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PERCINA (*IMOSTOMA*) *TANASI*, A NEW PERCID FISH FROM THE LITTLE TENNESSEE RIVER, TENNESSEE

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The Little Tennessee River begins in Macon County, North Carolina, and flows northwest to enter the Tennessee River near Lenoir City, Loudon County, Tennessee. The flow of the Little Tennessee River is interrupted by Fontana Reservoir, a large warmwater impoundment in Swain and Graham counties, North Carolina. Tailwaters of Fontana Reservoir are consistently cold and well suited to a recreational trout fishery. The cold water habitat continues through Cheoah, Calderwood, and Chilhowee reservoirs. Below Chilhowee Reservoir a trout fishery persists for about 21 river km, ending approximately 2.5 river km above the U.S. Highway 411 bridge, Monroe County, Tennessee. Although trout occur sporadically in the lower 32 km of river, warmwater fishes are predominant.

Records indicate that the original fish fauna of the Little Tennessee River system was rich. Among the more interesting species known from this system are an undescribed darter of the subgenus *Catonotus* (R. E. Jenkins, in lit.), *Hybopsis monacha* (Cope), *Cycleptus elongatus* (Lesueur), and *Percina burtoni* Fowler. *Noturus baileyi* Taylor, a madtom that is likely extinct, is known only from a rough fish removal operation in Abrams Creek, tributary to the Little Tennessee River (Taylor, 1969). A number of reports of lake sturgeon (*Acipenser fulvescens* Rafinesque) from recent sightings and captures in the river suggest the continued existence of what is possibly a reproducing population of this vanishing species in the lower Little Tennessee River. A reasonable number of fish collection records are available from the tributaries and headwater portions of the system, and from the 21 km of river utilized as a trout fishery below Chilhowee Dam. The lower 32 km of the Little Tennessee River remained uncollected until recently. It seemed possible that (despite environmental changes that have taken place over the years) some elements of the original main channel fish fauna might persist in the lower portion of the river. An additional impoundment, Tellico Reservoir, is under construction by the Tennessee Valley Authority, and would innundate virtually all of the river remaining below Chilhowee Dam. With this in mind, Robert A. Stiles and I visited the river at Coytee Spring, River Mile 7, Loudon County, Tennessee, on 12 August 1973, in an attempt to survey the fish fauna with the aid of face masks and snorkels. Although very few fishes were seen, a single specimen of a very unusual darter was observed and "scooped up" by hand by the author. Subsequent examination of this specimen indicated that it was a new species of the genus *Percina,* subgenus *Imostoma.*

In the genus *Percina*, the subgenus *Imostoma* had until recently been envisioned as containing two species, *P. shumardi* (Girard) and *P. uranidea* (Jordan and Gilbert). Three specimens collected in Shoal Creek, tributary to the Etowah River (Mobile Bay drainage), Cherokee County, Georgia, by Don Scott and O. Tyson, were recognized by J. D. Williams in 1966 as representing a distinct species allied with *P. uranidea.* Impoundment of Alatoona Reservoir apparently eliminated the population. Stiles and I collected a specimen of this species in the Conasauga River, Polk County, Tennessee, in 1968. Approximately 60 additional specimens have now been collected from the latter stream, and the description of this species by Williams and Etnier is in preparation.

In 1970 I examined some specimens at Tulane University from the Ozark region collected by R. C. Cashner and B. A. Thompson. These distinctive specimens, collected with what was then known as *P. uranidea,* appeared to be a new species. Subsequent examination of the types of *P. uranidea* and its supposed junior synonym *P. ouachitae* (Jordan and Gilbert) by Thompson revealed that their "new" species was identical with the types of *P. uranidea*, and the types of *P. ouachitae* were identical with specimens then being referred to as *P. uranidea* (Thompson, in lit.). A paper concerning the status of *P. uranidea* and *P. ouachitae* is being prepared by Thompson and Cashner. Examination of the specimen from the Little Tennessee River suggested that its affinities were with true *P. uranidea* rather than with *P. ouachitae*, *P. shumardi*, or the undescribed species from the Conasauga River. Further studies confirmed this view and indicated that the Little Tennessee River population represented a species distinct from *P. uranidea*.

The Subgenus *Imostoma*

The subgenus *Imostoma* currently includes the following five species: *P. shumardi* (Girard), which lacks distinct dorsal saddles; and four species with saddles—*P. uranidea* (Jordan and Gilbert), restricted now to the White and Saline river systems, Arkansas, but formerly occurring in the Wabash River, Indiana; *P. ouachitae* (Jordan and Gilbert), widespread in the lower Mississippi River valley and in the Gulf Coastal drainages; the undescribed species from the Conasauga River; and the new species from the Little Tennessee River, described herein.

