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PERCINA (IMOSTOMA) ANTESELLA, A NEW PERCID FISH  
FROM THE COOSA RIVER SYSTEM IN  
TENNESSEE AND GEORGIA

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Introduction

Like *Percina lenticula* Richards and Knapp, *Percina antesella* was first taken in a tributary to the Etowah River (Coosa Drainage), Cherokee County, Georgia, in an area that is now flooded by an Army Corps of Engineers impoundment, Alatoona Reservoir. The collection, of three specimens, was made by Donald C. Scott and O. Tyson in Shoal Creek, 5 July 1948. One specimen was sent to the Museum of Zoology, University of Michigan; the remaining two were deposited in the University of Georgia fish collection. While visiting the University of Georgia collection in 1966, the two specimens were examined and recognized as a new species. Attempts by Williams to secure additional specimens from tributaries to Alatoona Reservoir in Cherokee County, Georgia, were unsuccessful.

In 1968 David Etnier and Robert Stiles of the University of Tennessee collected additional specimens in the Conasauga River (Coosa Drainage), Polk and Bradley counties, Tennessee. Since 1968 approximately 70 specimens have been collected from three localities on the Conasauga River in Murray County, Georgia and Polk and Bradley counties, Tennessee. The three localities are within a 15 mile section of the Conasauga River.

The new species, *Percina antesella*, brings to five the number of species belong to the subgenus *Imostoma*. Four of the species (*P. antesella*, *P. ouachitae*, *P. tanasi*, and *P. uranidea*) appear to represent a distinct phyletic line, characterized, in part, by the presence of four or five dark saddles across the **dorsum**. The fifth species of the subgenus *Imostoma*, *Percina shumardi*, lacks saddles. Within the "saddleback" species group it appears that *Percina tanasi* and *Percina uranidea* form a species pair, while *P. ouachitae* is interpreted as a more recently evolved generalized species capable of adapting to a variety of stream conditions. *Percina antesella* is considered a relict species which is not closely aligned with any of the other three species.

The recognition of *Percina ouachitae* (Jordan and Gilbert) as a distinct species rather than a synonym of *P. uranidea* (Jordan and Gilbert) is based on unpublished studies by Bruce A. Thompson and Robert C. Cashner. Their validation of *P. ouachitae* and a discussion of relationships within the subgenus *Imostoma* will appear elsewhere.

We acknowledge with thanks the assistance of the following individuals. For the collection and loan of material we are grateful to R. M. Bailey,

Museum of Zoology, University of Michigan (UMMZ); H. T. Boschung, T. S. Jandebeur, and H. Harima, University of Alabama Ichthyological Collection (UAIC); G. H. Clemmer, Mississippi State University (MSU); N. H. Douglas, Northeast Louisiana University (NLU); E. A. Lachner, National Museum of Natural History (USNM); J. S. Ramsey, Auburn University (AU); M. E. Sisk, Murray State University Collection (MSUC); D. C. Scott, University of Georgia (UG); W. M. Howell and R. A. Stiles, Samford University; W. C. Starnes, University of Tennessee (UT); R. D. Suttkus, Tulane University (TU); and R. W. Yerger, Florida State University (FSU). We especially thank Robert C. Cashner and Bruce A. Thompson for their valuable comments on the manuscript during its preparation.

The methods of Hubbs and Lagler (1958) were followed in obtaining counts and measurements. Vertebral counts followed the methods of Bailey and Gosline (1955).

*Percina antesella*, new species

Amber Darter

Fig. 1

*Percina uranidea*. Richards and Knapp, 1964:700 (misidentification, supplementary material, UMMZ 156697).

*Percina (Imostoma)* sp. Stiles and Etnier, 1971:12, 15 (Conasauga River, Polk and Bradley counties, Tennessee); Page and Whitt, 1973a:3, 4 (Conasauga River, Bradley Co., Tennessee); Page and Whitt, 1973b:614-616, 621 (Conasauga River, Bradley Co., Tennessee); Page, 1974:66-72, 75-82, 85 (Conasauga River, Bradley Co., Tennessee).

*Percina* sp. of *uranidea*. Dahlberg and Scott, 1971:47, 64 (Coosa System, Georgia and Tennessee).

