaudalis: definitely convex.

N. bifrenatus: slightly concave (sometimes nearly straight).

DORSAL CONTOUR AT FRONT OF DORSAL

N. alborus and *bifrenatus*: rather sharply elevated.

N. procne: very little elevated.

N. atrocaudalis: intermediate in elevation.

CURVATURE OF DORSAL CONTOUR IN REFERENCE TO VENTRAL
CONTOUR

N. alborus: much greater.

N. procne and *atrocaudalis*: somewhat more curved.

N. bifrenatus: about equally curved.

BODY DEPTH IN HEAD

N. alborus: 0.8–1.1.

N. procne: 1.1–1.3.

N. atrocaudalis: 0.9–1.3.

N. bifrenatus: 0.8–1.0.

EYE IN SNOUT

N. alborus: 1.2–1.5.

N. procne: about 1.0.

N. atrocaudalis: 1.0–1.3.

N. bifrenatus: 0.7–0.9.

EYE IN POSTORBITAL

N. alborus: 1.4–1.7.

N. procne: 1.4–1.6.

N. atrocaudalis: 1.7–2.0.

N. bifrenatus: 1.4–1.7.

MOUTH

N. alborus: nearly horizontal, not rising anteriorly to above lower border of orbit. Angle measurements, taken with an arm protractor (Hubbs, 1946) in 10 specimens, vary as follows: angle between edge of upper lip and line joining middle of caudal base with tip of snout, 18° to 26° (average, 22°); angle between edge of upper lip and line tangential to top of head, 39° to 52° (average, 43°).

N. procne: slightly sloping, rising anteriorly to between levels from lower border of orbit and lower border of pupil.

N. atrocaudalis: mouth moderately oblique, rising anteriorly to level from lower part of pupil.

N. bifrenatus: rather strongly oblique, rising anteriorly to above level from lower margin of pupil.

SNOUT IN SIDE VIEW

N. alborus: blunt and gibbous, projecting a little beyond upper lip.

N. procne and *atrocaudalis*: moderately blunt, scarcely projecting beyond upper lip.

N. bifrenatus: very bluntly pointed, scarcely or not at all projecting beyond upper lip.

NUPTIAL TUBERCLES ON HEAD

N. alborus: weak, rather evenly distributed over top and sides of head, but nowhere much enlarged; scarcely developed about either jaw or on adjacent edge of snout.

N. procne: moderately coarse over top and sides of head, but weak on opercles, except on uppermost part; rather strong on cheeks and preorbital; moderately developed about jaws.

N. atrocaudalis: developed over top and most of sides of head, becoming strengthened on region behind upper half of eye and obsolescent on middle of parietal region, cheek, and mandible.

N. bifrenatus: tubercles very few and scattered; a patch above each eye; a band between anterior nostrils in front of snout; a patch in front of eye on lachrymal; a few on cheek; some on upper part of opercle; almost none on mandible.

NUPTIAL TUBERCLES ON BODY SCALES NEAR HEAD

N. alborus: lacking.

N. procne and *atrocaudalis*: more or less developed in a row near each scale margin.

N. bifrenatus: lacking.

DARK MARGIN OF EACH SCALE POCKET

N. alborus: forming a conspicuous streak down to lateral line; contrasting sharply with the light center and edge of scale; conspicuous dark spots formed where the lines cross.

N. procne: rather conspicuous down to lateral line, but appearing more like bands of dots than pigment

streaks; spots at intersection of lines weaker; scale centers conspicuously lighter.

N. atrocaudalis: rather indistinct; whole scale tending to be evenly peppered with dots becoming indistinct toward lateral line; without prominent spots at intersections of lines.

N. bifrenatus: strongly developed, but whole scale with lightly stippled scale centers; streaks extending to lateral line; spots at intersections of lines rather large, but diffuse.

