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NOTROPIS HUBBSI, A NEW CYPRINID FISH FROM THE MISSISSIPPI RIVER BASIN, WITH COMMENTS ON *NOTROPIS WELAKA*

BY REEVE M. BAILEY AND HENRY W. ROBISON[1]

Notropis is the largest, hence from an evolutionary viewpoint most successful, and one of the widest ranging of North American freshwater fish genera. Diversification in size, structural adaptations, habitat, pigmentation, behavior, and other attributes has been sufficiently great that eight or more species of *Notropis* commonly coexist. Approximately 113 species are currently recognized in the region from the Balsas basin in Mexico to the Mackenzie River in Canada; most inhabit the Atlantic drainage waters of central and eastern United States.

In this paper we make known a highly distinctive species, naming it for Carl L. Hubbs, who has played a key role in the development of knowledge of *Notropis*. He has been personally involved in the description of ten valid species, was the first to discover several others named by colleagues, participated in the description of a number of subspecies, and resurrected several valid species earlier named but long interred in synonymy by less discriminating ichthyologists.

Notropis hubbsi first came to our attention in 1954 when specimens collected by Gerald E. Gunning in Wolf Lake, Illinois, were sent to one of us (RMB) for identification. Soon after, additional specimens from Caddo Lake, Texas, were loaned by Royal D. Suttkus. From the same and an adjacent area Hubbs,

[1] Department of Biological Sciences, Southern Arkansas University, Magnolia, Arkansas 71753.

Kemp, and Gray (1956) reported a species new to Texas under the name *Notropis ortenburgeri* Hubbs. Reexamination of these specimens by HWR reveals, however, that they are the species described herein. The true *N. ortenburgeri* lives in clear upland streams, not quiet and weedy lowland waters to which *N. hubbsi* is restricted. In 1974 Robison encountered *N. hubbsi* in southern Arkansas from which state we now have several records. Additional localities in Louisiana and Texas were provided by Neil H. Douglas.

Meanwhile Brooks M. Burr and Lawrence M. Page from the Illinois Natural History Survey have been investigating the species in Wolf Lake. For the privilege of describing *N. hubbsi* we are indebted to the above persons and also George A. Moore, Oklahoma State University, who assisted Robison in early phases of the study but who withdrew from authorship when we pooled our efforts. Stephen Pelt and Joe L. Stephen assisted in field collecting. Mark Orsen and William L. Brudon, current and former staff illustrators of the Museum of Zoology, produced Plates 1 *(N. hubbsi)* and 2 *(N. welaka)* respectively. Their skilled craftsmanship is much appreciated.

MATERIAL

Specimens utilized have been made available from the following institutions and through the courtesy of the persons named. Abbreviations employed in the listing of specimens appear in parentheses. Academy of Natural Sciences of Philadelphia (ANSP), J. E. Böhlke; Arkansas State University (ASU), J. K. Beadles; Auburn University (AU), J. S. Ramsey; Cornell University (CU), E. C. Raney; Florida State Museum (UF), C. R. Gilbert; Florida State University (FSU), R. W. Yerger; Illinois Natural History Survey (INHS), P. W. Smith and L. M. Page; National Museum of Natural History (USNM), W. R. Taylor; Northeast Louisiana University (NLU), N. H. Douglas; Oklahoma State University (OAM), R. J. Miller; Tulane University (TU), R. D. Suttkus; University of Alabama Ichthyological Collection (UAIC), H. T. Boschung; University of Michigan Museum of Zoology (UMMZ); University of Tulsa (UT), W. Adams; and University of West Florida, Pensacola (UWFP), S. A. Bortone.

Notropis hubbsi, new species
Bluehead Shiner

Pl. 1; Fig. 1

Notropis ortenburgeri (misidentification in part).—Hubbs, Kemp, and Gray, 1956: 110-111 (Texas localities: Haggerty Cr., 3 mi NW Karnack, Harrison Co.; Caddo L., 5 1/2 mi E Karnack, Harrison Co.; Caddo L., 4 1/2 mi NE Karnack, Marion Co.).

Notropis sp.—Gilbert and Bailey, 1972: 8 (undescribed species, probably related to *N. welaka,* dorsal rays 9 or 10). Robison, 1976: 54-55 (Locust Bayou, near Locust Bayou, Calhoun Co., Ark.).