Page (1974) presented a brief diagnosis of the subgenus *Imostoma* based on *P. shumardi*, the undescribed species from the Conasauga River, and *P. uranidea* from a "ditch" in Missouri. His *P. uranidea* specimens were likely *P. ouachitae*, since *P. uranidea* is extremely rare in Missouri, and appears to be restricted to swift water in moderate size rivers. *P. ouachitae* does occur in ditch-type habitats. The inclusion of two additional species in the subgenus (*P. uranidea* and *P. tanasi*), plus examination of extensive material of the three species considered by Page, necessitates modification of the diagnosis, as follows. A "midbelly row of modified (enlarged and strongly toothed) scales" develops on individuals of all five species. These modified midventral scales are most conspicuous in large adults, and may be lacking in juveniles and small adults. In nuptial males of *P. uranidea* there is a more or less well developed band of exposed but scarcely modified ctenoid scales extending from the ventral prepectoral area transversely across the middle of the breast. In the other four species embedded cycloid and occasionally a few exposed ctenoid scales are present on the breast in many individuals. These are most conspicuous in nuptial males, and are usually confined to the posterior half of the breast.

Key to the Species of the Subgenus *Imostoma*

1. Dorsal saddles absent .... *Percina shumardi* (Girard)
   Four or five distinct dorsal saddles present 2
2. Anteriormost dorsal saddle entirely in front of dorsal fin .... *Percina* species
   Anteriormost dorsal saddle beneath dorsal fin 3
3. Posterior margin of fourth dorsal saddle over dorsal insertion of caudal fin; fifth dorsal saddle absent; anal soft rays 11–12 (extremes 10–13) 4
   Posterior margin of fourth dorsal saddle anterior to dorsal insertion of caudal fin; fifth saddle adjacent to dorsal insertion of caudal fin, moderately developed; anal soft rays 10–11 (9–12) .... *Percina ouachitae* (Jordan and Gilbert)
4. Anal rays modally 11; pectoral fins long and pointed, overlying lateral-line scale 19–24 (males) or 17–23 (females and juveniles); pelvic fins 22% of standard length or longer in males, 20% of standard length or longer in females and juveniles; nuptial males with tubercles on pelvic spine and adjacent four soft rays .... *Percina uranidea* (Jordan and Gilbert)
   Anal rays modally 12; pectoral fins shorter and more rounded, overlying lateral-line scale 17–19 (males) or 15–18 (females and juveniles); pelvic fins less than 22% of standard length in males, less than 20% of standard length in females and juveniles; nuptial males with pelvic fin tubercles confined to the four median rays .... *Percina tanasi* new species

Methods

Measurements and counts (Tables 1–8) follow the methods of Hubbs and Lagler (1958) unless defined below. Measurements were made with a needle-point divider and read to the nearest 0.1 mm. Head length was measured from the tip of the snout to the tip of the membranous extension of the operculum. Orbital diameter and interorbital width were measured between the fleshy coverings of the bones delimiting these areas. Trans-pelvic width was the measurement between the outer edges of the parallel pelvic spines. Saddle widths were measured along the dorsal midline and the saddle position from the occiput. The lateral-line scale under the tip of the pectoral fin (Table 3) was obtained by counting from the head to the fin tip when pressed against the lateral midline.

Material Studied

The number of specimens appears in parentheses after the catalog number. The following abbreviations have been used: SL (Standard length), TU (Tulane University), UT (University of Tennessee), USNM (National Museum of Natural History, Smithsonian Institution), CU (Cornell University), FSM (Florida State Museum), INHS (Illinois Natural History Survey), NLU (Northeastern Louisiana State University), UAIC (University of Alabama Ichthyological Collection), UMMZ (Museum of Zoology, University of Michigan), OAM (Oklahoma State University), HWR (Henry W. Robison collection).

Percina tanasi, new species

Snail Darter

Figure 1

Type-specimens: Holotype, TU 90858, an adult male, 59.1 mm SL, Little Tennessee River at Coytee Spring, River Mile 7, Loudon County, Tennessee, 6 Nov. 1973, G. F. Boronow, B. F. Clark, Jr., D. A. Etnier, R. L. Hensen, W. C. Starnes, B. A. Thompson. Allotype female, TU 90859, 54.6 mm SL, same data as holotype. Paratypes taken with the holotype are TU 83994 (2) and USNM 214697 (2). Additional paratypes taken at the type-locality are CU 64754 (5), FSM 20852 (5), INHS 75000 (5), NLU 32057 (5), UAIC 5020.01 (5), and UMMZ 197413 (5), all 16 Aug. 1973; USNM 214698 (5), 4 Oct. 1974; UT 91.803 (1), 12 Aug. 1973; UT 91.1074 (10), 23 April 1975. An additional paratype, OAM 9536 (1), is from River Mile 15, main channel side of Davis Island, Little Tennessee River, Loudon County, Tenn., 4 Oct. 1974.

