NOTROPIS EDWARDRANEYI, A NEW CYPRINID FISH FROM THE ALABAMA AND TOMBIGBEE RIVER SYSTEMS AND A DISCUSSION OF RELATED SPECIES

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ABSTRACT

Notropis **edwardraneyi,** an endemic cyprinid of the Alabama – Tombigbee River system, is described from 32,493 specimens. A close relative of *N. blennius,* it is restricted to the main channels and larger tributaries below the Fall Line where it is the dominant minnow. *N. edwardraneyi* is compared to *N. blennius* and *N. potteri,* and differs in having a larger eye and in pigmentation. Additional data are given for *N. blennius* and *N. potteri,* and their interrelationship is discussed.

This new species of *Notropis* is of moderate size and presumably is a close relative of *Notropis blennius* (Girard), 1856, and *Notropis potteri* Hubbs and Bonham, 1951. Probably, Hubbs and Bonham's (1951:103) reference to *Notropis blennius* in the Tombigbee River was based on specimens of this new form.

The senior author collected the new species for the first time on 1 August 1957 from below Lock No. 2 on the Tombigbee River. Five years later Meredith May (Blackwell), then a student of Dr. Herbert T. Boschung, requested identification of some specimens taken from the Cahaba River and these proved to be the same as the Tombigbee specimens. An intensive survey of the fishes of the main channel of the Alabama River was started in 1964 and the new form was common, if not the most abundant cyprinid as indicated by the numbers of specimens in the series listed below.

The bulk of the specimens used in this study was obtained by the authors and Dr. Gerald E. Gunning. Some of the remainder were collected by the senior author with the aid of the Environmental Biology Training Program[1] students. We wish to acknowledge assistance in collecting by Dr. C. Robert Shoop, Dr. Sylvia Earle, and Mr. Armand Kuris.

We are indebted to Mr. Ben Stimpson for his generous hospitality. He provided us with a campsite near Choctaw Lake and use of a private boat ramp into the Alabama River for three summers, 1964-1966. This enabled us to obtain samples from the lower part of the Alabama River, a few miles above its junction with the Tombigbee River. During our stay on the Stimpson property, Mr. Elwood Overstreet gave us much valuable assistance.

We are grateful to Mr. B. Frank Wilson, Sr., Executive Vice President of Peoples Bank in Selma, Alabama who made arrangements for our use of the old Crocheron house and property in Cahaba, Alabama as a campsite during the summer of 1964.

Mr. J. Campbell Banks of Columbus, Mississippi made available for our use an area along the Tombigbee River for which we are most grateful.

We would like to take this opportunity to extend our thanks to the biologists and enforcement personnel of the Alabama Conservation Department for their cooperation in all of our biological studies in the State of Alabama. Mr. Carlyle Suttle's cooperation and help deserve special mention.

For permission to examine material housed in the University of Alabama collection, we wish to thank Dr. Herbert T. Boschung. We

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extend our gratitude to Dr. Ernest A. Lachner for making arrangements to examine type-material of *Notropis blennius* in 1958, and other materials during subsequent years; Drs. Reeve M. Bailey and Robert R. Miller for personal efforts to locate series of *Notropis blennius* in the University of Michigan, Museum of Zoology collection for our use as comparative material and Dr. Neil H. Douglas of Northeast Louisiana State College for the loan of some fine series of *Notropis blennius* and *Notropis potteri* from the lower Mississippi River and Red River (in Louisiana) respectively.

We wish to acknowledge our appreciation for the pen and ink illustrations by Miss Betsy Grover and for the photographs by Dr. Clyde Barbour.

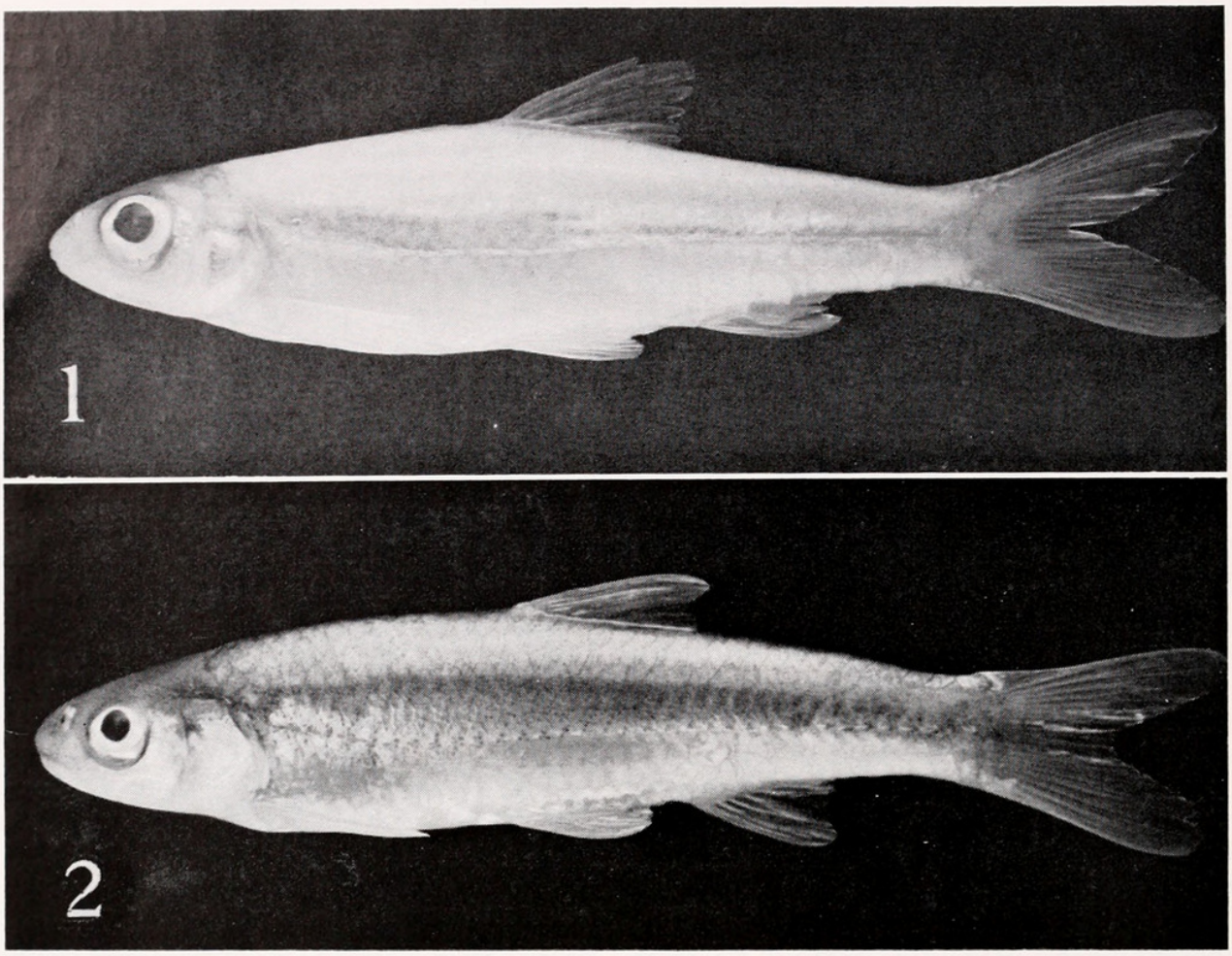
Notropis **edwardraneyi**
new species
Fluvial Shiner
(Figs. 1, 4, 7, 9)

The description is based on thousands of specimens (32,493), all of which were taken from the Alabama and Tombigbee drainages.

Material. The holotype, Tulane University number 49485, an adult 57.6 mm in standard length, was collected from the Alabama River at Yellow Jacket Bar, River Mile 129.8 (U. S. Corps of Engineers Navigation Chart, 1958), 1.2 miles down-river from Holly Ferry crossing or 12.5 miles east of Pine Hill, Wilcox County, Alabama, on 8 March 1967, at 2245 to 2345 hours, RDS 4097, by R. D. Suttkus and G. E. Gunning.

Paratypes: Taken with the holotype were 8,224 paratypes (22.1-56.0 mm in standard length) which were distributed as follows: TU 44028 (7,324 specimens); United States National Museum, USNM 202435 (100); Cornell University, CU 52941 (100); University of Michigan, Museum of Zoology, UMMZ 187475 (100); Academy of Natural Sciences of Philadelphia, ANSP 109424 (100); Museum of Comparative Zoology, MCZ 45878 (100); Stanford University, SU 66551 (100); University of Kansas, Museum of Natural History, KU 12674 (100); University of Alabama, UAIC 2791 (100); and Field Museum of Natural History, FMNH 74294 (100). Other paratopotypes (7,551) were taken 7-8 April 1966 at 2340-2422 hr, (TU 40303, 1020: 19-62); 28 June 1966 at 2227-2308 hr, (TU 40925, 85: 24-52); 1 July 1966 at 1945-2100 hr, (TU 41400, 390: 23-59); 5 August 1966 at 1645-1710 hr, (TU 41726, 16: 12-23); 4 October 1966 at 2200-2235 hr, (TU 41618, 33: 19-40); 19 December 1966 at 2135-2215 hr, (TU 42737, 5630: 19-57); 31 May 1967 at 2150-2230 hr, (TU 46802, 223: 24-55); 7 August 1967 at 2110-2215 hr, (TU 47361, 49: 18-46); and 26 September 1967 at 2155-2250 hr, (TU 47924, 105: 18-53).