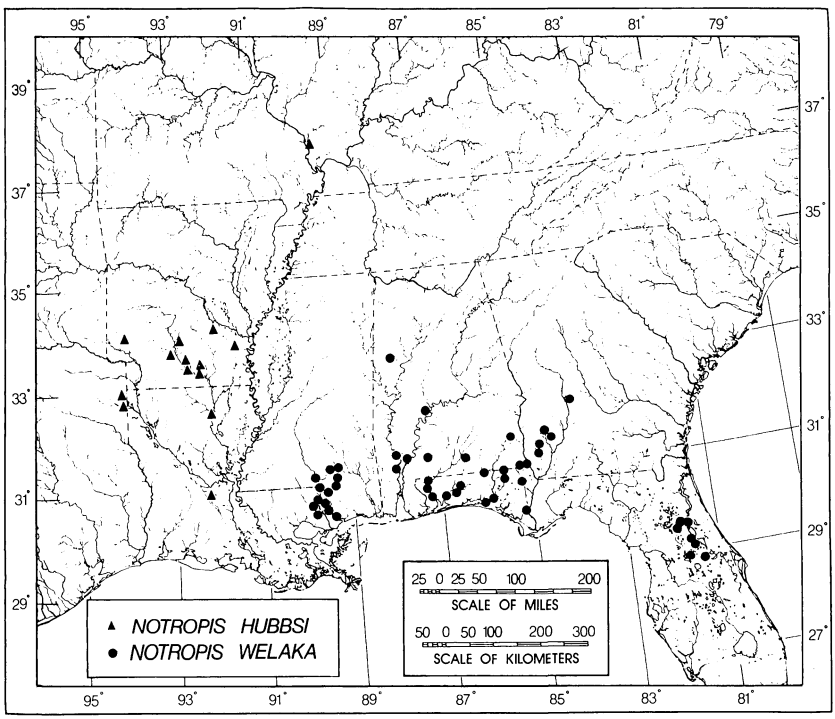

Figure 1. Southeastern United States showing by record stations the distribution of *Notropis hubbsi* (triangles) and *Notropis welaka* (circles). Some additional stations for *welaka* were not mapped to avoid cluttering the map.

MATERIAL.– The holotype, UMMZ 197480, is an adult, prespawning male, 48.1 mm SL, collected in Locust Bayou, tributary to Ouachita River, 1 km W Locust Bayou at Arkansas highway 4 bridge, Calhoun Co., Arkansas, on 10 May 1975, by S. Pelt and J. Stephen (SP 75-27). Taken with the holotype are paratopotypes: UMMZ 197481 (47), 34-49 mm; OAM 9628 (10), 35-48 mm. Other paratopotypes (same locality) are: UMMZ 197482 (54), 35.5-47 mm; TU 96238 (31), 28-48 mm, 20 May, 1975, H. W. Robison and Pelt (HWR 75-47); OAM 9629 (24), 25-35 mm, 14 Dec. 1974, Robison, Pelt, and Stephen (HWR 74-109). NLU 32727 (14), 23.5-27 mm, 6 Oct. 1974, Pelt and Stephen; W. Adams private coll, UT 960 (46), 26-38 mm, 8 Jan. 1975, W. Adams, H. Lindsay, and A. Bell; NLU 32728 (6), 30-37 mm, 15 Feb. 1975, Pelt and J. Wilson (SP 75-1); ASU 4733 (18), 29-42 mm, 6 Apr. 1975, Robison and Pelt (HWR 75-34).

Additional paratypes are as follows:

Arkansas.—NLU 32198 (17), 25-42 mm, backwater between Tulip and Whiteoak creeks, Ark. hwy. 128, 9.7 km SE Sparkman, Dallas Co., 5 Apr. 1975, D. Simpson, C. Lassiter, and P. Lassiter. NLU 32729 (2), 43-44 mm, trib. to Encore Fabre Bayou, 3.2 km NE Bragg City (9.7 km NW Camden), Ouachita Co., 6 May, 1975, Pelt and Stephen (SP 75-24). NLU 32730, 48 mm, Ouachita R. backwater, 4.8 km upstream from Lock 8, mouth of Bang Slough, T16S, R13W, sec. 17, Calhoun Co., 19 May, 1975, Pelt. NLU 32199 (5), 39-42 mm, backwater of Ouachita R., below Calion Lake Dam, S Calion, Union Co., 13 Apr. 1975, M. Williams. NLU 32731 (23), 40-47 mm, Moro Cr., Ark. hwy. 160 bridge, W Jersey, Bradley Co., 25 May, 1975, Pelt and J. Wilson (SP 75-48). NLU 32723 (2), 42-44 mm, Ouachita R. backwater, Moro Bay, off Ark. hwy. 15, 24 km N Strong, Bradley Co., 5 Apr. 1975, L. Raymond. ASU 4732, 53 mm, Bayou Bartholomew, US hwy. 15 bridge, T6S, R9W, sec. 27, Jefferson Co., 2 May, 1974, Hogue, Arnoldi, and Click. ANSP 114112 (3), 17-23.5 mm, stream at US hwy. 65, just S of junction with Ark. hwy. 138, 1.6 km E Winchester, Drew Co. (near Desha Co., line), 17 Aug. 1960, J. E. Böhlke family (B 60-61). NLU 32732 (159), 20-30 mm, backwater of Saline R. (Little R. system, Red R. drainage) at Ark. hwy. 24, E Lockesburg, Sevier Co., 27 Sept. 1975, Robison (HWR 75-136).

Illinois.—All from Wolf Lake, Union Co. UMMZ 197478 (4),

40-42 mm, 14 Aug. 1954, Gerald E. Gunning. INHS 18147, 50.5 mm, 21 June 1973, B. M. Burr and L. M. Page. INHS 18152 (2), 50,50 mm, 25 July 1973, Burr, P. W. Smith, and Page. INHS 18157, 34 mm, 29 Nov. 1973, Burr, Page, and J. A. Boyd. INHS 75026 (3), 32-33 mm, 24 Jan. 1974, Burr, Page, and Boyd. INHS 75027 (2), 37,39 mm, 28 Feb. 1974, Burr, Boyd, and L. R. Davis. INHS 75028 (2), 37,39 mm, 28 Mar. 1974, Burr, Boyd, and Davis.