TABLE 1. Measurements of *Percina tanasi* and *P. uranidea* expressed in thousandths of standard length. ($\bar{x}$ = mean, W = range, S_x = standard deviation, N = sample size, M = males, F = females, J = juveniles and subadults)

Characters		*P. tanasi*				*P. uranidea* (White R.)				*P. uranidea* (Saline R.)				*P. uranidea* (Wabash R.)			
		$\bar{x}$	W	S_x	N	$\bar{x}$	W	S_x	N	$\bar{x}$	W	S_x	N	$\bar{x}$	W	S_x	N
Minimum inter-orbital width	M	51.54	44–58	3.80	13	47.30	44–52	2.98	10	43.50	40–49	2.92	10	45.00	39–49	3.85	6
	F	51.18	46–61	4.38	11	45.70	41–50	3.06	10	44.11	40–49	3.18	9	41.50	40–43		2
	J	49.47	42–55	3.13	19	49.70	45–55	2.83	10	44.20	34–50	5.41	10				
Width below origin of soft dorsal fin	M	132.46	119–147	8.77	13	116.10	107–126	6.11	10	123.10	114–133	5.43	10	119.17	114–126	4.12	6
	F	135.91	127–149	7.24	11	124.20	108–137	8.98	10	121.10	113–129	6.26	10	117.50	112–123		2
	J	133.68	124–145	5.28	19	124.00	115–132	4.88	10	121.00	115–129	4.78	10				
Width below origin of saddle 3	M	95.69	76–109	8.40	13	80.70	74–88	5.06	10	90.30	84–96	4.52	10	82.57	75–88	5.09	7
	F	99.91	93–113	6.02	11	87.80	81–100	7.89	10	89.00	80–100	5.54	10	82.50	80–85		2
	J	101.37	93–109	4.30	19	95.50	90–102	4.81	10	95.10	89–102	3.84	10				
Pectoral fin length	M	242.69	215–276	16.95	13	285.46	252–326	18.21	28	287.50	264–304	11.04	18	269.33	257–279	9.40	6
	F	218.82	195–238	13.49	11	266.39	234–291	12.62	23	255.73	223–274	14.83	11	253.00	251–255		2
	J	207.79	192–224	8.85	19	248.75	223–274	10.65	24	240.90	230–253	6.12	10				
Pelvic fin length	M	200.00	165–223	15.68	13	228.89	218–244	7.62	19	231.12	211–248	11.26	17	221.60	206–232	8.60	7
	F	184.27	158–199	12.75	11	219.89	207–242	9.38	18	223.18	208–234	9.38	11	216.00	215–217		2
	J	180.42	160–194	7.90	19	210.58	187–226	10.46	24	225.80	217–232	5.88	10				
Width of first saddle	M	64.20	52–84	9.24	10	45.40	34–57	8.02	10	57.00	42–71	9.58	10	46.67	38–58	6.47	6
	F	63.00	41–82	11.85	10	48.89	31–61	10.42	9	56.10	46–65	7.08	10	31.00			1
	J	59.21	41–76	9.46	19	55.10	45–58	4.23	10	61.70	51–82	8.88	10				
Width of second saddle	M	55.69	40–79	12.00	13	36.70	22–51	7.60	10	53.80	36–71	11.68	10	48.86	39–58	6.41	7
	F	61.91	47–75	9.33	11	42.20	34–50	4.13	10	53.00	45–63	6.56	10	47.00	43–55		2
	J	56.84	40–64	6.61	19	51.10	42–60	6.45	10	61.90	56–78	6.85	10				
Width of third saddle	M	62.15	46–81	10.42	13	30.50	19–41	6.70	10	49.70	33–67	13.69	10	49.14	37–63	8.63	7
	F	64.45	50–80	9.68	11	29.40	18–38	6.67	10	49.10	36–67	10.16	10	43.00	38–48		2
	J	63.74	42–79	8.12	19	47.10	40–55	5.57	10	54.40	29–79	12.48	10				
Width of fourth saddle	M	42.00	30–60	8.60	13	25.40	13–33	6.02	10	37.10	28–54	8.89	10	33.14	24–43	7.29	7
	F	44.36	33–60	8.37	11	28.10	21–43	7.36	10	41.80	34–51	6.39	10	35.00	26–44		2
	J	46.21	24–59	8.14	19	36.20	30–45	5.29	10	48.30	41–60	5.85	10				

TABLE 2. Frequency of lateral-line scales in *Percina tanasi* and *P. uranidea*.