*Percina* sp. Narrowsaddle Darter. Miller, 1972:245, 246, 250 (Rare, Conasauga River, Georgia and Tennessee).

*Percina* sp. Etnier, 1975:472, 482, 484 (key to species of subgenus *Imostoma* and comparison with *P. tanasi*).

*Percina (Imostoma)* sp. Page, 1976:258, 261 (Upper Alabama River System).

*Holotype*.—*Adult* male, TU 94031, 47.0 mm standard length (SL), Conasauga River, Tennessee Hwy. 74, Bradley Co., Tennessee 9-10 April 1970.

*Paratopotypes*.—UT 91.471 (10 specimens), collected with the holotype, TU 58938 (7), 17 Oct. 1969; TU 58968 (3), 19 Oct. 1969; TU 65937 (7), 29 June 1970; TU 69143 (8), 15 April 1971; TU 78368 (1), 1 July 1972; UAIC 4459.01 (1), 6 March 1971; UAIC 4729.01 (11), 29 Nov. 1969; USNM 210666 (1), 16 May 1970; USNM 210667 (3), 22 Oct. 1969; USNM 210668 (2), 22 Feb. 1970; UT 91.799 (2), 28 June 1973; UT 91.800 (1), 22 July 1972; UT 91.1100 (1), 4 Nov. 1973.

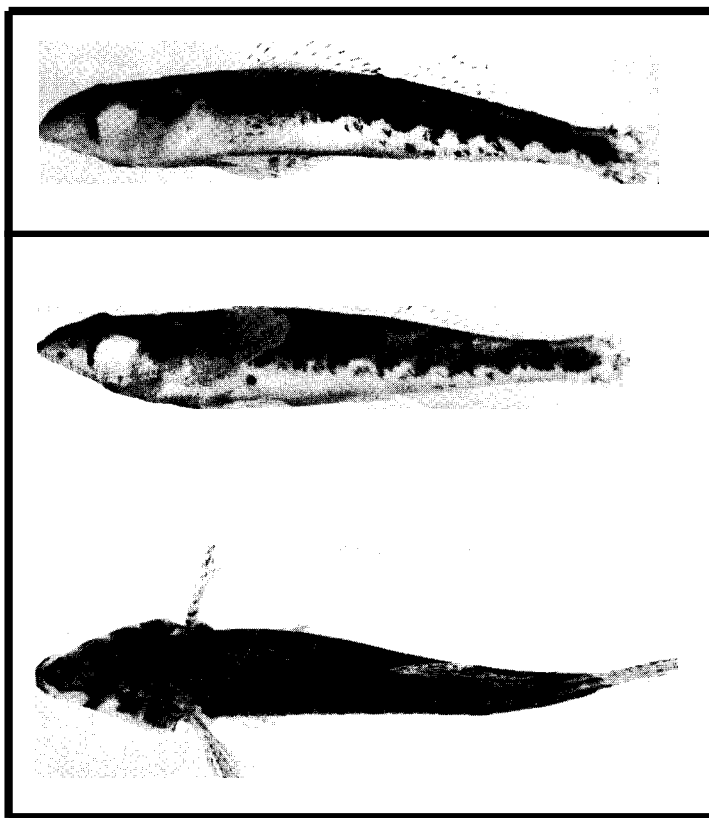


Fig. 1. *Percina antesella* n. sp., paratopotypes. Top: UT 91.799, ♂, 53 mm SL. Middle: UAIC 4729.01, ♀, 52 mm SL. Bottom: UT 91.1100, ♂, 52 mm SL.

Other paratypes.—Georgia, Cherokee Co.: UMMZ 156697 (1) and UMMZ 194317 (2), Shoal Creek, first bridge above mouth (now flooded by Alatoona Reservoir), 5 July 1948. Murray Co.: TU 59427 (7) Conasauga River, Hwy. 286 bridge, 2.3 mi W of junction of Hwy. 225 and 286, 19 Oct. 1969. Tennessee, Polk Co.: UAIC 4730.01 (1) Conasauga River at Boanerges Church bridge, 3-4 Nov. 1968; USNM 210669 (1) Conasauga River, second riffle below Boanerges Church bridge (first bridge above Tennessee Hwy. 74 bridge), 11 Oct. 1969.