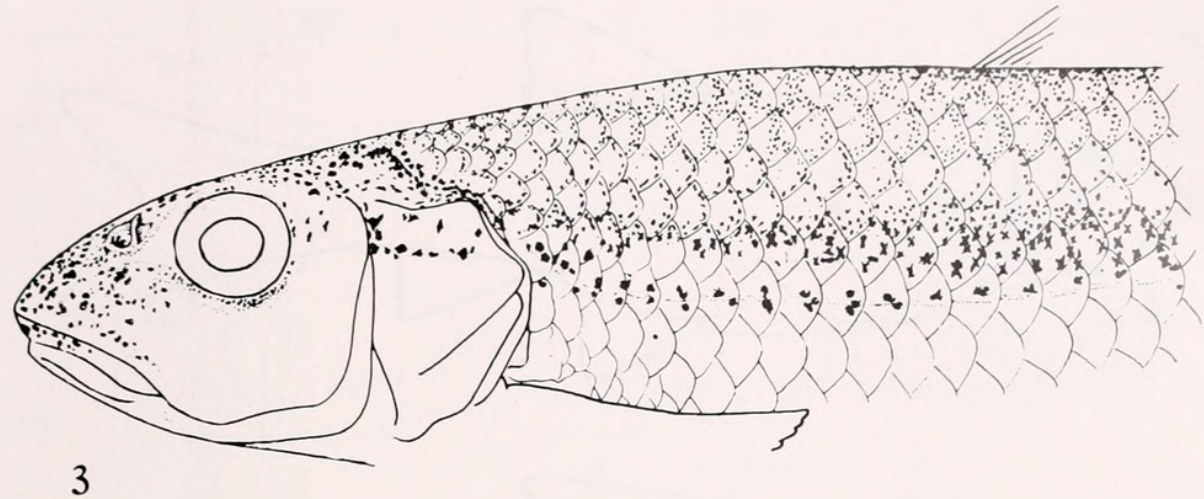
Other paratypes (11,773 specimens), all taken from the main channel of the Alabama River from Watts Bar, 3.5 mi above Cahaba, River Mile 204.5, downstream to the Choctaw Bluff area, River Mile 45, are as follows: TU 33381 (1613, 27-65), Dallas Co., Watts Bar, 29 June 1964, Royal D. Suttkus 3515; TU 35243 (236, 24-52), Dallas Co., old ferry landing across river from Cahaba, 27-28 June 1964, RDS 3508; TU 35269 (314, 25-55), Dallas Co., old ferry landing across river from Cahaba, 28 June 1964, RDS 3512; TU 47822 (85, 16-47), Wilcox Co., Hurricane Island, River Mile 166.5, 19 Aug. 1967, RDS 4193; TU 47838 (75, 18-46), Wilcox Co., St. Johns Bar, River Mile 164.8, 19 Aug. 1967, RDS 4192; TU 47762 (143, 20-50), Wilcox Co., Lower Canton Bar, west bank, River Mile 156.7, 18 Aug. 1967, RDS 4190; TU 47781 (9, 16-43), Wilcox Co., Lower Canton Bar, east bank, River Mile 156.7, 18 Aug. 1967, RDS 4191; TU 47515 (306, 17-50), Wilcox Co., Hobbs Bar, River Mile 149.5, 18 Aug. 1967, RDS 4189; TU 40293 (297, 16-54), 7 Apr. 1966, RDS 3857; TU 40900 (289, 24-54), 28 June 1966, RDS 3918; TU 41695 (83, 8-24), 5 Aug. 1966, RDS 3945, TU 41608 (284, 18-56), 4 Oct. 1966, RDS 4011; TU 42731 (470, 19-50), 19 Dec. 1966, RDS 4065; TU 44011 (175, 17-62), 8 Mar. 1967, RDS 4096; TU 46783 (202, 16-41), 31 May 1967, RDS 4143; TU 47346 (64, 21-51), 7 Aug. 1967; TU 47909 (152, 18-47), 26 Sept. 1967; RDS 4202, all from Wilcox Co., Evans Upper Bar, River Mile 135.8; TU 41711 (29, 10-17), 5 Aug. 1966, RDS 3946; TU 47477 (89, 22-45), 9 Aug. 1967, RDS 4186, from Wilcox Co., Evans Lower Bar, River Mile 133. TU 46796 (395, 26-54), Wilcox Co., new bar above Yellow Jacket Bar, River Mile 130.1, 31 May 1967, RDS 4144; TU



Figures 1 and 2. 1 (top) *Notropis edwardraneyi*: lateral view of a paratype (TU 44028) S.L. 54.8 mm, T.L. 71.0 mm. 2 (bottom) *Notropis blennius*: lateral view of topotype (TU 43167) S.L. 54.2 mm, T.L. 69.4 mm.

41732 (19, 15-22), 5 Aug. 1966, RDS 3949; TU 41632 (92, 20-46), 4 Oct. 1966, RDS 4013; TU 47374 (86, 19-42), 7 Aug. 1967, RDS 4179; TU 47936 (39, 13-58), 26 Sept. 1967, RDS 4204; all from Wilcox Co., Reeves Bar, River Mile 128.5. TU 40320 (491, 18-52), 8 Apr. 1966, RDS 3859; TU 40940 (226, 27-57), 28 June 1966, RDS 3920; TU 41745 (63, 14-46), 5 Aug. 1966, RDS 3950; TU 41639 (187, 18-47), 4 Oct. 1966, RDS 4014; TU 42746 (687, 21-56), 19 Dec. 1966, RDS 4067; TU 44029 (94, 21-53), 9 Mar. 1967, RDS 4098; TU 46819 (43, 15-42), 31 May 1967, RDS 4146; TU 47387 (168, 21-36), 7-8 Aug. 1967, RDS 4180; TU 47968 (230, 20-51), 27 Sept. 1967, RDS 4207; all from Wilcox Co., Tait Bar, River Mile 122.4; TU 40335 (243, 22-61), 8 Apr. 1966, RDS 3860; TU 40950 (109, 25-63), 29 June 1966, RDS 3921; TU 41755 (12, 20-48), 5 Aug. 1966, RDS 3951; TU 41655 (119, 19-40), 5 Oct. 1966, RDS 4015; TU 42759 (900, 16-54), 19-20 Dec. 1966, RDS 4068; TU 44045 (461, 18-45), 9 Mar. 1967, RDS 4099; TU 46830 (32, 29-38), 31 May - 1 June 1967, RDS 4147; TU 47396 (33, 20-44), 8 Aug. 1967, RDS 4181; TU 47980 (108, 15-48), 27 Sept. 1967, RDS 4208; all from Wilcox Co., Wilcox Bar, River Mile 120.3.

TU 41761 (9, 28-45), 5 Aug. 1967, RDS 4182; TU 41666 (147, 19-44), 5 Oct. 1966, RDS 4016; TU 47408 (475, 16-48), 8 Aug. 1967, RDS 4182; TU 47994 (65, 19-46), 27 Sept. 1967, RDS 4209, all from Wilcox Co., Ohio Bar, River Mile 111.6; TU 41772 (151, 14-53), 6 Aug. 1966, RDS 3953; TU 41670 (301, 16-41), 5 Oct. 1966, RDS 4017; TU 47420, (173, 18-49), 8 Aug. 1967, RDS 4183; TU 48012 (232, 17-48), 27 Sept. 1967, RDS 4210, all from Monroe Co., Stein Island, River Mile 107.5; TU 41791 (22, 11-17), 5 Aug. 1966, RDS 3954; TU 47491 (24, 24-47), 10 Aug. 1967, RDS 4187, from Monroe Co., St. James



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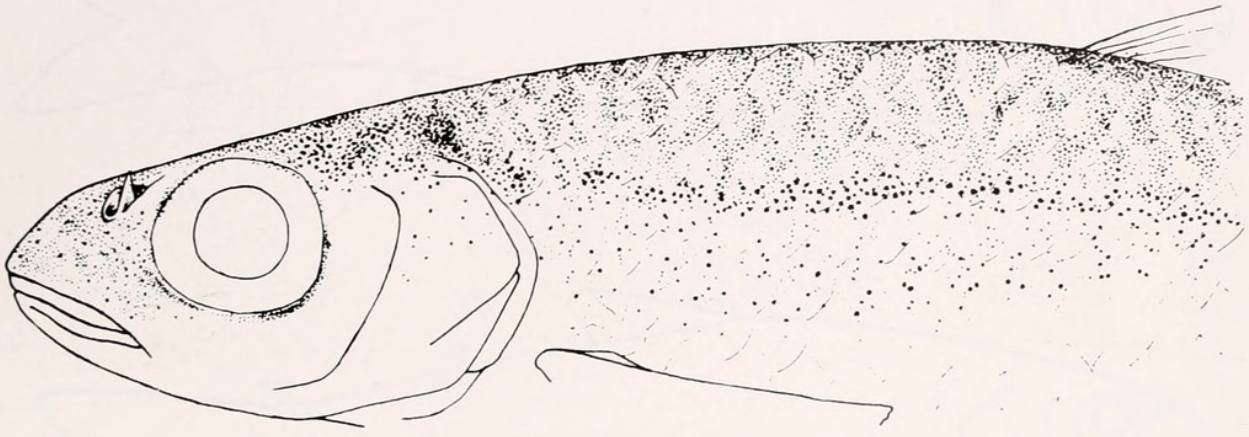

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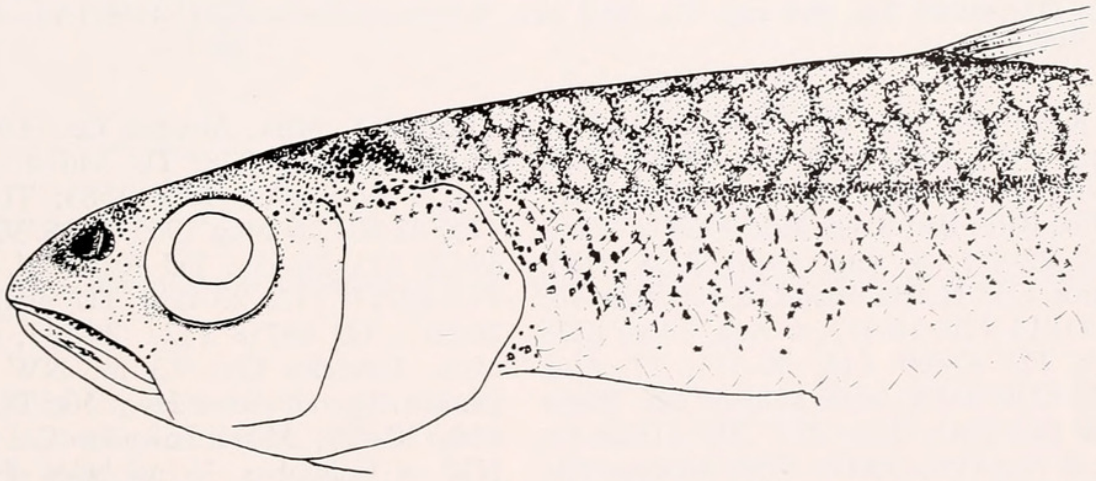