TABLE 1

PROPORTIONAL MEASUREMENTS OF ADULTS OF *NOTROPIS HUBBSI* FROM THE TYPE LOCALITY

Proportions are thousandths of the standard length.
Holotype, UMMZ 197480; paratopotypes, UMMZ 197481, 197482.

		10 Males (incl. holotype)		10 Females	
Measurement	Holotype	Range	$\bar{X}$	Range	$\bar{X}$
Standard length, mm	46.7	41.3-46.7	43.7	39.5-46.5	42.0
Dorsal origin to snout tip	544	518-544	529	522-562	540
Dorsal origin to caudal base	516	516-540	526	501-533	521
Dorsal origin to occiput	355	339-356	349	345-389	360
Pelvic insertion to snout tip	494	465-499	484	472-499	487
Anal origin to caudal base	364	361-395	378	348-386	367
Body depth	263	246-265	256	249-274	262
Body width	158	133-159	147	149-177	157
Caudal peduncle length	225	194-236	219	196-231	212
Caudal peduncle depth	122	110-124	116	98-109	104
Head length	246	235-256	242	233-247	238
Head depth	167	151-170	161	148-159	154
Head width	131	116-133	128	117-131	121
Interorbital width	92	76-92	84	73-86	79
Snout length	62	58-63	61	53-60	57
Orbit length	66	63-68	66	66-72	69
Upper jaw length	58	54-62	59	56-62	59
Mandible length	77	73-82	77	73-81	77
Dorsal fin, longest ray	330	263-330	300	207-240	221
Dorsal fin, depressed length	388	334-389	358	254-289	267
Anal fin, longest ray	263	233-291	262	171-215	189
Anal fin, depressed length	315	284-335	303	213-258	230
Caudal fin, length from base to tip of longest ray	308	304-351	321	262-309	281
Pectoral fin length	169	169-218	201	148-175	162
Pelvic fin length	216	204-228	212	160-185	172

Louisiana.—NLU 32724, 42 mm, Ouachita R., Monroe, Ouachita Parish, 7 Apr. 1967, N. H. Douglas. NLU 32725, 48 mm, Bayou Boeuf Diversion Channel, 6.5 km W Bunkie, Avoyelles Parish, 4 May 1975, D. G. Bryan.

Texas.—NLU 32202 (86), 29-48 mm, Drainage pipe at Iron Ore Lake, Jims Bayou, 10.5 km SE Linden, 2.4 km S Texas hwy. 125, Cass Co., 5 Apr. 1975, E. Beene. NLU 32726 (15), 28-49 mm, same locality, 29 Mar. 1975. TU 13956 (7), 34-39 mm; UMMZ 197479 (7), 33-39 mm, Caddo Lake, Harrison Co., 1955.

DIAGNOSIS. —A species of *Notropis* with principal dorsal and anal rays (i.e., branched rays plus one simple ray) usually 9 or 10 (Tables 2 and 3), the dorsal rays more numerous than in other species of *Notropis* except *N. emiliae;* a broad, dark, lateral axial stripe that extends from chin to just beyond caudal base where it ends abruptly; pharyngeal teeth in a single row, 4-4; fins in adults notably dimorphic, longer in males which have the dorsal and anal rounded and greatly elevated, dorsal origin somewhat behind pelvic insertion; body deep and compressed; lateral line very poorly developed, with only 2 to 9, mean 5.74, pored scales in adult; infraorbital canal disrupted into several short sections; breeding males with brilliant iridescent blue on top of head from between nostrils to occiput; no barbel; intestine short, with a single lengthwise loop; peritoneum somewhat dusky. *N. hubbsi* is allied to *N. welaka* but differs abundantly from that species (Table 5, Plates 1 and 2).

TABLE 2

FREQUENCY DISTRIBUTION OF DORSAL RAY COUNTS IN *NOTROPIS HUBBSI* AND *N. WELAKA*

Species and Area	Number of Dorsal Rays					N	$\bar{X}$
	7	8	9	10	11		
N. hubbsi							
Illinois			11	4		15	9.27
Ouachita River		2	111	3		116	9.01
Red River			68	31	1	100	9.33
Total		2	190	38	1	231	9.16
N. welaka	1	117	5			123	8.03

TABLE 3

FREQUENCY DISTRIBUTION OF ANAL RAY COUNTS IN *NOTROPIS HUBBSI* AND *N. WELAKA*

Species and Area	Number of Anal Rays					N	$\bar{X}$
	7	8	9	10	11		
N. hubbsi							
Illinois			2	13		15	9.87
Ouachita River			42	73	1	116	9.65
Red River			27	67	6	100	9.79
Total			71	153	7	231	9.72
N. welaka	1	122	11			134	8.07

DESCRIPTION.–Variational data on body proportions, dorsal and anal fin-ray counts, and vertebral counts appear in Tables 1-4.