Diagnosis.—A species of the genus *Percina*, subgenus *Imostoma* (see Page, 1974:85), distinguished from known species by: anterior saddle on posterior portion of nape, entirely anterior to spinous dorsal fin (under anterior portion of spinous dorsal fin in *Percina tanasi*, *P. ouachitae*, and *P. uranidea*); lower procurent caudal rays of breeding males extended ventrally producing a triangular flange bearing breeding tubercles (no such flange in

Table 1. Measurements in thousands of SL of *Percina antesella* new species and *P. ouachitae* (Jordan and Gilbert).  $\bar{x}$  = mean, W = range of values, S = standard deviation.

		<i>P. antesella</i> n. sp. (12 ♂; 32 ♀)			<i>P. ouachitae</i> Tenn. & Miss. R. (11 ♂; 9 ♀)			<i>P. ouachitae</i> Gulf Coast (20 ♂; 209 ♀)		
Standard length	♂	45.09	414-485	2.16	44.87	372-522	4.93	49.80	428-648	6.15
	♀	46.06	350-592	5.70	40.87	336-570	6.97	47.94	420-610	5.84
Head length	♂	292.50	284-300	5.47	278.91	262-307	12.74	275.45	259-300	8.76
	♀	292.62	278-304	7.44	284.33	280-295	8.60	274.55	259-296	8.41
Snout length	♂	87.75	81-93	3.33	81.91	76-90	4.25	83.90	77-91	3.87
	♀	88.41	78-96	4.04	81.78	70-86	5.24	84.20	76-93	4.32
Orbit diameter	♂	68.25	62-72	5.19	75.18	71-78	3.25	67.75	60-77	4.47
	♀	69.69	64-75	3.29	78.78	71-86	6.12	67.05	60-75	4.98
Interorbital width	♂	35.50	30-41	3.37	42.36	38-47	3.32	37.90	33-43	3.57
	♀	36.00	27-43	4.21	43.78	38-51	3.99	38.40	35-42	2.23
Caudal peduncle depth	♂	71.42	67-77	3.20	76.64	73-81	2.62	73.25	65-83	4.64
	♀	74.16	65-80	3.62	78.67	71-84	3.87	73.45	68-83	3.80
Caudal peduncle length	♂	210.83	201-221	6.59	198.00	180-217	11.64	192.15	173-213	11.45
	♀	211.07	186-237	12.09	198.45	176-214	11.58	202.95	182-233	14.18
Pelvic fin length	♂	219.25	195-238	11.00	208.36	193-222	10.63	204.50	171-224	13.70
	♀	210.72	193-230	8.91	203.78	184-224	12.56	200.75	190-212	6.47

Table 1. Continued.

		$S_z$								
Spiny dorsal fin length	♂	244.83	227-265	9.28	258.36	242-282	10.60	275.40	246-300	13.75
	♀	244.94	230-269	10.70	257.00	243-285	12.42	270.65	249-291	12.62
Soft dorsal fin length	♂	277.42	225-311	33.57	304.27	286-323	10.24	313.40	270-330	14.35
	♀	261.34	252-296	48.67	259.11	249-271	8.43	260.90	238-281	12.01
Length of anal spine	♂	90.50	79-101	5.98	73.64	63-84	6.44	74.65	63-88	7.12
	♀	83.22	63-94	6.62	74.46	67-82	6.45	65.75	54-74	4.82
Occiput to first saddle	♂	72.25	57-80	6.55	154.27	140-164	12.18	144.50	121-166	13.60
	♀	75.81	62-88	5.98	153.78	140-164	7.90	146.65	127-169	12.44
Width of first saddle	♂	43.50	36-50	5.53	66.46	57-80	9.28	71.50	51-93	11.51
	♀	44.50	28-56	6.63	72.78	61-86	8.70	68.90	44-98	12.60
Occiput to second saddle	♂	334.92	316-349	10.61	356.00	336-385	15.97	369.50	332-404	16.77
	♀	338.66	307-370	14.97	361.56	331-385	17.42	376.30	348-419	18.25
Width of second saddle	♂	48.08	29-63	8.93	56.36	38-63	9.68	56.45	38-75	10.32
	♀	51.16	41-69	6.65	55.78	46-68	9.04	59.15	46-84	11.34

*Percina tanasi*, *P. ouachitae* and *P. uranidae*); transverse scale rows 15-19, usually 16 or 17 (11-16, usually 13-15 in *P. ouachitae*).