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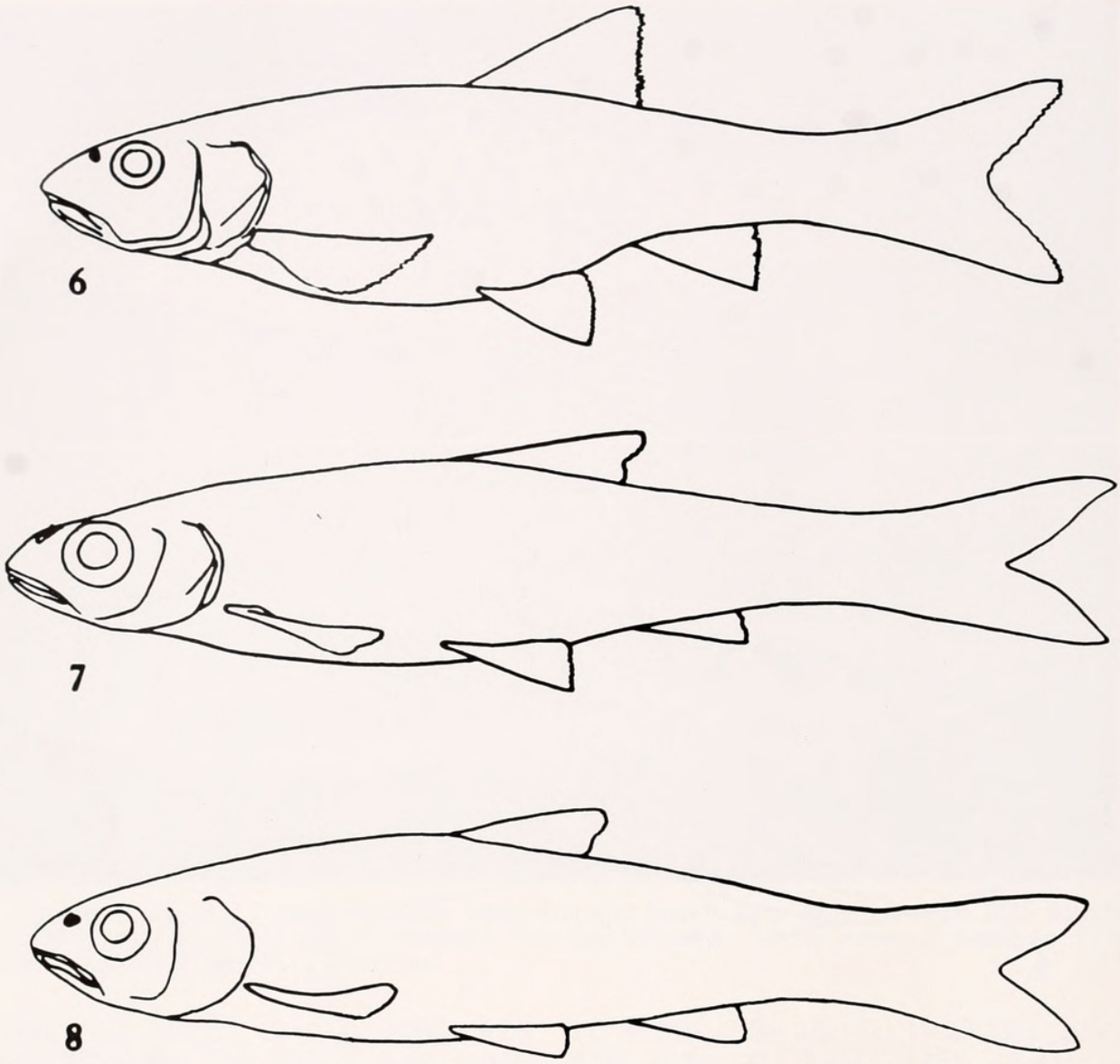
Figures 3-5. 3 (top) *Notropis potteri* (NLSC 5357) S.L. 46.7 mm, T.L. 60.1 mm. 4 *Notropis edwardraneyi* (TU 44028) S.L. 48.9 mm, T.L. 62.3 mm. 5 *Notropis blennius* (TU 43167) S.L. 48.8 mm, T.L. 61.6 mm.



Figures 6-8. 6 *Notropis potteri* (NLSC 5357) S.L. 46.7 mm, T.L. 60.1 mm. 7 *Notropis edwardraneyi* (TU 44028) S.L. 48.9 mm, T.L. 62.3 mm. 8 *Notropis blennius* (TU 43167) S.L. 48.8 mm, T.L. 61.6 mm.

Bar, River Mile 104: TU 41797 (4, 18-27), 5 Aug. 1966, RDS 3955; TU 47435 (229, 15-48), 8 Aug. 1967, RDS 4184, from Monroe Co., Bates Bar, River Mile 99; TU 47452 (134, 22-55), 8 Aug. 1967, RDS 4185, Monroe Co., Haines Island, River Mile 96; TU 41813 (10, 18-41), 6 Aug. 1966, RDS 3957; TU 47499 (16, 30-47), 17 Aug. 1967, RDS 4188, from Monroe Co., Silver Creek Bar, River Mile 87.7; TU 41823 (1, 22), 6 Aug. 1966, RDS 3958, Monroe Co., Mouth of Limestone Cr., River Mile 80.1; TU 35323 (28, 25-33), 2 July 1964, RDS 3519, Clarke Co., Choctaw Bluff, River Mile 45.

Other material, 1297 specimens. Tombigbee R.: TU 40497 (7, 40-48) 10 Apr. 1966, RDS 3865, Miss., Monroe Co., 3.9 mi W of Amory, Hwy 278; TU 34614 (32, 35-58), 9 Sept. 1964, RDS 3583; TU 37585 (25, 42-60), 6 May 1965, RDS 3663; TU 39420 (15, 26-43); TU 40162 (4, 25-43); TU 40217 (12, 20-45); TU 40489 (49, 26-60); TU 48758 (127, 26-53), all from Miss., Lowndes Co., 9.3 mi NW of Columbus, ½ mi above Hwy 50; TU 48837 (30, 30-49), Miss., Lowndes Co., 9.3 mi NW of Columbus, ½ mi below Hwy 50; TU 48867 (758, 20-36), Ala., Pickens Co., 0.7 mi W of Pickensville; TU 16124 (6, 34-39), Ala., Choctaw Co., 5.5 mi SE of Pennington, below Lock No. 2; UAIC 2593 (145, 30-62), Pickens Co., at Vienna; UAIC 1470 (4, 31-46), Sumpter-Greene

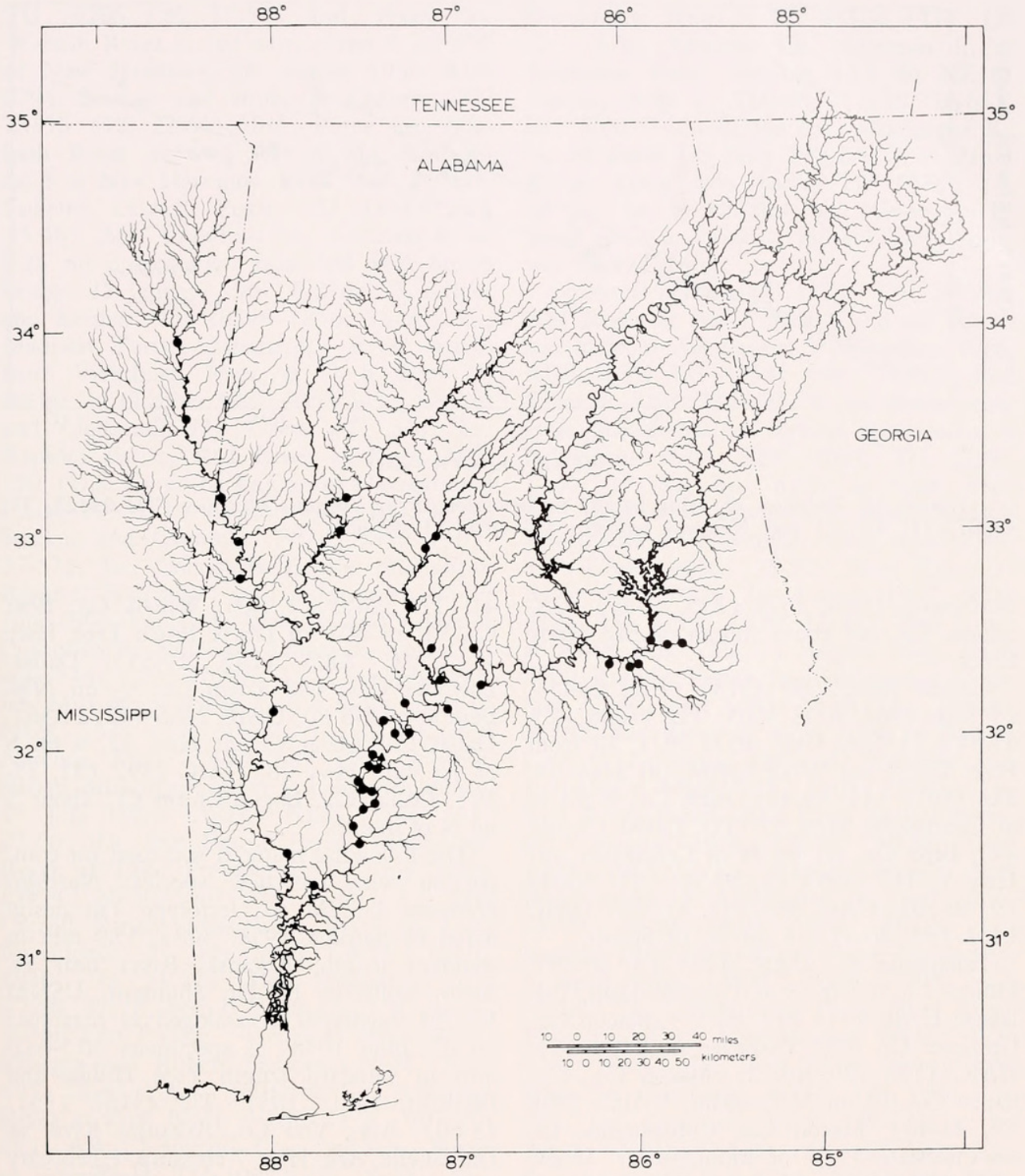


Figure 9. Distribution of collection sites of *Notropis edwardraneyi*. Triangle symbol indicates type-locality.

Cos., Noxube Cr., 1 mi N of mouth; UAIC 2475 (12, 34-42), Clarke Co., 300 yds below Hwy 43 at Jackson.