Pharyngeal teeth in a single row, 4-4 in 15 specimens counted, well hooked, the grinding surface narrow, concave, and the cutting edge entire. Dorsal-fin origin behind pelvic insertion, its distance from snout tip and caudal base subequal in males, usually slightly closer to snout in females. Dorsal fin in juveniles with free edge straight, anterior rays longest in the depressed fin; in adult margin gently rounded, the rays becoming much higher with maturity, middle rays longest. Anal fin also becoming higher with age, the margin slightly concave in juveniles, straight or gently rounded in adults. Lateral line very short, pored scales in adult 2(in 1 specimen), 3(3), 4(7), 5(8), 6(6), 7(7), 8(4), 9(2); these scales not elevated. Scales in lateral series (i.e., transverse body scale rows) 34(2 counts), 35(9), 36(15), 37(3), 38(1). Body circumference scale rows 25(2), 26(7), 27(9), 28(13), 29(4). Caudal peduncle scale rows 12(23), 13(8), 14(4). Predorsal scales somewhat irregular, in 16(11), 17(5), 18(4) diagonal rows; usually 20 to 24 scales crossing middorsal line. Mouth almost terminal, oblique, the snout projects slightly beyond upper lip which is subequal with lower lip; edge of upper jaw almost straight or with a gentle curve; maxilla extends almost to anterior border of eye.

Dorsal principal rays 9 or 10, rarely 8 or 11. Anal rays 9 or 10, rarely 11. Pectoral rays 12-12 (7 counts), 12-13(2), 13-13(16), 13-14(1), 14-13(2), 14-14(2). Pelvic rays 8-8 in 38 specimens. Total gill rakers on anterior arch 8 or 9.

TABLE 4

FREQUENCY DISTRIBUTION OF VERTEBRAL COUNTS IN TWO SPECIES OF *NOTROPIS*

Counts include the urostylar vertebra; four vertebrae in the Weberian complex are among the precaudal vertebrae.

Species and State	N	Precaudal			$\bar{X}$	Caudal			$\bar{X}$	Total				$\bar{X}$
		18	19	20		16	17	18		34	35	36	37	
N. hubbsi														
Arkansas	58	17	40	1	18.72	9	40	9	17.00	1	15	41	1	35.72
Illinois	8	2	6	–	18.75	–	6	2	17.25	–	–	8	–	36.00
Total	66	19	46	1	18.73	9	46	11	17.03	1	15	49	1	35.76
N. welaka														
Mississippi and Louisiana	16	11	5	–	18.31	–	4	12	17.75	–	1	13	2	36.06

Nuptial tubercles in breeding males are well developed but small. They are irregularly disposed over the head, being concentrated along the mandible, anterodorsal rim of orbit, lower edge of lachrymal, with rather uniform distribution over the dorsal surface. The opercle has larger tubercles on the upper part with minute ones on the lower part, cheek, and opercle. Many body scales bear small tubercles; these are arranged in arcs near the scale edges. All fins may bear tubercles. Those on the dorsal surface of the anterior three to five pectoral rays are somewhat enlarged and arranged in single series on the rays. Minute tubercles located on the rays occur on the median fins and on both dorsal and ventral surfaces of the pelvic fins.

COLOR.–The dominating pigment feature of preserved specimens is the broad, dark lateral stripe (Pl. 1). This crosses the chin without involving the upper lip or snout, is well developed on the lachrymal, and extends from the eye across upper parts of the cheek and opercle backward to the caudal base; it is nearly as wide as the eye length. At caudal base the stripe forms a deeper and darker basicaudal spot that extends a short distance onto the caudal rays. There is a pronounced semicircle of dark pigment mesial and posterior to each nostril. The upper parts are rather uniformly dusted with melanophores but on the lower side these are concentrated around the scale edges. The lower surface of the head and body are light. The median fins of adults are shaded with dusky that is concentrated on the

membranes. The dorsal is crossed with a narrow diagonal cross bar (Pl. 1).

Life colors were recorded from recently preserved fish from Locust Bayou, Arkansas, collected May 10 and 20, 1975. The body was dusky above with lateral stripe black, chin black, and underside of head and belly white. The dorsolateral surface, especially just above the lateral stripe, was reddish orange, extending from the light area ahead of the nostril backward to the caudal base. This color was most evident in a female. The rays but not the membranes of the basal half to three-fifths of the caudal fin and the basal half of the dorsal fin also were reddish orange. This color is similar to that in *N. welaka* (Pl. 2) but the distribution is different. Extending downward from the lateral stripe for the width of that stripe was yellowish orange. Males (but not females) had olive yellow on membranes but not the rays of the middle of the anal fin, excluding the basal fifth and the distal fifth. A similar faint wash of olive yellow was present on the membranes of the middle half of the pelvic fin and on membranes bordering the first pectoral ray.

The dorsal fin was dark in large specimens but much less so than in *N. welaka;* some specimens had a trace of orange on the dorsal rays. Larger fish had iridescent greenish blue on the dorsal membranes from just proximal of the middle almost to the distal margin. Most of the pelvic and anal fins was washed with blue green. One male had considerable reddish in the upper half of the iris and a trace of the same in the lower part.

The vernacular name bluehead shiner derives from the most conspicuous color feature of the species. The top of the head from occiput to between the anterior edges of the nostrils was deep azure blue with green iridescence. This same color was evident superficially over the dark area of the lachrymal.