Description.—*Percina antesella* is a small, moderately slender species rarely exceeding 60 mm standard length (SL). Head length contained 3.4-3.6 times in standard length. Head length in *P. antesella* slightly longer than in *P. ouachitae*, due in part to the somewhat longer snout of *P. antesella* compared to that of *P. ouachitae*. Snout moderately long and pointed, slightly longer than orbit. As in most species of subgenus *Imostoma*, eyes placed high on head and interorbital width very narrow. The general body shape is illustrated in Fig. 1. Proportional measurements of 44 paratypes are presented in Table 1.

Gill membranes usually separate, narrowly connected in some individuals. Development of frenum variable but usually incomplete. Cephalic sensory canal system complete with three pores in supratemporal canal, four pores in supraorbital, and a single coronal pore. **Preoperculomandibular** canal usually has 10 pores. Infraorbital canal has 8 or 9 pores, typically 8.

Dorsal spines range from 9-11 with mode of 10; dorsal rays range from 12-15, usually 13 or 14. Pectoral rays range from 13-15, usually 14. Anal rays usually 9 or 10. Typically 12 branchiostegal rays, six per side. Vertebral counts varied from 38-40 with mode of 39. Frequency distributions of fin-ray and vertebral counts are given in Table 2.

Body squamation usually complete, except anterior portion of nape and belly, both of which vary from naked to almost complete coverage with embedded scales. In males, midventral row of modified scales not well developed, width usually only slightly larger than scales of adjacent rows. Males usually have two modified scales present between pelvic fins and an additional three to seven scales along ventral midline of posterior half of breast. A few scattered embedded cycloid scales present on breast of some individuals. Opercles usually only partially scaled, and cheeks typically naked. Lateral line complete with 51-66 scales, usually 55-61. Usually 16-18 transverse scale rows and 19-21 caudal peduncle scale rows. Frequency distributions of scale counts are given in Table 3.

Coloration in life.—On trunk, golden brown of dorsum extends ventrad to first or second scale row above lateral line. Four dark brown saddles present on dorsum, first crosses posterior part of nape, entirely anterior to origin of spinous dorsal fin. Posterior margin of this saddle usually one to three scales anterior to first dorsal spine and saddle usually four to six scales in width. In *Percina ouachitae* first dorsal saddle beneath anterior portion of spinous dorsal fin (Fig. 2). Second dorsal saddle situated under posterior end of first dorsal fin. Second saddle usually with anterior margin between last two dorsal spines and posterior margin at or just anterior to soft dorsal origin. Third dorsal saddle usually under three or four rays between the sixth and eleventh dorsal rays. Fourth dorsal saddle on pos-

Table 2. Frequency distributions of fin-ray and vertebrate counts in *Percina antesella* and *P. ouachitae* from drainages east of the Mississippi River.

	Dorsal spines					
	9	10	11	12		
<i>P. antesella</i>	2	43	25		10.33	
<i>P. ouachitae</i>	19	279	174	6	10.35	
	Dorsal rays					
	12	13	14	15		
<i>P. antesella</i>	9	38	22	1	13.21	
<i>P. ouachitae</i>	8	109	283	83	13.91	
	Pectoral rays					
	13	14	15	16	17	
<i>P. antesella</i>	19	47	4			13.79
<i>P. ouachitae</i>	5	194	267	11	1	14.60
	Anal rays					
	8	9	10	11	12	
<i>P. antesella</i>	7	32	31			9.34
<i>P. ouachitae</i>		18	179	257	26	10.31
	Principal caudal rays					
	14	15	16	17		
<i>P. antesella</i>		15	44	7		15.88
<i>P. ouachitae</i>		87	254	27		15.57
	Vertebrae					
	38	39	40			
<i>P. antesella</i>		8	37	3		38.90
<i>P. ouachitae</i>		10	45	7		38.95

terior portion of caudal peduncle, just anterior to procurrent caudal rays; usually three to four scales wide at dorsal midline. All four dorsal saddles angle anteriad, narrowest at dorsal midline, expanded ventrad, terminating near lateral line. Ventral expansion of saddles most prominent on second and third saddle.