MID-DORSAL STREAK

N. alborus: obsolescent.

N. procne: moderately strong with intensifications at front of dorsal, at base of caudal, and often at nape.

N. atrocaudalis: weak except toward head, where intensified.

N. bifrenatus: very weak.

COLOR OF DORSAL FIN BASE

N. alborus, *N. atrocaudalis*, and *N. bifrenatus*: a little intensification along base of each membrane.

N. procne: strong black streak with pale area near origin of dorsal and about end of fin.

PIGMENT ON LIPS (Figs. 1-3)

N. alborus: lacking except in concealed area about symphysis of upper lip.

N. procne: developed on both exposed and concealed parts of entire length of upper lip and weakly in a row on tip of chin.

N. atrocaudalis: developed on exposed part and on concealed part near symphysis, but not on lower lip.

N. bifrenatus: upper lip blackish on both exposed and concealed parts except near edge of gape, becoming black on forward extension of lateral band; a streak of pigment on middle of lower lip, but never, as far as observed by us, with a black chin tip as described and figured by Fowler (1906: 140, Pl. 11).

DARK BAND ON SIDE OF SNOUT (Figs. 1-3)

- N. alborus*: ringing tip of snout, entirely above upper lip.
N. procne: confined to preorbital blotch, the whole tip of snout evenly pigmented.
N. atrocaudalis: ringing snout and encroaching upon exposed part of upper lip.
N. bifrenatus: ringing snout in a narrow band on upper lip and extreme edge of rostral fold.

PIGMENTATION ON TOP OF SNOUT (Figs. 1-3)

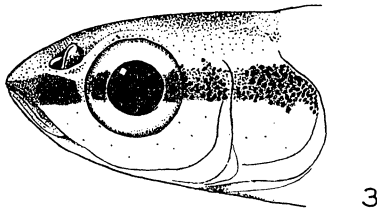
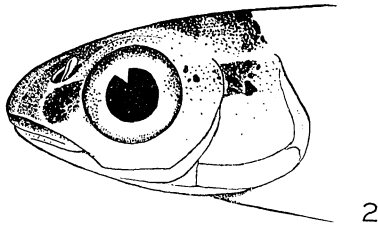
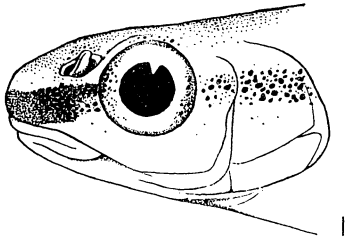
- N. alborus*: no pigment or very little behind nostrils and in a terminal ring just above the dark band; evenly stippled between nostrils.
N. procne: some stippling behind nostrils; no light band ringing snout; pigment between nostrils mostly concentrated in a pair of lateral crescents.
N. atrocaudalis: reduced stippling behind nostrils and in light ring above dark stripe anteriorly; pigment between nostrils evenly stippled.
N. bifrenatus: pigment somewhat reduced behind and before nostrils, but without a definite light ring; region between nostrils darkened and somewhat blotched, but without a definite pair of dark crescents.

BAND OF PIGMENT ON SIDE OF HEAD POSTERIORLY (Figs. 1-3)

- N. alborus* and *atrocaudalis*: moderately broad, subcontinuous.
N. procne: moderately broad to narrow, more or less disrupted (blackest on anterior part of opercle).
N. bifrenatus: broad and continuous.

PIGMENT ON AND JUST BEHIND SHOULDER GIRDLE

- N. alborus*: well developed or intense on shoulder girdle, still more intensified just behind in a streak which is not definitely continued downward.
N. procne: weak or lacking on shoulder girdle; typically intensified just behind girdle in a streak extending more than half way to pectoral base.
N. atrocaudalis: band rather evenly continuous across this region.



FIGS. 1-3. Heads of *Notropis alborus* (Fig. 1), *Notropis procne procne* (Fig. 2), and *Notropis bifrenatus* (Fig. 3), to show form and pigmentation. Drawings by Edwin Ruda.

N. bifrenatus: broad streak across shoulder girdle and region just behind, more or less disrupted by an oblique light streak.

LATERAL BAND ON BODY

N. alborus: narrower than pupil; moderately diffuse and weakly intensified about lateral line pores.

N. procne: rather narrow and diffuse, but strongly marked by black pigment about pores.

N. atrocaudalis: about as narrow as pupil, blackish, and strongly set off by light area above; concentration of pigment about lateral line pores conspicuous.