Black Warrior River: TU 43332 (14, 23-34), 22 Dec. 1966, Glenn H. Clemmer 518, Ala., Tuscaloosa Co., 0.5 mi S of Northport, below dam; UAIC 889 (346, 29-51); UAIC 1056 (217, 31-62); UAIC 1060 (156, 31-46); UAIC 1264 (2, 42-43); UAIC 1502 (235, 20-50); UAIC 1594 (7, 35-44); UAIC 1595 (77, 23-54); UAIC 1608 (36, 28-57); UAIC 1647 (184, 29-56); UAIC 1648 (58, 29-54); UAIC 1694 (193, 28-55); UAIC 1791 (20, 30-52); UAIC 1935 (287, 26-54); UAIC 2032 (276, 25-54); UAIC 2033 (52, 32-51); UAIC 2515 (678, 25-55), all from Tuscaloosa Co., below Oliver Lock and Dam at

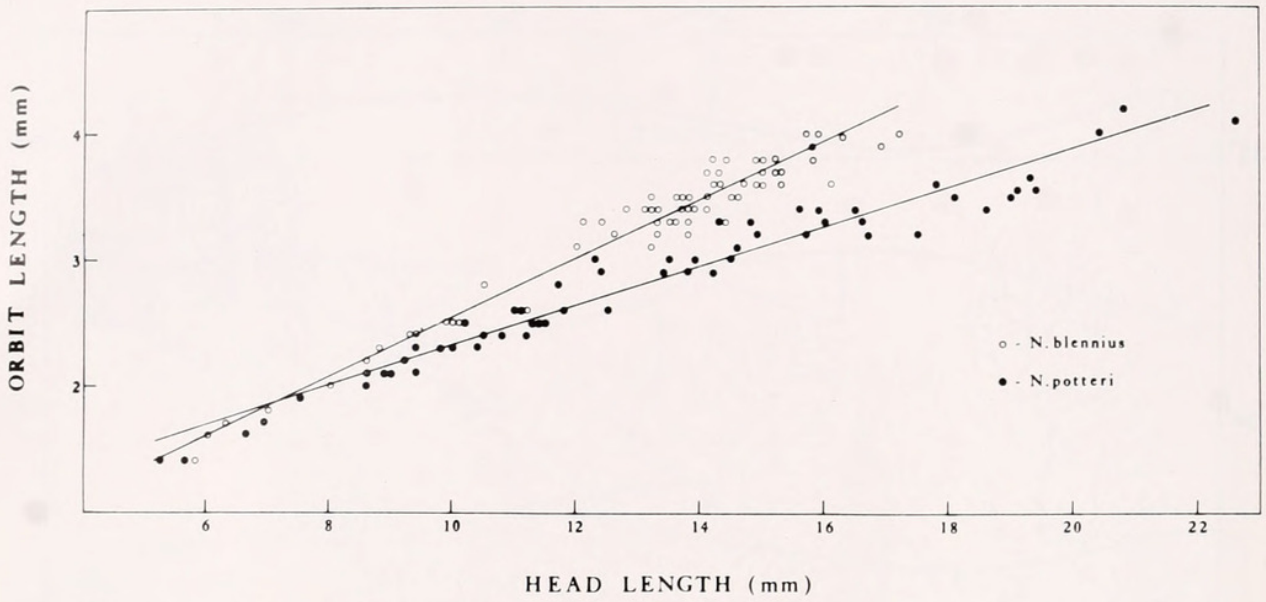


Figure 10. Relation of orbit length to head length in *Notropis blennius* (TU 22422, TU 43167, TU 43174) and *Notropis potteri* (TU 4936, TU 42395).

Tuscaloosa; UAIC 1570 (255, 17-47), Tuscaloosa Co., bar above mouth of Big Sandy Creek.

Cahaba River: TU 35134 (127, 39-45), 26 June 1964, RDS 3505; TU 37698 (13, 45-54), 11 May 1965, RDS 3671, all from Perry Co., 1 mi W of Sprott, off Hwy 14. TU 34055 (14, 39-46), Bibb Co., 8 mi N of Centreville, Hwy 27; TU 35090 (5, 40-44), Bibb Co., 2.1 mi N of Centreville, off Hwy 5; TU 29893 (3, 50-51); TU 30099 (9, 40-50); UAIC 962 (11, 37-52); UAIC 1437 (24, 36-47), 1 mi W of Sprott.

Tallapoosa R.: UAIC 1281 (3, 40-49), Elmore Co., 1.5 mi S of Thurlow Dam, Tallassee; UAIC 1514 (13, 40-47), Macon Co., Uphapee Cr. NW Tuskegee on Hwy 199; UAIC 1516 (29, 40-62), Macon Co., Uphapee Cr., 0.2 mi N Franklin; UAIC 1368 (7, 41-46), Macon Co., Cubahutchee Cr. on Interstate 85, E of Montgomery; UAIC 1234 (38, 36-51), Montgomery-Macon cos., Line Cr. on Interstate 85, E of Montgomery; UAIC 1232 (14, 39-48), Montgomery Co., trib. on Wells Ferry Rd. near Mt. Meigs Station.

Other tributaries: TU 40457 (15, 28-37), 9 Apr. 1966, RDS 3868, Dallas-Autauga cos., Big Mulberry Cr. 10.1 mi E of Selma, Hwy 14; TU 35066 (21, 32-46), Dallas Co., Oakmulgee Cr., 7.2 mi NW of Selma, Hwy 14; TU 35193 (6, 31-42); and TU 35187 (4, 32-39), Dallas Co., Pine Flat Cr. (Six-Mile Cr.) 6 mi S of Selma, Hwy 41; TU 32455 (1, 30), Wilcox Co., Bear Cr. 3.1 mi NW of Lower Peach Tree, Hwy 1; UAIC 2403 (245, 19-55), Dallas-Lowndes Cos., Old Town Cr., ½ mi NW Benton on US 80; UAIC 2366 (12, 24-36), Dallas Co., Cedar Cr., at Hwy 41, 4 mi S of Jct with Hwy 28; UAIC 2392 (11, 25-39), Dallas Co., Bogue Chitto Cr., about 5 mi N of mouth.

The following material was used for comparison with the new species: *Notropis blennius,* USNM 67, lectotype (so designated by Suttkus, 1958: 308), 55.9 mm in standard length, Arkansas River near Ft. Smith, collected by Dr. Shumard; USNM 171791 (syntypes, recataloged as paratypes on 27 June 1958) 5 specimens 50.5-64.0 mm in standard length (see Hubbs and Bonham, 1951: 103); TU 43167 (332: 13-60), Ark., Yell Co., Arkansas River at Dardanelle, Ark. Hwy 7 crossing, 1 February 1967, RDS 4080, Suttkus and Kenneth Relyea; TU 43174 (579: 27-65), same locality as for RDS 4080, 2 February 1967, RDS 4081; TU 22422 (365: 17-50), Ark., Arkansas Co., Arkansas River at Pendleton's Ferry, Ark. Hwy 1 crossing, 23 October 1959, RDS 2851, Suttkus, Myrna Andersson, Bangalore I. Sundararaj; UMMZ 180500 (16: 28-34), Manitoba, Seine River, T10, R3E, S34, 18 August 1955, J. J. Keleher; UMMZ ACC. 1947: XI: 28 (113: 31-58) Iowa, Muscatine Co., Mississippi River at Fairport, Miss. River Survey, 15 June 1946;

TU 19296 (20, 17-57), Ind., Posey Co., Wabash River at old dam, about 4 mi SW of New Harmony, 28 August 1958, RDS 2744, Suttkus and Bruce B. Collette; TU 19356 (12, 22-61), Ind., Posey Co., Wabash River on west side of old dam, 2.5 mi S of New Harmony, RDS 2746, Suttkus, Collette, Dowell, Pugh; TU 43053 (15, 23-48), Ark., Crawford Co., Arkansas River 0.25 mi downstream from old Fort Smith bridge, 25 January 1967, KR-Ark 3, Relyea and Reimer; TU 48248 (856: 18-60) La., Madison Parish, Mississippi River across from Vicksburg, Miss., at U. S. Hwy 80 bridge, 11 October 1967, RDS 4236, Suttkus and Clemmer; TU 47644 (1: 53), La., Rapides Parish, Red River at River Mile 100 (U.S. Corps of Engineers Navigational Chart, 1958) 25 August 1967, RDS 4200, Suttkus and Clemmer; NLSC 5356 (105: 37-57), La., Concordia Parish, Mississippi River at Natchez, 1 to 4 miles north, 25-26 July 1966, Louisiana Wildlife and Fisheries Commission; Northeast Louisiana State College 5441 (19: 37-58), La., Concordia Parish, Mississippi River, 1 to 4 miles north of NLSC 5374 (37: 30-55), La., East Carroll Natchez, Miss., 25-26 July 1966, LWFC; Parish, Mississippi River at Lake Providence, 27 July 1966, LWFC; NLSC 5506 (31: 27-60), La., East Carroll Parish, Mississippi River at Lake Providence, 27 July 1966, LWFC; NLSC 5367 (47: 22-63), La., East Carroll Parish, Mississippi River at Lake Providence, 27 July 1966, LWFC; UAIC 1830 (99, 24-59), Mo., Mississippi Co., T22N, R17E, Sec. 6, Mississippi River 17 mi SE East Prairie, 14 August 1963, W. L. Pflieger and Robert Hentges; NLSC 5654 (43: 23-43), Ark., Jefferson Co., Arkansas River at Pine Bluff; NLSC 5574 (40: 20-46), Ark., Jefferson Co., Arkansas River at Pine Bluff; TU 19022 (2, 16-22), Ky., Jefferson Co., Ohio R about opposite 38th St. in Louisville, just below K and I RR. bridge; TU 2242 (3, 43-46), Okla., Noble Co., Skeleton Cr.; TU 13831 (6, 26-54), Okla., Noble Co., Salt Fork, 7 mi S of Ponca; TU 15543 (35, 27-54), Okla., Wagoner Co., Verdigris R. at Okay bridge, T16N, R19E, S19, TU 10250 (7, 29-43); TU 15637 (311, 20-52); TU 14877 (143, 29-49); TU 15611 (90, 18-49); TU 15471 (9, 27-50); TU 39666 (3, 34-41); all from Ark., Pope and Yell cos., Arkansas R. at Dardanelle, Hwy 7; TU 43164 (113, 17-45), Ark., Arkansas Co., Arkansas R. at Pendleton Ferry crossing, 11.3 mi NE of Dumas, Hwy 1; TU 48267 (39, 16-61), La., West Baton Rouge Par., Mississippi R., ¼ mi above US Hwy 190 bridge at Baton Rouge along west bank; TU 16786 (4, 24-43), La., St. Charles Par., Mississippi R. flood pools in front of Bonnet Carre Spillway dam at Norco.