Pigment along lateral line present in varying concentrations. On anterior third to half of body lateral pigment consists of irregular light brown blotches scattered just below lateral-line scale row. Light brown to brown irregularly shaped blotches present on or just below lateral-line scale row on posterior half to two-thirds of body. Most prominent blotches are on



Table 3. Frequency distributions of scale counts in *Percina antesella* and *Percina ouachitae* from drainages east of the Mississippi River.

		Lateral line scales																					
		46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	
<i>P. antesella</i>						1		1	5	7	6	7	7	6	9	6	5	3	3	2	1	58.65	
<i>P. ouachitae</i>		2	5	10	13	33	46	55	60	69	59	50	35	23	10	8	5	1					53.75
		Transverse scale rows																					
		11	12	13	14	15	16	17	18	19													
<i>P. antesella</i>						4	22	20	5	1	16.56												
<i>P. ouachitae</i>		2	4	102	201	96	10					14.06											
		Caudal peduncle scales																					
		17	18	19	20	21	22																
<i>P. antesella</i>			2	15	32	20	1	20.04															
<i>P. ouachitae</i>		24	83	191	110	28	2	19.11															

posterior part of body and usually appear as irregular expansions along ventral margin of dorsal saddles. Below lateral pigment, concentrations of dark chromatophores present on groups of one to three scales on ventro-lateral body surfaces, most apparent on posterior third to half of body. Venter pale yellow to cream color.

Dorsal and dorsolateral surfaces of head, including upper portion of cheeks, opercles, and snout tip dark olive brown. Lateral and ventral areas of head yellowish to cream color. Interopercle and subopercle iridescent pale blue. A prominent dark brown subocular bar about width of pupil slopes downward and slightly forward from eye. A small concentration of melanophores usually present on gular region at junction of branchiostegal membranes.

Spinous dorsal has vague gray black basal and marginal bands with central third to half of fin clear. Chromatophores apparently absent from spinous dorsal fin. Soft dorsal fin has four or five clusters of dark chromatophores evenly spaced along each ray, usually best developed toward base of fin; membranes unpigmented. Caudal and pectoral fins similar to soft dorsal but usually have a somewhat irregular pattern which gives them a more mottled appearance. A caudal spot of varying intensities usually present near middle of caudal fin base. Unpigmented areas usually present above and below caudal spot. Anal and pelvic fins unpigmented except for an occasional cluster of dark chromatophores.

Breeding tubercles.—Males of *Percina antesella* taken in April have well developed tubercles which are different in their distribution and somewhat

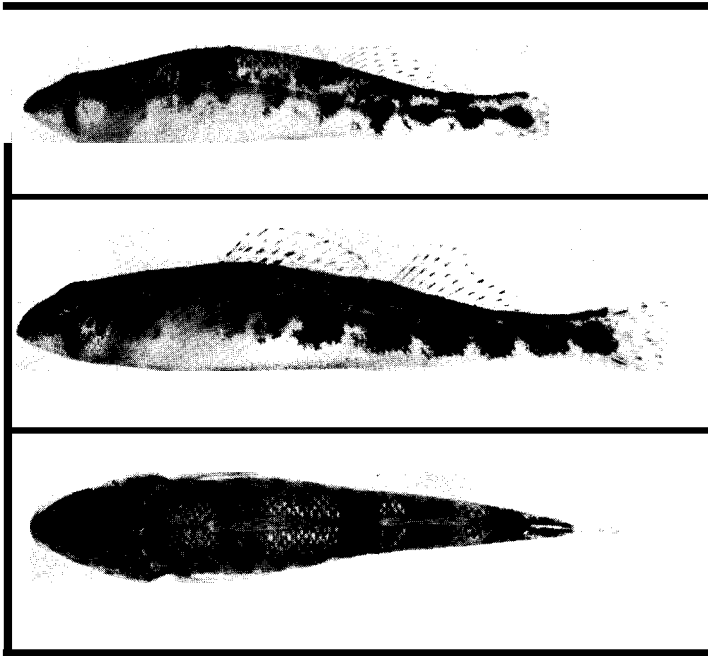


Fig. 2. *Percina ouachitae* (Jordan & Gilbert), UT 91.860, Buffalo River approximately 1.3 mi above its mouth, Humphreys Co., Tennessee, 10 November 1973. Top: ♂, 44 mm SL. Middle: ♀, 53 mm SL. Bottom: ♀, 50 mm SL.

reduced in size compared to *P. ouachitae* and *P. uranidea*. Tubercles are present on the caudal, anal, pelvic, and pectoral fins and some scales on venter, breast, and caudal peduncle. *Percina antesella* lacks tubercles on branchiostegals, rami of lower jaw and scales on cheeks and opercles in contrast to *P. ouachitae* which has tubercles on these areas.