N. bifrenatus: much wider than pupil and very intense, especially near base of scale pockets (1 row of these blotches is made up of the dark pigment around the lateral line pores).

CAUDAL SPOT AND ADJACENT PIGMENT

N. alborus and *bifrenatus*: conspicuous, black, and conjoined with lateral band; several median caudal rays rather inconspicuously dark edged.

N. procne: much smaller than pupil, disconnected from lateral band; several median caudal rays inconspicuously dark edged.

N. atrocaudalis: about as large as pupil, very intense, disconnected from lateral band; two median caudal rays boldly bordered with black so that the spot appears to be continued backward.

MELANOPHORES ON LOWER EDGE OF CAUDAL PEDUNCLE

N. alborus and *procne*: more or less definitely triserial; tending to form a chainlike pattern with 3 subequal loops.

N. atrocaudalis and *bifrenatus*: biserial or nearly so; little tendency to form a chainlike pattern of three links.

PIGMENT ABOUT ANUS

N. alborus: moderately conspicuous on either side of anus.

N. procne: scarcely developed, except in moderate intensity behind anus.

N. atrocaudalis: moderately developed behind and on sides of anus.

N. bifrenatus: conspicuous around entire region of anus and often also in area between anus and pelvic bases.

It will be seen that a large proportion of the diagnostic characters in this group of shiners is made up of details of pigmentation. This is true also of 2 other species of the same region, and of their relatives elsewhere (Hubbs, 1941), and of certain other minnows (Hubbs, 1942). Insufficient attention has been given such pigmentary characters in the systematics of the American cyprinids.

MATERIAL.—The holotype, 42 mm. in standard length, was

collected by E. C. Raney and Ernest A. Lachner on March 6, 1940, in Brush Creek, a tributary of Deep River, 5 miles west of Siler City, Randolph County, North Carolina. U. M. M. Z., No. 138489. (The dot for the type locality, on Map 1, is ringed.)

Nineteen paratypes, 28 to 45 mm. long, were taken at the same locality. U. M. M. Z., No. 138490; Cornell University, No. 10074.

Additional paratypes bear the following data:

U. M. M. Z., No. 132797: 1 specimen, 49 mm. long, collected by Joe F. Wilson in May, 1939, in a tributary of Rocky River 2 miles south of Davidson, Mecklenburg County, North Carolina.

U. M. M. Z., No. 138332: 8 adults, 38 to 49 mm. long, collected by A. McLaren White on April 28, 1933, in Morgan Creek 2 miles below bridge on the Pittsboro-Chapel Hill Highway, Orange County, North Carolina.

U. M. M. Z., No. 138333: 3 adults, 47 to 48 mm. long, collected by A. McLaren White on June 3, 1933, in Morgan Creek 1 mile above the Pittsboro-Chapel Hill Highway, Orange County, North Carolina.

U. M. M. Z., No. 138488: 8 specimens, 31-36 mm. long, collected by Raney and Lachner on April 5, 1940, in a tributary of the Yadkin River 11 miles southeast of Lexington, Davidson County, North Carolina.

U. S. N. M., No. 40347: 25 specimens, collected by David Starr Jordan in 1888 at Greensboro, Guilford County, North Carolina.

U. S. N. M., No. 93227: 16 adults, 42 to 50 mm. long, collected by L. L. Williams in February, 1930, in Bolins Creek, Chapel Hill, North Carolina.

U. S. N. M., 107615: 48 specimens, 21 to 44 mm. long, collected by L. P. Schultz and Earl D. Reid on July 11, 1938, in Little Buffalo Creek about 5 miles west of Clarksville, Mecklenburg County, Virginia.

Cornell University, No. 3538: 5 specimens, 32 to 45 mm. long, collected by Elmer E. Brown on December 25, 1934, in a tribu-

tary of Buffalo Creek 5 miles southwest of Greensboro, Guilford County, North Carolina.