Notropis potteri, TU 42251 (71: 20-58), Red River at River Mile 97, 6 mi downstream from Alexandria, 9 November 1966, RDS 4039, TU 42304 (46: 16-51), Red River at River Mile 86, 17 mi downstream from Alexandria at Ryland Revetment, 9 November 1966, RDS 4043, TU 42395 (130: 17-58), Red River at River Mile 96.5, half mile downstream from Hudson Revetment, 23 November 1966, RDS 4049, TU 47536 (666: 13-52), Red River at River Mile 81.2, 25 August 1967, RDS 4194, TU 47649 (529, 11-48), Red River at River Mile 100, 25 August 1967, RDS 4200, Rapides Parish, La., Suttkus and Clemmer, NLSC 5352 (483: 18-68), La., Bossier Parish, Red River 11 miles north of Bossier City, 8-12 August 1966, K. Burnside and J. Brantley, NLSC 5357 (505: 17-56), La., Red River Parish, Red River at Coushatta, 8-12 August 1966, LWFC; NLSC 3700 (371: 24-51), La., Rapides Parish, Red River north of Alexandria, 6 April 1966, LWFC; NLSC 3839 (1851: 22-50), La., Rapides Parish, Red River above Alexandria, 5 April 1966, LWFC; NLSC 7297 (46: 15-36), La., Natchitoches Parish, Red River 15 miles SE of Natchitoches; NLSC 7409 (54: 18-47), La., Red River Parish, Red River at Coushatta; NLSC 124 (36: 14-32), La., Concordia Parish, Red River at Acme; NLSC 5442 (38: 26-46), La., Rapides Parish, Red River above Alexandria; NLSC 3393 (570: 18-45), La., Bossier Parish, Red River at Beene Place, Sec 7-T18N-R13W; NLSC 5351 (305: 18-58), La., Red River Parish, Red River at Coushatta; NLSC 4966 (50: 23-60), La., Red River Parish, Red River at Coushatta, 1-2 miles north of bridge; NLSC 3291 (257: 18-58), La., Bossier Parish, Red River at Beene Place, 3-5 miles N of Bossier City; NLSC 4607 (262: 12-65), La., Bossier Parish, Red River at Beene Place, Hwy 3, Sec 7-T18N-R13W; NLSC 3840 (627: 23-

TABLE 1
Measurements of *Notropis* in thousandths of standard length. Mean value is given below (in parentheses) range of variation.

Species	*edwardraneyi*		*blennius*		*blennius*
Catalog Number	TU 49485 Holotype	TU 44028 Paratypes	USNM 67 Lectotype	TU 43167 Topotypes	UMMZ ACC. 1947:XI:28
River System and State		Alabama, Alabama		Arkansas, Arkansas	Mississippi, Iowa
Standard length (mm)	57.6	51.0–55.2* (52.9)	55.9	51.9–58.2* (54.3)	43.3–58.1* (48.8)
Predorsal length	524	491–533 (514)	509	504–528 (517)	501–525 (510)
Dorsal origin to caudal base	493	491–523 (507)	518	482–520 (503)	487–523 (508)
Dorsal origin to occiput	299	275–312 (299)	318	295–320 (307)	300–319 (309)
Prepelvic length	516	497–524 (510)	501	491–515 (505)	485–525 (509)
Anal origin to caudal base	297	290–310 (303)	304	297–334 (313)	304–328 (317)
Body depth	224	211–231 (224)	234	201–238 (219)	215–251 (233)
Body width	144	142–164 (152)	–	147–165 (158)	146–169 (156)
Caudal peduncle length	217	198–219 (211)	227	195–231 (216)	213–229 (222)
least depth	101	100–107 (103)	113	101–111 (106)	103–123 (112)
Head length	271	253–275 (262)	266	255–281 (267)	256–276 (264)

TABLE 1 (Continued)

Species	*edwardraneyi*		*blennius*		*blennius*
Catalog Number	TU 49485 Holotype	TU 44028 Paratypes	USNM 67 Lectotype	TU 43167 Topotypes	UMMZ ACC. 1947:XI:28
River System and State	Alabama, Alabama			Arkansas, Arkansas	Mississippi, Iowa
Head depth	168	162–176 (168)	168	155–172 (165)	162–176 (170)
Head width	154	145–162 (152)	143	142–156 (151)	134–155 (146)
Interorbital width, least fleshy	94	83–96 (89)	93	94–104 (99)	90–107 (98)
Snout length	87	76–89 (82)	79	78–92 (84)	71–83 (78)
Orbit length	90	79–91 (86)	75	60–67 (64)	60–70 (65)
Upper jaw length	80	67–82 (77)	93	76–90 (83)	77–91 (84)
Suborbital width	29	27–39 (30)	27	24–32 (29)	26–34 (29)
Dorsal fin, depressed length[1]	210	215–239 (226)	214	204–225 (213)	203–236 (216)
Anal fin, depressed length[2]	153	156–178 (164)	161	156–169 (162)	153–174 (162)
Pectoral fin length	188	189–207 (194)	191	180–209 (196)	180–203 (189)
Pelvic fin length	154	145–168 (156)	150	142–156 (149)	145–154 (150)

[1] measured to end of anterior lobe [2] measured to end of posterior lobe * based on ten specimens

TABLE 2
Measurements of *Notropis* expressed in thousandths. Mean value is given below (in parentheses) range of variation.

Species	*edwardraneyi*	*blennius*	*potteri*
River System	Alabama	Arkansas	Red
Catalog Numbers	TU 44028	TU 43167	NLSC 3700, 5352, 5357
Number of Specimens	50	50	50
Standard length (mm)	44.0–55.5 (50.5)	45.9–60.0 (52.4)	41.8–57.1 (47.8)
Head length/Standard length	251–276 (263)	207–294 (268)	259–305 (285)
Interorbital/Head length	312–372 (336)	347–413 (374)	324–400 (354)
Snout/Head length	267–333 (307)	282–342 (312)	281–333 (307)
Orbit/Head length	308–363 (333)	229–273 (249)	199–248 (223)
Upper jaw/Head length	267–323 (299)	285–348 (320)	320–382 (347)
Postorbital/Head length	369–436 (402)	441–482 (466)	467–530 (498)
Orbit/Interorbital	886–1102 (992)	589–755 (667)	558–714 (631)
Orbit/Snout	978–1250 (1086)	706–943 (799)	643–833 (727)
Orbit/Upper jaw	1023–1228 (1114)	674–868 (781)	545–743 (644)
Orbit/Postorbital	727–907 (828)	478–579 (535)	381–508 (448)

51), La., Rapides Parish, Red River above Alexandria; Other material all from Red R., Rapides Parish, La., collected by the authors with Dr. Gerald E. Gunning and Jayson S. Suttkus: TU 42229 (61: 17-50), TU 47669 (100: 12-42), River Mile 105, 2 mi above Alexandria; TU 42244 (63: 17-42), TU 45178 (22: 17-30), River Mile 100, 3 mi below Alexandria; TU 45172 (2: 20-23), TU 47628 (22: 15-40), River Mile 97; TU 42267 (51: 20-53), TU 45163 (14: 19-30), River Mile 96.5, half mile below Hudson Revetment; TU 42277 (30: 20-49), TU 42374 (274: 15-48), TU 45161 (11: 20-32), TU 47608 (86: 13-51), River Mile 94 at Grand Bend; TU 42287 (20: 17-28), TU 42365 (20: 15-54), TU 47584 (220: 13-47), River Mile 90; TU 42345 (73: 16-59), TU 45140 (6: 21-35), TU 47571 (678: 13-36), River Mile 86, opposite Ryland Board Revetment; TU 42329 (14: 19-46), River Mile 82.7, 1 mi NE of Magda, 20.3 mi below Alexandria; TU 42318 (32: 19-53), TU 45135 (28: 21-35), River Mile 81.5, at Roxana Revetment; TU 47556 (272: 12-40), River Mile 78; also TU 13403 (194: 20-57), La., Natchitoches Par., Red R., 5 mi N of Natchitoches; TU 13362 (124: 22-43), La., Rapides Par., Red R. at Alexandria, Hwy 71; TU 13027 (7: 31-46), La., Concordia Par., Red R. at Acme.

Notropis potteri material from the Brazos R. system in Texas: TU 4936 (70, 28-86), Bosque Co., Brazos R. where trib. enters about 4 mi S Whitney Dam, 8 Apr. 1952, RDS 2278, Suttkus and Anderson; TU 20235 (5: 56-69), Stonewall Co., Double Mountain Fork, 11.3 mi S Aspermont, Hwy 83, 30 May 1959, RDS 2780, Suttkus, Negus, Shoop, Gould; TU 20257 (3: 54-67), Wichita Co., Wichita R., 0.7 mi N Kadane Corner, Hwy 25, 29 May 1959, RDS 2778, Suttkus, Negus, Shoop, Gould: TU 4994 (11: 35-54), Bosque Co., Trib. 4.0 mi S Whitney Dam, 8 Apr. 1952, RDS 2277, Suttkus and Anderson; TU 35613 (6: 14-48), Brazos Co., Brazos R. at Mussel Shoals, 17 July 1964, RDS 3540, Env. Biol. Class; TU 5013 (1: 52), Williamson Co., San Gabriel R., 6.5 mi E Georgetown, 18 Apr. 1952, RDS 2282, Suttkus and Anderson.

Methods of counting and measuring de-

TABLE 3
Total number of vertebrae in three species of *Notropis*.

Species Drainage	34	35	36	37	38	N	$\bar{X}$
edwardraneyi							
Alabama R., Ala.	18	105	8			131	34.9
blennius							
Seine R., Manitoba			4	12		16	36.7
Mississippi R., Iowa			6	9		15	36.6
Wabash R., Ohio R., Ind.			12	10		22	36.4
Arkansas R., Ark.	1	4	47	26		78	36.2
Mississippi R., La.			11	6	1	18	36.4
Totals	1	4	80	63	1	149	36.4
potteri							
Brazos R., Tex.		4	17	2		23	35.9
Red R., La.		11	66	12		89	36.0
Totals		15	83	14		112	36.0

edwardraneyi (TU 34614, 35269, 35323, 37698, 40320, 40497)
blennius (UMMZ 180500; UMMZ Acc. 1947:XI:28; TU 19296, 19356; TU 22422, 43053, 43167; TU 48248)
potteri (TU 4936; TU 42251, 42304, 47536, 47649)

scribed by Hubbs and Lagler (1958) were followed except for number of scale rows before the dorsal. The counts given represent the number of rows crossing an imaginary diagonal between the origin of the dorsal fin and the pectoral girdle, just above the anteriormost lateral line scale.