In males, caudal fin has well developed tubercles on unbranched and branched portions of ventral fifth to eighth rays. Posterior third to fifth lower procurrent caudal rays extended ventrally into a triangular flange which may have up to four tubercles along base. Both *P. ouachitae* and *P. uranidea* lack the triangular flange. Three to six tubercles present on both spines of anal fin. Tubercles present on distal half to two-thirds of all anal rays. Pelvic fins have tubercles on dorsal and ventral surfaces of rays, usually best developed on ventral surface of rays, from near base to fin margin. Distal half to two-thirds of ventral surface of pelvic spine usually with a ridgelike structure; occasionally two or three low, rounded tubercles present on proximal third of spine; tubercles usually absent from dorsal surface of spine. Ventral third of pectoral fins with a few small tubercles on distal half of longer rays.

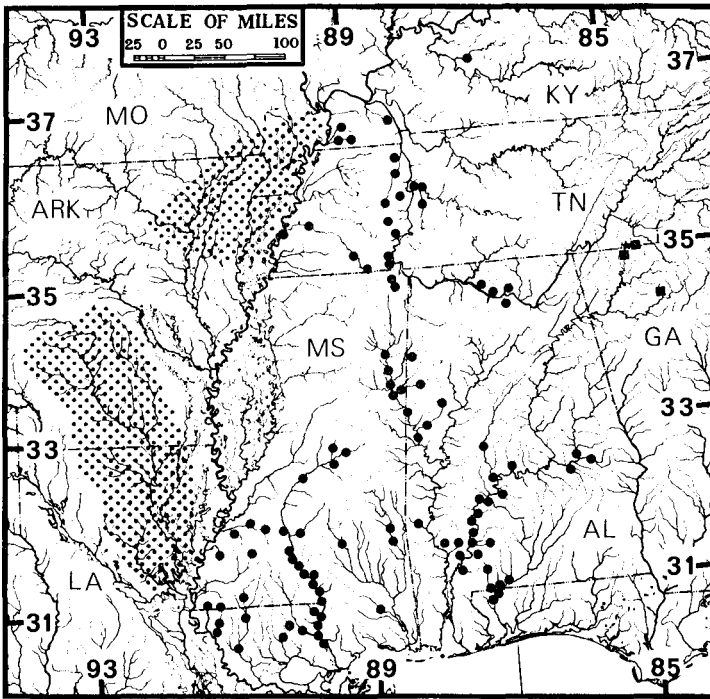


Fig. 3. Distribution of *Percina antesella* (squares and star, the type-locality) and *Percina ouachitae* (closed circles). The stippled area west of the Mississippi River (Arkansas, Louisiana, and Missouri) depicts the general distribution of *P. ouachitae* west of the Mississippi River. *P. ouachitae* and *P. uranidea* occur syntopically in some drainages west of the Mississippi River.

Tubercles on scales generally poorly developed, each scale usually bearing a single low rounded tubercle. On abdomen, tubercles usually present on two to four scale rows on either side of midventral modified scale row from near anal fin origin to one-half to two-thirds distance to insertion of pelvic fins. On breast, the few scales anterior to pelvic insertion may have tubercles, and if tubercles present they are smaller than those on scales of venter. Tubercles on caudal peduncle scales restricted to those around the base of triangular flange.

Tubercles usually absent in females; however, one gravid female was found to have very weakly developed tubercles on anal and pelvic fin rays. The triangular flange formed by the ventral procurent caudal rays present on females, but development is much less than in males.

Distribution and habitat.—*Percina antesella* is known only from two head-water tributaries of the Coosa River, the Conasauga and Etowah rivers in northwestern Georgia and extreme southeastern Tennessee (Fig. 3). In

the Etowah River system it was known from one locality, Shoal Creek near its junction with the Etowah River, Cherokee County, Georgia. This locality was flooded by a U.S. Army Corps of Engineers impoundment, Alatoona Reservoir, in the 1950's. Attempts to collect additional specimens in Shoal Creek about the impoundment were unsuccessful. In the Conasauga River system it is known from the main channel of the river in Polk and Bradley counties, Tennessee, and Murray County, Georgia.