C. U. No. 9619: 2 specimens, 40 and 41 mm. long, collected by Raney, Lachner, and R. A. Pfeiffer on April 2, 1941, in a tributary of the Roanoke River at Clarksville, Mecklenburg County, Virginia.

DESCRIPTION.—Many of the features of this species have been described in the preceding comparisons, or are indicated in the illustrations (Pl. I and Fig. 1). Scale and ray counts comprise Table I. Measurements taken according to the directions given by Hubbs and Lagler (1941: 12–20, Figs. 2–3), and corresponding with those recently given for *Notropis scepticus* and *Notropis altipinnis* (Hubbs, 1941), are recorded in Table II. A few supplementary items follow.

The teeth are constantly 4—4, without room on the arch for an outer row. They are hooked and have a rather broad, flat grinding surface. The uppermost tooth is weakly crenate on the lower edge of its grinding surface.

In the breeding male the anteriormost pectoral ray is arched outward. The tuberculate part of each of the following several rays is arched upward. The tubercles on these rays form a rather fine shagreen. In these respects *alborus* agrees with *deliciosus*, *procne*, *atrocaudalis*, and *bifrenatus*, but contrasts with *volucellus volucellus*, which has the tubercles larger, in a single series that branches once.

The life color was described by Jordan (1890: 132) as follows: "The jet-black lateral band distinct; fins slightly yellowish." No bright colors were noted by us on live or on freshly preserved material.

HABITAT.—As already noted, this is a Piedmont species. It apparently avoids not only the "black-water" streams of the Coastal Plain but also the swift mountain streams. The ecological records for the collections indicate a considerable diversity in habitat. The streams inhabited varied from small (with the maximum width 10 feet) to medium-sized (30 to 60 feet wide). The water was described as "white," and as clear to turbid; the vegetation, none; the bottom, sand, rubble, bed-

rock; the current, generally rather swift, or pools and riffles. In one pool-and-riffle stream, these minnows were taken in a pool. Elsewhere, the niche was not recorded.

The name *alborus*, derived from *albus*, white, and *os* (genitive *oris*), refers to the unpigmented lips.

TABLE I
SCALE AND RAY COUNTS IN *Notropis alborus*

	Holo- type	Para- types	Total Speci- mens	Aver- age
Scale counts				
Along lateral line	33	33-35	49	33.8
Above lateral line	5	4-6	49	5.0
Below lateral line	4	3-5	49	4.1
Predorsal rows	13	12-16	30	13.5
Predorsal scales	17	13-19	39	15.4
Around body				
Above lateral line	11	10-11	22	10.9
Below lateral line	11	11 (in all)	22	11.0
Total	24	23-24	39	23.9
Around caudal peduncle				
Above lateral line	5	5 (in all)	20	5.0
Below lateral line	5	4-5	20	4.9
Total	12	11-12	20	11.9
Ray counts				
Dorsal fin	8	8 (in all)	20	8.0
Anal fin	7	7 (in all)	82	7.0
Pectoral fin	14-14	13-13 to 14-15	38	13.9
Pelvic fin	8-8	8-8 to 9-9	36	8.1

TABLE II
 MEASUREMENTS OF *Notropis alborus* IN THOUSANDTHS OF STANDARD LENGTH

Stream system	Roanoke	Cape Fear		Yadkin	Total Range and Grand Average
Museum and catalogue number	U. S. N. M. 107615 C. U. 9619	U. M. M. Z. 138489 (Holotype)	U. M. M. Z. 138490 U. S. N. M. 93227	U. M. M. Z. 132797	All series
Specimens measured	8	1	7	1	17
Standard length, mm.	38.65-44.1 (40.47)	43.1	40.2-49.7 (46.30)	48.75	38.65-49.7 (43.51)
Predorsal length	483-502 (491)	498	492-516 (506.5)*	512	483-516 (499)
Dorsal to occiput	283-307 (295)	287	293-315 (305)	313	283-315 (300)
Prepelvic length	473-501 (484)	497	475-515 (498)	491	473-515 (491)
Body depth	213-240 (228)	234	225-234 (230)	216	213-240 (228)
Body width	119-138 (130)	155	114-147 (129)	143	114-155 (132)
C. peduncle, depth	92-105 (99.5)	115	108-111 (110)	105	92-115 (105)
C. peduncle, length	241-275 (251)	237	240-254 (248)	219	219-275 (247)
Head length	251-270 (259)	235	247-274 (257)	245	235-274 (256)
Head depth	153-167 (160)	161	154-177 (164)	159	153-177 (162)

TABLE II—(Cont.)