Diagnosis. A moderately stocky shiner of medium length (largest specimen of 32,493 examined was 65 mm in standard length); usually 34 lateral line scales, often 33, occasionally 35; number of vertebrae usually 35, occasionally 34, rarely 36; eye very large, supralateral in position; diameter of orbit greater than length of upper jaw, about one-third length of head, nearly equal to fleshy interorbital distance (sometimes greater but more often slightly less than interorbital distance) and averages more than three-fourths of the postorbital distance.

Description. Notropis edwardraneyi is similar to *Notropis blennius* in many proportions (Table 1) but differs primarily in the size of the orbit (Tables 1 and 2, Figs. 1, 2, 4, 5, 7, and 8). In profile the snout is blunter in *edwardraneyi* than in *blennius* and the eyes are more dorsal in position. The position and large size of the eye is reflected in the proportionally smaller interorbital distance. As shown in Tables 1 and 2, the relationship of the length of head to the standard length is almost identical in *edwardraneyi* and *blennius,* but when the relationship of orbit to standard length is considered there is no overlap. Thus, in addition to the effect on size of interorbital distance, the large eye in *edwardraneyi* averages greater than three-fourths of the postorbital distance, whereas the diameter of orbit averages slightly more than half the postorbital distance in *blennius.* The orbit is nearly always greater in diameter than length of snout in *edwardraneyi* and never as great (average about three-fourths snout length) in *blennius.* The mouth is smaller in *edwardraneyi* and the diameter of orbit is always greater than length of upper jaw. *Notropis blennius* has the opposite combination, i.e., larger mouth and smaller orbit that is never as great as length of upper jaw (about three-fourths).

Notropis edwardraneyi typically has a pharyngeal tooth formula of 2, 4-4, 2. An examination of 50 sets revealed 47 specimens with 2, 4-4, 2; two with 1, 4-4, 1 and one with 1, 4-4, 2. All specimens used were taken from TU 33381. For comparison the same number of *Notropis blennius* (TU 22422, Arkansas River) and *Notropis potteri* (NLSC 3839, Red River) were examined. The examination of pharyngeal teeth of *blennius* resulted in 46 specimens with 2, 4-4, 2; two with 1, 4-4, 2; one with 1,

TABLE 4
Number of lateral line scales for three species of *Notropis*.

Species and Drainage	32	33	34	35	36	37	38	39	40	41	N	$\bar{x}$
edwardraneyi												
Tombigbee R.		8	13								21	33.6
Black Warrior R.		5	9								14	33.6
Big Mulberry Cr.		3	11	1							15	33.9
Cahaba R.		3	15	2							20	33.9
Alabama R.,												
Watts Bar		7	18	5							30	33.9
Hobbs Bar		2	16	2							20	34.0
Yellow Jacket Bar		6	17	7							30	34.0
Choctaw Bluff Bar	2	17	12								31	33.3
Totals	2	51	111	17							181	33.8
blennius												
Seine R., Manitoba				8	7	1					16	35.6
Mississippi R., Iowa				39	65	5	0	0	0	1	110	35.7
Mississippi R., Missouri			2	20	26	2					50	35.6
Arkansas R., Arkansas			2	22	31	3	2				60	35.7
Mississippi R.,												
Lake Providence				14	26	10	0	1			51	36.0
Vicksburg			2	18	23	6	1				50	35.7
Natchez			4	17	19	10					50	35.7
Red R., Louisiana							1				1	
Totals			10	138	197	37	4	1	0	1	388	35.7
potteri												
Red R.,												
Bossier City, La.			4	14	2						20	34.9
Coushatta, La.				9	4	2					15	35.5
Alexandria, La.			3	7	5						15	35.1
Totals			7	30	11	2					50	35.2

4-4, 1; and one with 3, 4-4, 2. Of the 50 specimens of *potteri,* 48 had 2, 4-4, 2 pharyngeal teeth and two had 1, 4-4, 2 pharyngeal teeth. The total number of vertebrae, including Weberian apparatus (4) and urostylar vertebra (1), was as follows: 18 specimens with 34, 105 with 35, and eight with 36 vertebrae (Table 3). Except on the belly, the scales are rather large over most of the body, including the nape. The head and breast are naked. Although we found that most of the specimens of *blennius* had complete squamation of breast (Hubbs and Bonham, 1951: 105), we observed that some were incomplete either by having the extreme anterior portion naked or by having only a few scattered, partially imbedded, scales on the breast. The scales on the belly are progressively smaller anteriorly and some of the anteriormost are imbedded. The lateral line is complete and slightly decurved anteriorly. There are 32 to 35 scales (some slightly elevated) along the lateral line (modally 34, frequently 33) (Table 4), 20 to 26 (typically 22 to 25) rows around body before dorsal and pelvic fins (Table 5), scales are not crowded before dorsal, 13 to 15 rows before it on a diagonal to opercle (Table 6). The number of scale rows around the caudal peduncle was determined for 181 specimens. Nearly all (177) had five rows above and five rows below the lateral line (5-2-5). One specimen had five above and only four below (5-2-4), two specimens had 6-2-5, one had 7-2-5. The same 181 specimens had the following fin ray counts: 180 specimens had 8 principal dorsal fin rays, one had 7 rays; 178 had 7 principal anal fin rays, three had 8 rays; 175 had 19 principal caudal fin rays, two had 20 rays, three 18 rays and one had 16 principal caudal fin rays; 1 specimen had 12 left pectoral rays, five had 13 left pectoral rays, 57 had 14 rays, 93 had 15 rays, and 25 had 16 rays (Table 7); four specimens had 13 right pectoral fin rays, 62 had 14 rays, 92 had 15 rays, 22 had 16 rays, and one had 17

TABLE 5
Body circumference scale row counts for three species of *Notropis*.

Species and Drainage	20	21	22	23	24	25	26	27	28	29	30	31	32	N	$\bar{x}$
edwardraneyi															
Tombigbee R.	1	0	14	3	2	1								21	22.4
Black Warrior R.			1	4	8	0	1							14	23.7
Big Mulberry Cr.			1	3	10	1								15	23.7
Cahaba R.			5	11	4									20	22.9
Alabama R.,															
Watts Bar			3	11	9	5	2							30	23.7
Hobbs Bar			5	7	7	1								20	23.2
Yellow Jacket Bar		1	3	13	10	2	1							30	23.4
Choctaw Bluff Bar		1	2	2	13	10	3							31	24.2
Totals	1	2	34	54	63	20	7							181	23.5
blennius															
Seine R., Manitoba				3	8	2	3							16	24.3
Mississippi R., Iowa			1	5	49	19	12	10	12	2				110	25.1
Mississippi R., Missouri					15	11	17	6	1					50	25.3
Arkansas R., Arkansas					21	15	9	10	5					60	25.4
Mississippi R.,															
Lake Providence					10	11	11	8	10	0	0	0	1	51	26.0
Vicksburg			1	0	19	12	14	3	1					50	25.0
Natchez				2	8	8	12	11	8	0	1			50	26.0
Red R., Louisiana										1				1	
Totals			2	10	130	78	78	48	37	3	1	0	1	388	25.4
potteri															
Red R.,															
Bossier City, Louisiana							2	6	8	2	2			20	27.8
Coushatta, Louisiana							3	3	7	2				15	27.5
Alexandria, Louisiana						1	4	2	5	2	1			15	27.4
Totals						1	9	11	20	6	3			50	27.6

right pectoral rays (Table 8). The typical number of pelvic fin rays was 8 on either side but two specimens had 9 on each side and five specimens had only 7 on each side (Table 9).

The mouth is terminal to slightly subterminal, upper lip varies from slightly exceeding snout to slightly subequal. The lower lip is subequal to or included by upper lip; maxilla is slightly curved. The mouth is oblique and does not quite reach to the anterior border of orbit. Anterior lobe of dorsal fin is longest in depressed position, its posterior margin straight or slightly falcate. The posterior lobe of the moderately falcate anal fin is typically longer than anterior lobe in the depressed position of fin.

Nuptial tubercles are well developed on pectoral fins only in adult males. There is a single row along the upper surface of the anterior ray. Proximally there is a single row on the second to the seventh or eighth ray but a double row more distally on these same rays. The double row of tubercles is separated at the fork of each ray, one row continues out each of the two branches. Both males and females have fine tubercles on the head, more on the former.

Coloration. As is typical with many large river forms *Notropis edwardraneyi* is a silvery shiner without any striking colors. The entire ventral surface of head and body is devoid of pigment except for a few deeply imbedded melanophores along the base of the anal fin and along the ventral portion of caudal peduncle. The dorsal and dorsolateral portion of body is pigmented (Fig. 4) with small chromatophores. These chromatophores are concentrated on the central portion of most scales and the concentrations have a well defined posterior border which is submarginal to the posterior margin of the scales. Thus many scales in the dorsolateral area of the body have a pronounced light margin as illustrated in Figure 4. The lower margin of the above described area is bordered by a band of

TABLE 6
Predorsal scale row counts between dorsal fin and opercle in three species of *Notropis*.

Species and Range	13	14	15	16	17	18	19	20	N	$\bar{x}$
edwardraneyi										
Tombigbee R.	1	12	8						21	14.3
Black Warrior R.	1	8	5						14	14.3
Big Mulberry Cr.		9	6						15	14.4
Cahaba R.		14	6						20	14.3
Alabama R.,										
Watts Bar		18	12						30	14.4
Hobbs Bar		12	8						20	14.4
Yellow Jacket Bar	1	16	13						30	14.4
Choctaw Bluff Bar	3	21	7						31	14.1
Totals	6	110	65						181	14.3
blennius										
Seine R., Manitoba			5	10	0	1			16	15.8
Mississippi R., Iowa		1	44	44	16	3	2		110	15.8
Mississippi R., Missouri		1	20	20	6	3			50	15.8
Arkansas R., Arkansas			33	24	2	1			60	15.5
Mississippi R.,										
Lake Providence			24	18	6	2	0	1	51	15.8
Vicksburg		1	20	22	4	2	1		50	15.8
Natchez		1	30	15	2	2			50	15.5
Red R., Louisiana							1		1	
Totals		4	176	153	36	14	4	1	388	15.7
potteri										
Red R.,										
Bossier City, Louisiana		1	10	6	2	1			20	15.6
Coushatta, Louisiana		1	3	9	2				15	15.8
Alexandria, Louisiana		3	9	2	1				15	15.1
Totals		5	22	17	5	1			50	15.5

larger chromatophores. This band extends posteriorly along the caudal peduncle to the base of the caudal fin. There is a faint disjunct basicaudal, wedge-shaped spot in some specimens. Many juveniles and young have such a spot. The area just above and below the lateral line sensory pores is sparsely pigmented. Some specimens contained in the University of Alabama collection from Black Warrior River system are rather densely pigmented. The moderate-sized melanophores are scattered (Fig. 4) and typically are not concentrated immediately above and below the lateral line pores nor are they aligned with scale margins. There is a fine (sometimes only a single line of chromatophores) to moderately developed pre- and postdorsal, median stripe. The top of the head is rather uniformly pigmented, the pigmentation extending only to the upper part of the almost immaculate opercle and cheek. There is a narrow ring of pigment around the lower rim of the orbit and a concentration of pigment in front of orbit (preorbital bar hardly visible with unaided eye). The extent of pigmentation on lips is variable. In some specimens both lower and upper lips are immaculate, other specimens have just the anterior portion of upper lip pigmented and in others both lips are pigmented but none has pigment on chin or isthmus. The pelvic and anal fins (a few specimens from Black Warrior River have pigmentation along rays of anal fin) are without pigment; the caudal and dorsal fins lack pigment on the membranes but have it along the rays. Pigmentation on the pectoral fins is sparse, progressively diminishing from anterior to posterior rays. There is usually a single file of chromatophores along the leading and posterior edge of the first pectoral ray and only along posterior margins of succeeding rays. The chromatophores are more widely spaced in the files, and the lengths of the files are shorter progressively toward the posterior rays of the

TABLE 7
Number of left pectoral fin rays in three species of *Notropis*.