The Conasauga River in Polk and Bradley counties, Tennessee, is a small river characterized by cool, clear water with moderate to swift current. The bottom consists primarily of gravel and cobbles with scattered patches of fine gravel and sand. *Percina antesella* has been collected most frequently in water up to two feet deep in riffle areas with moderate current. The bottom was typically cobbles and silt-free sand. Fishes of the Conasauga River in Polk and Bradley counties, Tennessee, were reported by Stiles and Etnier (1971).

*Conservation.*—The restricted habitat of *Percina antesella* makes it extremely vulnerable to extirpation. Alterations of the habitat through impoundments and runoff from poor agricultural practices have apparently resulted in extirpation of the population in the Etowah River. In the Conasauga River the amber darter population appears to be in good condition and should maintain its present numbers barring alteration of the riverine ecosystem. The collection of 70 individuals over a period of six years, as many as 32 in one year, has not had any noticeable effect on the population.

*Etymology.*—The specific name, *antesella*, is formed from the Latin *ante* which means anterior and *sella* which means saddle. The name calls attention to the anterior saddle which is situated anterior the origin of the dorsal fin.

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- seven species of darters (Etheostomatini), and the inclusiveness of the genus *Percina*. Ill. Nat. Hist. Sur. Biol. Notes No. 82:1-7.
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### Comparative Material

#### *Percina ouachitae* (Jordan & Gilbert)

*Escambia Bay drainage*.—*Alabama*: Escambia Co.: AU 1072 (1), TU 15260 (5), TU 16523 (5), UAIC 421 (4), UAIC 3512 (3), UMMX 124022 (1), UMMZ 163554 (19), UMMZ 165966 (1), USNM 63116 (4), UT 91.635 (12). Florida: Escambia Co.: FSU 3536 (1), FSU 4365 (1), FSU 5913 (6).

*Mobile Bay drainage*.—*ALABAMA RIVER SYSTEM*. Alabama: Autauga Co.: TU 9935 (3). Bibb Co.: AU 541-11 (2). Clarke Co.: UAIC 2318 (1). Dallas Co.: TU 33399 (18), TU 40454 (1), TU 35374 (11). Perry Co.: TU 35135 (2). Macon Co.: AU 591-3 (5), AU 4193 (14). Monroe Co.: TU 58710 (1), TU 52800 (6), TU 47508 (3), TU 53331 (1), TU 40427 (3), UAIC 2353 (3), UAIC 2354 (1). Wilcox Co.: TU 64758 (1), TU 55855 (7), TU 47776 (1), TU 48001 (6), TU 40337 (9), TU 44643 (16), TU 47381 (1), TU 40305 (31), TU 59356 (1), TU 47833 (1). *TOMBIGBEE RIVER SYSTEM*. Alabama: Choctaw Co.: UAIC 338 (1). Clarke Co.: TU 32493 (26), TU 35295 (17), TU 59964 (3), TU 59934 (7). Greene Co.: UAIC 1667 (8), UAIC 1470 (2), UAIC 3586 (4). Lamar Co.: UAIC (1). Pickens Co.: TU 76537 (12), UAIC 3043 (1), UAIC 4337 (4). Tuscaloosa Co.: UAIC 1625 (25), UAIC 1434 (6). Mississippi: Lowndes Co.: MSU 51 (79), TU 76947 (4), UAIC 4338 (4), UAIC 4357 (2), UAIC 4389 (5), UAIC 4401 (1), UAIC 4418 (1), UAIC 4420 (1), UAIC 4425 (21). Monroe Co.: UAIC 2189 (1), UAIC 3629 (1), UAIC 4356 (1), UAIC 4434 (3). Prentiss Co.: UAIC 4341 (1).