RELATIONSHIPS.–Among the species of *Notropis, hubbsi* most closely approaches *welaka.* On the basis of shared synapomorphic characters these two are judged to constitute a monophyletic group. Shared characters of *hubbsi* and *welaka,* interpreted as advanced in *Notropis,* include the following. (1) The lateral line is reduced, with mean numbers of pored scales 5.74 and 8.64 in *hubbsi* and *welaka* respectively. In most species of *Notropis* the lateral line is complete, although in a few it is very short (e.g., *bifrenatus, calientis*) and in some there are often several unpored posterior scales (e.g., *chalybaeus, heterodon, heterolepis, texanus*). This reductional character reflects adapta-

TABLE 5

COMPARISON OF *NOTROPIS HUBBSI* AND *N. WELAKA*

Measurement ratios are thousandths of standard length.

Character	*hubbsi*	*welaka*
Dorsal fin rays+ (principal)	(8) 9 or 10 (11)	(7) 8 (9)
Anal fin rays+ (principal)	9 or 10 (11)	(7) 8 (9)
Pharyngeal teeth	4-4	Usually 1,4-4,1
Predorsal scales+	Irregular near midline; 16 to 18 rows	Regular; 14 or 15 (16) rows
Pored lateral-line scales+	(2) 3 to 8 (9); $\bar{X}$ 5.74	(5) 6 to 11 (12); $\bar{X}$ 8.64
Body circumference scales+	(25) 26 to 29	(21) 22 to 24
Proportions* (adults):		
Body depth	Greater; 246-265	Less; 184-233
Body width		
Males	Greater; 133-159	Less; 105-133
Females	Greater; 149-177	Less; 119-142
Caudal peduncle depth	Greater; 98-124	Less; 78-99
Snout length	Shorter; 53-63	Longer; 57-74
Orbit length	Shorter; 63-72	Longer; 72-90
Depressed dorsal fin		
Males	Shorter; 334-389, $\bar{X}$ 358	Longer; 281-435, $\bar{X}$ 386
Females	Longer; 254-289, $\bar{X}$ 267	Shorter; 224-250, $\bar{X}$ 239

Depressed anal fin		
Males	284-335, $\bar{X}$ 303	243-344, $\bar{X}$ 305
Females	Greater; 213-258, $\bar{X}$ 230	Shorter; 184-219, $\bar{X}$ 202
Snout	Subequal with upper lip	Often exceeds upper lip in adult
Mouth	More oblique	Less oblique
Dark bridle on muzzle	Broadly developed on mandible and lower lip, a few melanophores on upper lip, undeveloped on snout	Narrow on mandible, well developed on lips, narrow on edge of snout
Dark crescents on inner edges of posterior nares	Prominent	Present but weak
Dark pigment on floor of mouth and oral valve	Well developed	Less well developed; often little or none
Dark scale edges on ventrolateral area	Well marked	Undeveloped or weak
Basicaudal dark blotch	Subcircular, does not extend far on caudal rays	Elongate or wedge shaped, extends well back on caudal, commonly to edge of fin in adult
Caudal pigmentation	Melanophores scattered over area above and below caudal blotch; marginal rays little darkened	Few or no melanophores above and below caudal blotch; marginal rays notably darkened in basal half of fin

[+]Usual counts, including at least 90 percent of specimens, appear without parentheses; infrequent counts are in parentheses.
*Proportions based on 10 males and 10 females of each species. For *hubbsi* see Table 1. *N. welaka* from western Florida, Mississippi, and Louisiana; males 34-53, $\bar{X}$ 43 mm; females 32-43, $\bar{X}$ 37 mm. Most females of both species contained enlarged eggs.

tion to quiet or standing, usually heavily-vegetated waters. (2) In adults the dorsal, anal, and pelvic fins are rounded and elevated (Pls. I and II), the rays relatively much longer than in juveniles. In this feature these forms are approached but not equalled by some species of the subgenus *Cyprinella.* (3) In both species there is a continuous, broad lateral dark stripe that either ends abruptly near the caudal fin base *(hubbsi)* or extends well onto the caudal *(welaka).* This feature is shared with several other unrelated species of *Notropis,* especially those that frequent weed beds. (4) Bright iridescent blue is present on the snout, side and top of head. Although blue is not an uncommon color in *Notropis,* especially in *Cyprinella,* we know of no other species in which its intensity and distribution are as in these two species.

In *N. hubbsi* the lateral line is shorter than in *welaka,* the dorsal fin rays are more numerous, and the pharyngeal teeth are in a single row (Table 5), all characters that we believe are specialized in the genus. *N. hubbsi* appears to be the more advanced species.

We conclude that these two species are intimately related and make up a small species group or subgenus in *Notropis.* Broader relationships within the genus are not obvious. They are perhaps closest to subgenus *Cyprinella* (Gibbs, 1957), but the two groups do not appear to be especially close.

HABITAT.—*Notropis hubbsi* is an inhabitant of quiet, backwater areas of small to medium-sized, sluggish streams and oxbow lakes. Typically the tannin-stained water where *N. hubbsi* is found is heavily vegetated with such plants as *Proserpinaca palustris* L., *Polygonum hydropiperoides* Michx., and American lotus, *Nelumbo pentapetala* Walt., among others, although no high incidence of association with a particular plant species was noticed throughout its range. Substrate over which the species occurs is generally mud or occasionally mixed mud and sand. *N. hubbsi* schools in backwater or side areas away from substantial current and seems to remain poised in mid-water just outside vegetation into which it darts for protection if disturbed.