Species and Range	11	12	13	14	15	16	17	N	$\bar{x}$
edwardraneyi									
Tombigbee R.			1	7	10	3		21	14.7
Black Warrior R.			1	5	8			14	14.5
Big Mulberry Cr.				6	7	2		15	14.7
Cahaba R.				5	9	6		20	15.0
Alabama R.,									
Watts Bar				4	20	6		30	15.1
Hobbs Bar			1	9	8	2		20	14.5
Yellow Jacket Bar				11	16	3		30	14.7
Choctaw Bluff Bar		1	2	10	15	3		31	14.5
Totals		1	5	57	93	25		181	14.7
blennius									
Seine R., Manitoba					9	7		16	15.4
Mississippi R., Iowa				2	17	9	2	30	15.4
Mississippi R., Missouri			2	4	24	17	2	49	15.3
Arkansas R., Arkansas				4	29	23	4	60	15.4
Mississippi R.,									
Lake Providence	1	0	0	6	34	10		51	15.0
Vicksburg			1	9	32	7	1	50	15.0
Natchez			1	11	21	16	1	50	15.1
Red R., Louisiana						1		1	
Totals	1	0	4	36	166	90	10	307	15.2
potteri									
Red River,									
Bossier City				3	7	8	2	20	15.4
Coushatta				1	8	5	1	15	15.4
Alexandria				2	6	5	2	15	15.5
Totals				6	21	18	5	50	15.4

fin. Usually the posterior half to two-thirds of the fin is immaculate. The peritoneum is silvery with scattered melanophores.

Reproduction. Ripe females were collected from the Alabama River at the abandoned ferry landing across from the town of Cahaba between 2300 and 0045 hours on 27-28 June 1964 (TU 35243). The spawning individuals were taken in moderate current along the bank from over a sand bottom. The water varied from one to two-and-a-half feet deep and was 28 C at the time of capture. Ripe individuals were collected again at the same locality on the following night (June 28) between 2230-2330 hours (TU 35269). The next time that ripe individuals were collected was 6 May 1965, from the Tombigbee River (TU 37585) northwest of Columbus, Mississippi, between 2115-2330 hours. A number of specimens was checked at the time of collection and all proved to be ripe females. These were taken from over gravel or a mixture of gravel, sand and silt in one and a half to two feet of water. The water temperature was 21 C at time of collection. During the following spring the same locality on the Tombigbee was sampled. Distended females collected between 2300 and 2430 hours, 9 and 10 April 1966 (TU 40489) voided eggs only when firm pressure was applied with fingers (squeeze ripe). Water temperature was 15 C at time of collection. Females collected from Tombigbee River 3.9 miles west of Amory on 10 April 1966 between 1120 and 1200 hours (TU 40497) were squeeze ripe also. Water temperature was 15 C and depth of capture, type of associated bottom and current was similar as described for other localities.

On 31 May 1967, many ripe females were taken from the Alabama River at an unnamed bar (River Mile 130.2) and Yellow Jacket Bar, the type locality (River Mile 129.8). The former collection (TU 46796) was obtained between 2123 and 2142 hours and the latter (TU 46802) 2150 to 2230 hours. Water temperature was 24 C at both

TABLE 8
Number of right pectoral fin rays in three species of *Notropis*.

Species and Range	13	14	15	16	17	N	$\bar{x}$
edwardraneyi							
Tombigbee R.		8	10	3		21	14.8
Black Warrior R.		7	6	1		14	14.6
Big Mulberry Cr.		6	7	2		15	14.7
Cahaba R.		6	10	4		20	14.9
Alabama R., Watts Bar		5	19	6		30	15.0
Hobbs Bar	2	8	8	1	1	20	14.5
Yellow Jacket Bar		10	16	4		30	14.8
Choctaw Bluff Bar	2	12	16	1		31	14.5
Totals	4	62	92	22	1	181	14.7
blennius							
Seine R., Manitoba			11	4	1	16	15.4
Mississippi R., Iowa	1	3	8	16	2	30	15.5
Mississippi R., Missouri	3	6	27	12	1	49	15.0
Arkansas R., Arkansas		2	29	23	6	60	15.5
Mississippi R., Lake Providence		7	31	12	1	51	15.1
Vicksburg		8	34	8		50	15.0
Natchez		11	23	15	1	50	15.1
Red R., Louisiana				1		1	
Totals	4	37	163	91	12	307	15.2
potteri							
Red R., Bossier City		1	8	7	4	20	15.7
Coushatta		1	6	7	1	15	15.5
Alexandria		2	5	7	1	15	15.5
Totals		4	19	21	6	50	15.6

localities. In both areas ripe fish were taken from over gravel in a riffle area as well as from over sand bottom in moderate current. The areas of capture varied from one to two-and-a-half feet in depth. Thus in summary, *Notropis edwardraneyi* was taken in spawning condition during May and June at water temperature ranging from 21 to 28 C.

Range. All specimens were taken from the main channel of the Alabama and Tombigbee rivers and the lower reaches of their major tributaries (Fig. 9). The irregular distribution of *Notropis edwardraneyi* shown on the map is a reflection of the discontinuity of collecting and not discontinuities in distribution.

Geographic Variation. No clines seem to be present in meristic characters, proportions, or pigmentation. Specimens from the extremes of the range as well as from intermediate areas and tributaries were used in making meristic counts. The only notable deviation was the number of lateral line scales in the sample from Choctaw Bluff (Table 4). However, the frequency distribution for Choctaw Bluff specimens and the other distributions for the upstream (more northerly) samples do not illustrate a north-south cline.

Relationships. Notropis edwardraneyi appears to be a close relative of *Notropis blennius* and may represent an off-shoot from *blennius* stock that gained access to the Alabama and Tombigbee systems through a former connection with the Tennessee (Hayes and Campbell, 1900: 131-133; Simpson, 1900: 133-136; Suttkus and Ramsey, 1967: 138). The absence of *edwardraneyi* in the Pascagoula River, Pearl River, and other minor river systems between the Alabama-Tombigbee systems and the Mississippi River would seem to negate an eastward movement of *blennius* stock from the Mississippi River basin to the Alabama-Tombigbee; we believe that the Tennessee River was the most likely route of access in the near geological past. A number of series of *blennius* from various localities along the Mississippi basin and from Manitoba was examined and characteristics compared to determine presence of geographical

TABLE 9
Number of pelvic fin rays for three species of *Notropis*.

	9–9	9–8	8–9	8–8	8–7	7–8	7–7	8–6	7–2	N
edwardraneyi (TU 33381, 30; TU 35134, 20; TU 35323, 31; TU 37585, 21; TU 40457, 15; TU 43332, 14; TU 44028, 30; TU 47515, 20)	2	3	1	163	3	4	5			181
blennius (UMMZ 180500, 16; UMMZ Acc. 1947:XI:28, 30; TU 43167, 60; TU 48248, 50; NLSC 5356, 32; NLSC 5374, 25; NLSC 5441, 18; NLSC 5506, 20; NLSC 5367, 6)	5	3	3	232	9	0	2	2	1	257
potteri (NLSC 3700, 15; NLSC 5352, 20; NLSC 5357, 15)		3	1	44	1	0	1			50

clines or populations which possessed intermediacies between other *blennius* populations and *edwardraneyi* (Tables 1, 4, 5, 6, 7, 8, 10). Unfortunately, *blennius* material from the Tennessee River was not available for our study. The specimens (UAIC 1830) from the Mississippi River in southeastern Missouri seem to have a larger orbit than any other *blennius* material from more northern or southern localities. However, some specimens (see footnote, Table 10) were in a partially dehydrated condition and accuracy of measurements was not comparable to that for other samples. Excluding the Missouri sample, the other three samples used for Table 10 demonstrate a weak north-south cline, with a slight increase in size of orbit toward the south. No samples examined indicated a population with close affinities (particularly with regard to size of orbit) to *edwardraneyi*. Thus we assume that differentiation occurred primarily or entirely after the stock became isolated in the Alabama-Tombigbee basins, if *blennius* and *edwardraneyi* are indeed close relatives and do not merely represent convergence because of their large river habitat.

Geographical clines are hardly demonstrable for *Notropis blennius* (Tables 1, 4, 5, 6, 7, 8 and 10) especially with regard to meristic characters. Perhaps the only proportions that could be considered as clinal are the diameter of orbit and length of upper jaw in relation to head length (Table 10). These data seem to be in contradiction to those presented by Hubbs and Bonham, 1951: 104 and comparison number 23, on page 107 in which they said *Notropis blennius jejunus* had a larger eye than *N. b. blennius*. However, they said also that in the far north the eye in *jejunus* becomes reduced. Apparently they did not mention the source of their comparative material and so further discussion is unwarranted. The trend toward the south in an increase in length of jaw is in about the same magnitude as the increase in size of orbit. In view of the wide separation of the range in size of orbit of *edwardraneyi* and the most southern samples of *blennius* examined, there seems to be little or no reason to believe that a population of *blennius* with intermediate size orbit exists, particularly in the intermediate geographical area. For the sake of completeness the following data are presented for 258 specimens of *Notropis blennius* (338 less 80 of the series, UMMZ ACC. 1947:XI: 28). One of the 258 specimens had 9 principal dorsal rays, all the rest had 8; two of the 258 specimens had 8 principal anal rays, all the rest had 7; 243 specimens had 19 principal caudal rays, two had 20, ten had 18 and three had 17; 233 specimens had a scale count around the caudal peduncle of 5-2-5, one had 5-2-6, one had 5-2-7, ten had 6-2-5, one had 6-2-6, eight had 7-2-5, two had 7-2-6 and two had 7-2-7.