*Eastern Gulf drainages*.—*PASCAGOULA RIVER SYSTEM*. Mississippi: Clarke Co.: TU 59981 (1), UMMZ 144721 (1). Covington Co.: TU 28598 (3). Stone Co.: TU 28089 (4). Wayne Co.: TU 58774 (4). *PEARL RIVER SYSTEM*. Louisiana: St. Tammany Parish: TU 30019 (40), TU 31454 (1), TU 34676 (13), TU 34741 (3), TU 42016 (1), TU 77351 (25), TU 81318 (2), TU 81436 (41). Tangipahoa Parish: TU 84229 (2). Washington Parish: TU 33235 (1), TU 45070 (11), TU 53946 (69), TU 63799 (9), TU 64197 (3), UAIC 3780 (14). Mississippi: Copiah Co.: TU 28861 (3), TU 43449 (3). Leake Co.: FSU 10703 (7), TU 26580 (4). Lawrence Co.:

TU 23917 (1), TU 23942 (13), TU 26897 (1), TU 27214 (3), TU 81211 (7), TU 81339 (1). Madison Co.: TU 26556 (1). Marion Co.: TU 159 (35), TU 9706 (20), TU 16143 (6), TU 27163 (14), TU 28270 (298), TU 38890 (16), TU 55217 (5). Neshoba Co.: TU 28992 (15). Simpson Co.: TU 43984 (1). TCHEFUNCTE RIVER SYSTEM. Louisiana: Washington Parish: NLU 6455 (1). AMITE RIVER SYSTEM. Louisiana: Livingston Parish: TU 29047 (1). East Feliciana Parish: TU 75550 (8). Mississippi: Amite Co.: NLU 11601 (4).

*Mississippi River tributaries, Mississippi.*—THOMPSON CREEK SYSTEM. Louisiana: West Feliciana Parish: TU 55303 (1), TU 69616 (24). Mississippi: Wilkinson Co.: TU 74706 (53), TU 74774 (30). BAYOU SARA SYSTEM. Mississippi: Wilkinson Co.: TU 59998 (1). HOMOCHITTO RIVER SYSTEM. Mississippi: Lincoln Co.: TU 71206 (1), TU 73271 (1), TU 78054 (1). COLES CREEK SYSTEM. Mississippi: Jefferson Co.: TU 55456 (1). BAYOU PIERRE SYSTEM. Mississippi: Claiborne Co.: FSU 9221 (2). Copiah Co.: FSU 9274 (3), TU 76810 (2), TU 80270 (31), USNM 266609 (6).

*Mississippi River Tributaries, Tennessee and Kentucky.*—HATCHIE RIVER SYSTEM. Tennessee: Hardeman Co.: USNM 190786 (1). McNairy Co.: USNM 190755 (2), UT 91.798 (8). Tipton Co.: UT 91.601 (24). MISSISSIPPI RIVER PROPER. Tennessee: Tipton Co.: UT 91.563 (1). OBION CREEK SYSTEM. Kentucky: Carlisle Co.: MSUC 24 (2). Hickman Co.: MSUC 212 (1). BAYOU DE CHIEN SYSTEM. Kentucky: Hickman Co.: MSUC 420 (3), MSUC 423 (5), MSUC 424 (13), MSUC 425 (2), MSUC 426 (4).

*Tennessee River drainage.*—TENNESSEE RIVER SYSTEM. Alabama: Limestone Co.: UMMZ 115038 (1), UMMZ 115049 (1), UMMZ 115121 (1), UMMZ 122637 (6), UMMZ 122707 (2). Madison Co.: UMMZ 115189 (1). Morgan Co.: UMMZ 115403 (1). Mississippi: Tishomingo Co.: UAIC 4359 (1), UAIC 4369 (1). Tennessee: Benton Co.: UMMZ 168331 (1), UT 91.795 (4). Decatur Co.: TU 91.812 (11). Hardin Co.: UMMZ 177666 (1), UT 91.249 (7). Henderson Co.: UT 91.726 (4), UT 91.796 (11). Henry Co.: UT 91.883 (6). Humphrey's Co.: UT 91.797 (13), TU 91.811 (18), UT 91.855 (18). Perry Co.: UT 91.623 (1). Kentucky: Marshall Co.: UMMZ Uncat. Coll. (1).

*Ohio River drainage.*—GREEN RIVER SYSTEM. Kentucky: Ohio Co.: USNM 117343 (2), USNM 63797 (2).

(JDW) Office of Endangered Species, Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240; and (DAE) Department of Zoology, University of Tennessee, Knoxville, Tennessee 37916.