The character of waters inhabited by the bluehead shiner is indicated by the associated fish species which at the Locust Bayou locality where study was concentrated were: *Esox americanus, E. niger, Erimyzon sucetta, Notemigonus crysoleucas, Notropis atherinoides, N. chrysocephalus isolepis, N. umbratilis, Hybognathus hayi, Gambusia affinis, Labidesthes sicculus, Fun-*

dulus notti, F. olivaceus, Aphredoderus sayanus, Centrarchus macropterus, Lepomis gulosus, L. macrochirus, L. marginatus, L. microlophus, L. punctatus, L. symmetricus, Micropterus punctulatus, M. salmoides, Elassoma zonatum, and *Etheostoma proeliare.* Additional fish associates at other localities include *Notropis chalybaeus, N. texanus, Noturus nocturnus,* and *Etheostoma gracile.* Dr. Neil H. Douglas (pers. comm.) has found *Notropis hubbsi* living with *Heterandria formosa* near Alexandria, Louisiana.

RANGE.—*Notropis hubbsi* occurs through lowlands of the Red and Ouachita river systems of northeastern Texas, southern Arkansas, and Louisiana; it has been encountered in a single locality (Wolf Lake) in southern Illinois (Fig. 1). Careful search of suitable habitat in the intervening region may close this seeming discontinuity in distribution.

Notropis welaka Evermann and Kendall

Bluenose Shiner

Pl. 2; Fig. 1

Despite its early description and illustration (Evermann and Kendall, 1898: 126-127, pl. 6, fig. 2), *Notropis welaka* was long a little-known species. Found originally in the St. Johns River at Welaka, Florida, *N. welaka* was mentioned by compilers in a number of works, but for many years was overlooked by collectors. One of us (RMB) caught an unrecognized shiner in Mississippi in 1948 and received breeding specimens from the same state from the late Fannye A. Cook. Dubbed bluenose shiner because of the brilliant blue snout of nuptial males, it was thought to be unnamed (Bailey, Winn, and Smith, 1954: 128), in part because the original description of *welaka* gave the dental formula 4-4. However, Drs. R. D. Suttkus and W. R. Taylor (and, later, Bailey) examined the holotype of *N. welaka* and found that it and the bluenose shiner are the same (Yerger and Suttkus, 1962: 328). The species has been described, discussed, and figured recently by Cook (1959: 126-127), Smith-Vaniz (1968: 52, fig. 86), and Douglas (1974: 162-163, col. pl. 6).

Variational data on dorsal and anal fin-ray counts and vertebral counts for *Notropis welaka* are presented in Tables 2-4, and the species is contrasted with *N. hubbsi* in Table 5. The breeding male is illustrated in Plate 2, and the distribution of

the species is shown in Figure 1. We have taken pharyngeal tooth counts of 35 specimens of *welaka;* 32 have the formula, 1,4-4,1 and one each has 2,4-4,2; 1,5-4,1; and 1,4-4,0. Dr. Neil H. Douglas informs us that he examined the teeth of 90 specimens of *welaka;* 86 had 1,4-4,1, and four had 4-4. Thus, the recorded count of 4-4 in the holotype (from which the arches are now missing) is either an error or a rare variation. A paratype has the usual count, 1,4-4,1. Lateral-line pored scale counts in 25 adults are 5(1), 6(1), 7(4), 8(4), 9(8), 10(5), 11(1), and 12(1). Scales in lateral series number 34(6), 35(11), 36(7), and 37(2). Body circumference scales are 21(1), 22(17), 23(2), and 24(3), and caudal peduncle rows are 12 (9 counts). Predorsal scale rows are 14(9), 15(17), and 16(3). Total gill rakers on the first arch number 6(2), 7(4), and 9(1).

The distribution of *Notropis welaka* (Fig. 1), as suggested by Yerger and Suttkus (1962: 328) and by Burgess, et al. (1977: 36-37, fig. 4), is apparently disjunct, with a wide hiatus between the St. Johns River system in the east and the Apalachicola River basin in the west. The intervening area includes the basins of the Ochlockonee, Wakulla, Aucilla, Fenholloway, and Suwannee rivers. Since the gap in range was first noted, Drs. Ralph Yerger and Carter Gilbert and their students and associates, among others, have collected extensively in the area without taking *welaka.* Like *N. hubbsi, welaka* is customarily found in quiet, often heavily vegetated waters with soft bottom. In the words of Cook (1959: 126): "It inhabits weedy streams with beds of deep dark fetid mire, supporting such aquatics as broad leaf *Sagittaria,* submerged and floating *Potamogeton,* and *Utricularia.*" In view of the familiarity of recent collectors with the habitat preference of *welaka,* it seems increasingly probable that the discontinuity in distribution is real and not the result of inadequate sampling.

Speculatively, the disjunct distribution of *Notropis welaka* may be attributed to (1) separation of insular and mainland stocks, perhaps in the late Pliocene, by marine submergence of parts of northern Florida, and (2) failure of recolonization after re-emergence due to low vagility of the species. The southeastern distribution of *N. welaka* bears strong parallels to those of *N. emiliae* (Gilbert and Bailey, 1972) and *Micropterus salmoides* (Bailey and Hubbs, 1949). In each of these there is a differentiated peninsular subspecies and a mainland form, with a zone of intergradation in that part of northern Florida which, in *welaka,*

is unoccupied. Higher mobility has led in *N. emiliae* and *M. salmoides* to wider distribution on the peninsula and invasion of the formerly submerged "Suwannee Straits" area both from the mainland subspecies and the island with resultant secondary intergradation. We attribute the slow dispersal of *welaka* to rigid habitat restriction (see above).