Notropis potteri was mentioned as an ally of *blennius* by Metcalf (1966: 122) and as a close relative of *edwardraneyi* in our introduction and perhaps is, but it is more distinct from *edwardraneyi* than *blen-*

TABLE 10
Measurements of *Notropis blennius* expressed in thousandths. Mean value is given below (in parentheses) range of variation.

Locality	Miss. R., Iowa	Miss. R., Mo.	Arkansas R., Ark.	Miss. R., La.
Catalog Number	UMMZ Acc. 1947:XI:28	UAIC 1830	TU 43167	NLSC 5356 NLSC 5441
Number of Specimens	30	50*	50	50
Standard Length (mm)	39.7–58.1 (45.1)	38.0–59.0 (47.6)	45.9–60.0 (52.4)	37.3–58.0 (49.5)
Head Length/S. L.	248–279 (265)	251–280 (265)	207–294 (268)	257–283 (271)
Interorbital/Head Length	342–391 (369)	351–405 (379)	347–413 (374)	328–393 (358)
Snout/Head Length	273–319 (295)	281–326 (301)	282–342 (312)	272–336 (294)
Orbit/Head Length	228–258 (241)	243–287 (262)	229–273 (249)	234–279 (253)
Upper Jaw/Head Length	298–347 (316)	299–339 (318)	285–348 (320)	300–351 (323)
Postorbital/Head Length	474–533 (494)	447–514 (476)	441–482 (466)	437–510 (476)
Orbit/Interorbital	600–731 (655)	620–778 (693)	589–755 (667)	618–828 (708)
Orbit/Snout	730–903 (819)	756–972 (872)	706–943 (799)	735–968 (851)
Orbit/Upper Jaw	700–854 (765)	750–897 (826)	674–868 (781)	711–906 (783)
Orbit/Postorbital	452–533 (489)	491–636 (552)	478–579 (535)	460–615 (532)

* Some specimens in partially dehydrated condition, orbit enlarged because of shrunken condition of fleshy orbital rim.

nius in a number of ways. Perhaps it too was an early offshoot of *blennius* stock that was isolated in the Brazos River and there differentiated. However, we believe a more plausible explanation of relationship is that *potteri* represents a descendent of a different but unknown stock, and that it has converged in a number of ways. Cross (1953: 258) concluded that the presence of *Notropis bairdi* in the Brazos was not attributable to recent introduction as a bait minnow, but that *N. bairdi* is endemic there. In a similar way we differ from Hubbs and Bonham (1951: 107-109) about the presence of *Notropis potteri* in the Red River as a result of bait introductions from the Brazos River. We believe that *N. potteri* gained access into the Red River system through natural means as the result of tributary captures or stream connections. We say this on the basis of the thousands of specimens of *N. potteri* taken from the lower Red River that are available in the Tulane University and Northeast Louisiana State College collections. We do not maintain that these collections of *potteri* from the lower portion of Red River refute the idea of bait introductions especially because most of the mentioned material was collected in recent years. The earliest collections were obtained in 1955 and 1956 from the Red River at Acme, Natchitoches, and Alexandria, Louisiana. At the Natchitoches locality a total of 837 specimens representing 18 species was seined, of which 194 specimens were *potteri.* The Alexandria collection had 15 species and 440 specimens, of which 124 were *potteri.* Unfortunately we do not have collections available at this time from a large intermediate section of the Red River either before or after formation of Lake Texoma. Our collections from the upper Red River system show *Notropis bairdi* to be the dominant ecological representative in that area. If *potteri* could not successfully compete with *bairdi,* this would

TABLE 11
Number of scales around the body below the lateral line.

	9	10	11	12	13	14	15	N	$\bar{x}$
edwardraneyi	33	63	76	9				181	10.3
blennius	1	11	198	69	54	3	2	338	11.5
potteri			1	6	34	7	2	50	13.1

account for its absence in the upper Red River. Perhaps the reverse is true in the lower Red River where at least we have never taken *bairdi.* The occasional collections of *potteri* from the Red River at Lake Texoma (Riggs and Bonn, 1959: 163) may be a reflection of more collecting effort after construction of the dam, or it may be a result of reinvasion of the area because of the changes in the habitat which are more suitable for *potteri* and other fishes that have been maintaining populations in the continuously flowing lower Red River. Further discussion of natural dispersion versus introduction by man should include *Notropis brazosensis* (= *shumardi*), following Gilbert and Bailey, 1962, and *Notropis oxyrhynchus* (Miller, 1953: 33-34). Such a discussion was not planned for this paper. However, an additional remark with regard to man's introduction versus natural occurrence of *N. potteri* in the Red River is here presented. If man introduced *potteri* it has swamped out and completely, or nearly so, replaced *blennius* in the shallow marginal areas of the lower Red River. *Notropis blennius* may have been displaced to the deeper parts of the channel where it may be present as natural resident populations.

The foregoing remarks are pertinent to the discussion of the relationship of *potteri* and *blennius.* Hubbs and Bonham (1951: 103) reported on a specimen of *blennius* taken from the Red River south of Ada, Oklahoma, by George A. Moore and J. M. Paden. Moore thought that it represented a bait introduction and perhaps this is true. A single specimen of *blennius* (TU 47644) was collected along with the hundreds of specimens of *potteri* from the lower Red River that are contained in the Tulane University collection. *Notropis potteri* obviously is the dominant ecological representative in the areas that we are able to sample with seines. However, many of the series housed at Northeast Louisiana State College were collected by use of wire trap nets. The single specimen of *blennius* is typical of the species from the Arkansas River in counts, measurements, and pigmentation and was immediately distinguished from *potteri* taken in the same collection. Northeast Louisiana State College collections from the Mississippi River at Natchez, Miss., represent a mixture of *blennius* and *potteri.* Because of the improper preservation (specimens probably died before they were preserved) it is difficult to be certain that introgressive hybridization has or has not taken place. Some specimens (those in better condition) are identifiable as *blennius* and others as *potteri.* Thus we record the presence of *Notropis potteri* in the Mississippi River proper. The collection (RDS 4236) obtained by the authors from the Mississippi River at Vicksburg on 11 October 1967 contained no *potteri* but 856 specimens of *blennius* (TU 48248), none of which resembled *potteri.* Of course this does not prove the absence of *potteri* in the Vicksburg area other than perhaps at the particular time and place of our collection. Collections of *blennius* from the Mississippi River at Baton Rouge and New Orleans, La., apparently do not exhibit any *potteri* traits. Further analysis of the relationship of the two species in the stretch of Mississippi River between Natchez and the mouth of the Red River is deemed impractical at this time. However, the relationship of *potteri* from the Red and Brazos rivers and *blennius* from the Arkansas and elsewhere in the Mississippi River drainage will be discussed.

The ontogenetic changes in *Notropis potteri* are remarkable and are decidedly different from those of either *blennius* or *edwardraneyi.* The size of orbit does not increase at the same rate as increase in length of head (Fig. 10). In specimens of 50 mm standard length the orbit is approximately one-fourth the length of head (Table

2) whereas the diameter of orbit is less than one-fifth the length of head in specimens over 80 mm standard length. For specimens which average about 50 mm standard length (Table 2) the orbit of *potteri* is considerably smaller than that of *blennius* and extremely so in comparison to that of *edwardraneyi.* Though the eye is smaller in *potteri* the interorbital distance is not proportionally so much greater than that in *blennius* because of the higher position of the eyes in *potteri.*

The changes in the shape and length of snout deserve special mention. The young and small juveniles of *potteri* have an extremely sharp-pointed snout (sharper than either *blennius* or *edwardraneyi*) which gradually approximates the shape and relative length of snout of *blennius* and *edwardraneyi* and then at its largest size has the bluntest snout of the three. Obviously larger individuals were under observation when Hubbs and Bonham (1951: 102) remarked upon the similarity of *potteri* to *Semotilus atromaculatus.* Moreover, there is a structural difference between *potteri* and *blennius* which apparently adapts *potteri* for a closer association with the bottom. The pectoral fins project laterally in a rather rigid fashion so that they are seldom seen on their side while flopping in the seine but are usually on their belly. *Notropis blennius* usually shows its side when alive in the net. Numerous field observations disclose that *potteri* lives on the bottom and is usually closely associated with it; however, *blennius* is often observed and taken from mid-depths, off the bottom. Some differences in proportions among the three species under consideration are illustrated in the outline drawings, Figures 6, 7, and 8.

We are in agreement with Hubbs and Bonham (1951: Table VI, 109) on measurements of *potteri* and so did not duplicate or incorporate a set of measurements in our Table 1. *Notropis potteri* tends to be closer to *blennius* than to *edwardraneyi* in most of the scale and fin-ray counts presented in Tables 4-8. *Notropis potteri* averages more scales around the body and usually has 13 or more below the lateral line (Tables 5 and 11). Many of the high counts in *blennius* relate to a high count above the lateral line and not below, the latter count (below) is modally 11.

Hubbs and Bonham (1951: 107) gave a description and comparison of pigmentation of *blennius* and *potteri.* Cognizant of some variability in pigmentation in the three species under consideration, we believe Figures 3, 4, and 5 represent typical patterns. *Notropis potteri* often has an intervening scarcely pigmented area between the lateral line pores with their associated pigmentation and the more dorsal band of large chromatophores. In *blennius* the pigmentation is continuous from the back, down the sides to the lateral line row of scales and often on the scale row below the lateral line.

Again, in order to be more complete, the following are the data for the less variable structures. In 50 specimens of *potteri* from the Red River in Louisiana two had 7 principal dorsal rays, the rest had 8; two had 8 principal anal rays, one had 6, and the rest had 7; two had 18 principal caudal rays, the rest had 19; 20 specimens had 5-2-5 scale rows around the caudal peduncle, 12 had 6-2-5, one had 6-2-6, 11 had 7-2-5, two had 7-2-6, and four had 7-2-7. Other scale and fin-ray counts are given in Tables 4-9, 11.

Etymology. We take pleasure in naming this new form in honor of Dr. Edward C. Raney in recognition of his many contributions to North American ichthyology and his guidance and imparted enthusiasm toward a multitude of students.

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