Stream system	Roanoke	Cape Fear		Yadkin	Total Range and Grand Average
Snout length	70-85 (77)	80	76-85 (80)	71	70-85 (78)
Eye length	74-81 (77)	82	70-88 (77)	68	68-88 (77)
Interorbital, least fleshy	53-79 (69)	75	72-88 (78)	93	53-93 (74)
Upper jaw, length	68-72 (71)	70	65-78 (72)	64	64-78 (71)
D. origin to lateral line	131-142 (136)	148	140-149 (144)	128	128-149 (140)
P ₂ insertion to lateral line	98-116 (106)	105	87-106 (95)	96	87-116 (101)
Dorsal height	249-277 (261)*	271	246-284 (265)*	262	246-284 (263.5)
Anal height	195-228 (215)	224	198-233 (216)	212	195-233 (216)
Anal, basal length	82-93 (88)	100	81-92 (88)	93	81-100 (89)
Caudal, longest ray	272-300 (285)†	307	269-326 (295)	269-326 (293)
Pectoral, length	195-212 (200)	217	188-219 (203)	198	188-219 (202)
Pelvic, length	169-203 (185)‡	195	178-205 (190)	183	169-205 (188)

* 6 specimens.

† 4 specimens.

‡ 7 specimens.

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ADDENDUM

As this paper was passing through the press two additional lots of *Notropis alborus* were received by the Museum of Zoology, as follows:

U.M.M.Z. No. 147606: 3 adults, 45 to 49 mm. long, collected by Joseph R. and Reeve M. Bailey on August 30, 1946, in Sugartree Creek, tributary to the Dan River, at U. S. Highway 158, 3 miles east of Leasburg, Person County, North Carolina.

U.M.M.Z. No. 147628: 2 adults, 41 and 42 mm. long, collected by Bailey and Bailey on August 31, 1946, in Deep River, tributary to the Cape Fear River, at Randleman, Randolph County, North Carolina.—REEVE M. BAILEY.

Hubbs and Raney

PLATE I

Notropis alborus new species. Photographs by Art Smith.

FIG. 1. Side view of an adult male paratype, 48 mm. in standard length, from Bolins Creek, Chapel Hill, North Carolina.

FIG. 2. Top view of an adult female paratype, 43 mm. in standard length, from Brush Creek, a tributary of Deep River, 5 miles west of Siler City, North Carolina.



FIG. 1

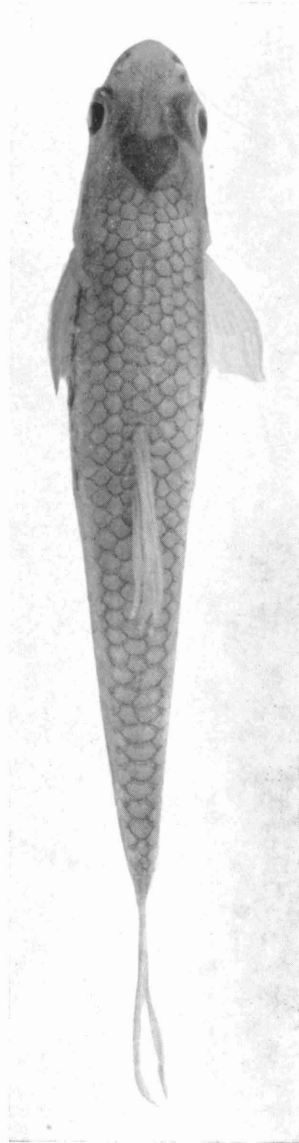


FIG. 2