Peninsular Florida is well known for its endemism of plants and animals (see e.g., Hubbell, 1932, Bailey and Hubbs, 1949, Gilbert and Bailey, 1972, and included references). In contrast to the many taxa which have differentiated or become restricted, *N. welaka* appears to be merely a relict on the peninsula. We note no meaningful differences from the population to the west of the Apalachicola drainage. The inference can be drawn that differentiation in *N. emiliae,* as an example, has been more rapid than in *N. welaka.* Alternatively, the isolation of *N. emiliae* in the peninsula may have occurred earlier than in *N. welaka* (Burgess et al, 1977: 38).

In drafting figure 1 we have plotted all localities recorded from Florida by Yerger and Suttkus, 1962: 327. We list below additional specimens examined by us. The curators of several collections have kindly made available lists of their holdings of *N. welaka,* and we have plotted a few localities from them. All of these lie close to localities from which specimens were examined. Adults are easily identified, but juveniles may be difficult. For example, the small fish from Murder Creek, Castleberry, Alabama, reported by Bailey, Winn, and Smith (1954: 128) as a bluenose shiner, proves on re-examination to be *Notropis harperi.*

New Locality Records for *Notropis welaka*

St. Johns River System

Florida.—CU 4068 (1), Eustis, Lake Co. (determined by C. R. Gilbert and G. H. Burgess).

Apalachicola River System

Flint River drainage, Georgia.—AU 11706 (2), trib. Pennahatchee Cr., 7.6 km NW Vienna, hwy. 90, Dooly Co. AU 11709 (3), Chickasawhatchee Cr., 2 km W Gillionville, hwy. 234, Dougherty Co. CU 17326 (1), Chickasawhatchee Cr., 11.6 km W

Pretoria, hwy. 62, Dougherty Co. AU 7059 (1), trib. Ichawaynochaway Cr., 5 km N Morgan, hwy. 41, Calhoun Co. CU 18376 (1), trib. Spring Cr., 3.7 km W Arlington, Early Co. AU 11705 (1), Spring Cr., 3 km W Damascus, hwy. 200, Early Co. AU 7338 (1), Spring Cr., 9.3 km NNW Colquitt, Miller Co.

Chipola River drainage.—CU 17669 (11), Chipola R., 1.4 km NW Orangeburg, Houston Co., Ala. UMMZ 163459 (4), Chipola R., 3 km N Marianna, T 5N, R10W, Jackson Co., Fla.

Choctawhatchee River System

Alabama.—CU 17148 (1), Choctawhatchee R., 8 km W Graball, hwy. 10, Henry Co.

Florida.—UAIC 2854.08 (2), Limestone Cr., 0.4 km S Ala. state line, hwy. 83, Walton Co. UAIC 1205.13 (2), trib. Chestnut Cr., hwy. 2A, Sweet Gum Head, Holmes Co. FSU 22404 (18), Holmes Cr., 1.6 km W Graceville, hwy. 2, Holmes-Jackson Co. line.

Yellow River Drainage, Alabama

UAIC 3553.16 (2), Five Runs Cr., 3 km E Andalusia, hwy. 84, T 4 N, R 16 E, S 14, Covington Co.

Escambia River System

Alabama.—CU 16155 (3), trib. Escambia R., 9.3 km E. Excel, Conecuh Co.

Florida.—FSU 14242 (6), Escambia R., hwy. 184, 6.4 km E Cottage Hill, Escambia Co. FSU 25223 (1), Escambia R., 400 m N hwy. 4 bridge, 2.7 km E Century, Santa Rosa and Escambia cos. UWFP, Canoe Cr., T 5 N, R 31 W, S 26 and T 5 N, R 32 W, S 2, Escambia Co. (determined by S. A. Bortone). UWFP, Wilder Branch, 1.2 km SE Molino, T 2 N, R 31 W, S 39, Escambia Co. (determined by S. A. Bortone). UWFP, Pine Barren Cr., T 4 N, R 32 W, S 12, Escambia Co. (determined by S. A. Bortone).

Alabama River System, Alabama

AU 7539 (1), 7871 (2), Big Swamp Cr., 6.4 km SSE Orrville, T 15 N, R 8 E, S 25 NE, Dallas Co. AU 7520 (5), 7750 (1), 7920 (3), Big Swamp Cr., 5 km SE Orrville, T 15 N, R 9 E, S 8 W,

Dallas Co. AU 6275 (22), Big Reedy Cr., 2.6 km N Choctaw Bluff, Clarke Co. UAIC 2317.13 (13), Little Reedy Cr., T 5 N, R 3 E, S 15, Clarke Co.

Tombigbee River System, Alabama

UAIC 2183.17 (1), Lubbub Cr., T 19 S, R 14 W, S 28, hwy. 82, Pickens Co. UAIC 4409.09 (3), Little Bear Cr., 4.5 km SW Gordo, hwy. 82, Pickens Co. UAIC 888.15 (1), 3.2 km NW Gordo, hwy. 82, Pickens Co. CU 16166 (1), Gaines Cr., trib. Bassett Cr., 4.5 km S Leroy, Washington Co.

Pascagoula River System, Mississippi

CU 21172 (11), trib. Black Cr., 12.7 km W Hattiesburg, Lamar Co. UAIC 1926.01 (14), Black Cr., hwy. 98, T 4 N, R 15 W, S 20, Lamar Co. TU 1561 (17), Priests Cr., 1 km S of junction, hwy. 49 bypass, Hattiesburg, Forrest Co. UMMZ 163710 (6), Black Cr. backwater, 16 km SW Hattiesburg, 6.4 km NNE Purvis, Lamar Co. TU 52071 (25), 54729 (25), Red Cr., 3.5 km SE Lumberton, hwy. I-59, Pearl River Co. (determined by R. D. Suttkus).

Jourdan River System, Mississippi

TU 89069 (2), 89136 (32), Bayou Bacon, hwy. 43, 7 km NW Kiln, Hancock Co. (determined by R. D. Suttkus).

Pearl River System

Mississippi.—UMMZ 155378 (11), White Sand Cr., trib. Hobolochitto Cr., 5.5 km NW Poplarville, T 2 S, R 16 E, Pearl River Co. UMMZ 166116 (5), East Branch Hobolochitto Cr., 1.5 km N Picayune, Pearl River Co. UMMZ 145065 (3), 159901 (7), 196258 (4), Mill Cr., trib. West Hobolochitto Cr., 1 km E Carriere, Pearl River Co. TU 17650 (28), 12.5 km N Sandy Hook, hwy. 35, Marion Co. (determined by R. D. Suttkus). TU 25785 (368), trib. Pearl R., 1.5 km E Sandy Hook, Marion Co. (determined by R. D. Suttkus).

Louisiana.—TU 1501 (66), Ards Cr., 5 km E Angie, Washington Parish. TU 52306 (246), 53129 (131), Lees Cr., 4.8 km S Bogalusa, hwy. 21, Washington Parish (determined by R. D.

Suttkus). UMMZ 166145 (5), overflow Talisheek Cr., 0.5 km N Talisheek, hwy. 58, St. Tammany Parish.

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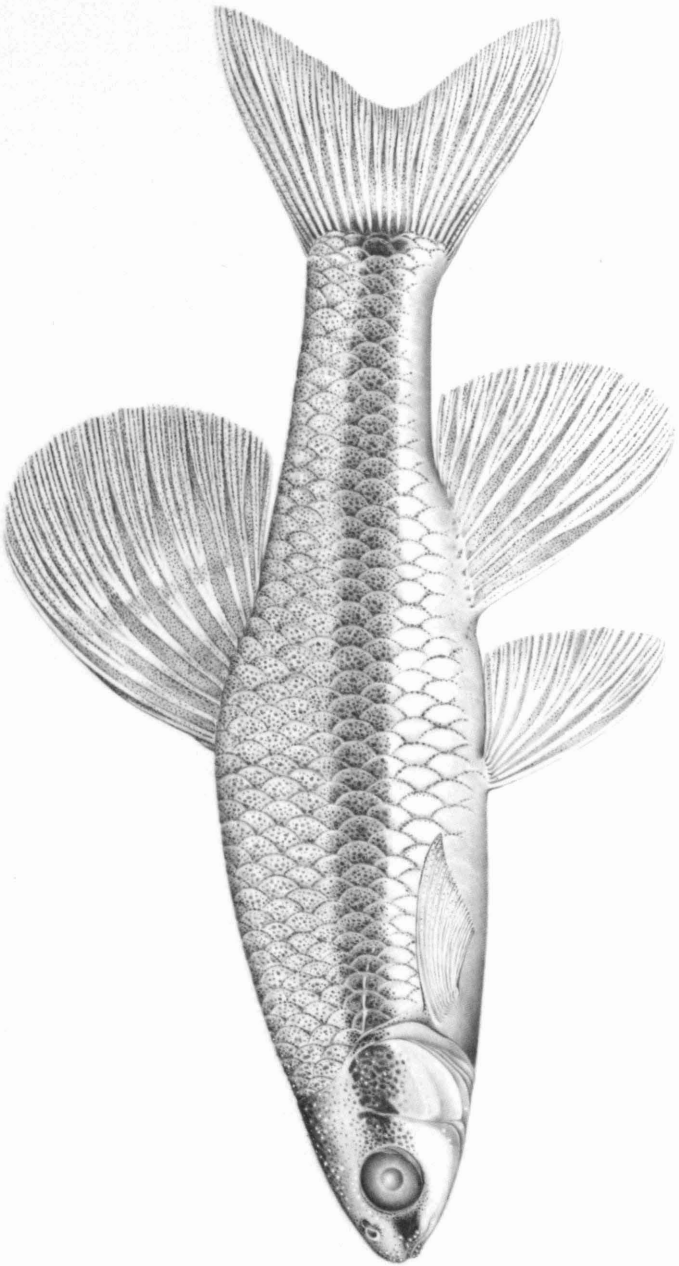

Plate 1. *Notropis hubbsi,* the holotype, an adult prespawning male 48.1 mm in standard length. Mark Orsen, del.

Plate 2. *Notropis welaka,* a composite painting based on adult, prespawning males (UMMZ 145065; 196258) 44-53 mm standard length, from Mill Creek near Carriere, Pearl River Co., Mississippi. W. L. Brudon, del.