	Number of lateral-line scales																
	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	N	x̄
Percina tanasi			2	8	5	10	5	6	7	4	6	1			1	55	52.3
P. uranidea																	
White River system	1	4	2	7	18	15	16	13	8	4						88	51.3
Saline River system		1	2	4	10	9	18	19	11	9	4	5	1		1	94	52.7
Wabash River system		1	2		1	1	1	2	1							9	50.7

TABLE 3. Lateral-line scale beneath tip of left pectoral fin in *Percina tanasi* and *P. uranidea*

	13	14	15	16	17	18	19	20	21	22	23	24	25	N	x̄
Percina tanasi, males				1	2	8	6	2						19	18.3
P. uranidea, males															
White River system						1	1	3	5	4				14	20.7
Saline River system						1	3	9	8	5	3	2		31	20.7
Wabash River system							3	3						6	19.5
Percina tanasi, females and juveniles	2		9	9	11	5								36	16.2
P. uranidea, females and juveniles															
White River system				1	2	16	11	10	9	6	3	1	1	60	19.8
Saline River system					4	7	9	12	5	3				40	19.4
Wabash River system					1			1						2	18.5

TABLE 4. Frequency of transverse scale rows (counted from first anal spine obliquely forward to dorsal fin) and minimum scale rows around caudal peduncle for *Percina tanasi* and *P. uranidea.*

	Transverse Scale Rows								Scales Around Caudal Peduncle						
	14	15	16	17	18	19	N	x̄	18	19	20	21	22	N	x̄
Percina tanasi		6	22	18	8	1	55	16.6		12	32	9	2	55	20.0
P. uranidea															
White River system		21	23	13	1		58	16.2	6	18	32	4	2	58	20.2
Saline River system	1	6	18	13	6	1	45	16.4	1	9	23	12		45	20.0
Wabash River system	1	5	2	1			9	15.3	1	4	4			9	19.3

TABLE 5. Frequency of spines and soft rays in dorsal fins of *Percina tanasi* and *P. uranidea.*

	Dorsal spines						Dorsal Soft Rays							
	IX	X	XI	XII	N	x̄	13	14	15	16	17	18	N	x̄
Percina tanasi	1	27	22	4	54	10.5	1	10	22	17	2		52	15.2
P. uranidea														
White River system	3	25	37	2	67	10.4		12	43	6			61	14.9
Saline River system		21	21	2	44	10.6		10	26	8		1	45	15.0
Wabash River system	1	2	6		9	10.6	1	2	6				9	14.6

Table 6. Frequency of soft anal rays and principal caudal rays in *Percina tanasi* and *P. uranidea*.

	Anal Soft Rays						Caudal Rays				
	10	11	12	13	N	$\bar{x}$	15	16	17	N	$\bar{x}$
Percina tanasi	2	15	36	1	54	11.7	6	42	3	51	15.9
P. uranidea											
White River system	5	32	15		52	11.2	6	27	14	47	16.2
Saline River system	3	40	9	1	53	11.2	2	21	22	45	16.5
Wabash River system	3	5	1		9	10.8					

Table 7. Frequency of pectoral fin rays in *Percina tanasi and P. uranidea*

	Left Pectoral Rays					Right Pectoral Rays					
	13	14	15	N	$\bar{x}$	13	14	15	16	N	$\bar{x}$
Percina tanasi	10	37	4	51	13.9	10	38	2		50	13.8
P. uranidea											
White River system	9	43	2	54	13.9	12	36	6	1	55	13.9
Saline River system	5	34	6	45	14.0	5	35	5		45	14.0
Wabash River system	4	4		8	13.5	1	5			6	13.8

TABLE 8. Measurements of *Percina tanasi* expressed in thousandths of standard length. ($\bar{x}$ = mean, W = range, S_x = standard deviation, N = sample size, M = males, F = females, J = juveniles and subadults)

Characters		$\bar{x}$	W	S_x	N
Head length	M	288.00	272–304	9.40	13
	F	286.91	282–293	4.23	11
	J	289.89	278–307	7.18	19
Orbit diameter	M	71.92	66–80	3.62	13
	F	72.91	68–76	2.21	11
	J	74.32	69–78	2.52	19
Maximum body width	M	166.46	142–195	13.73	13
	F	170.73	153–200	12.27	11
	J	155.84	141–172	8.66	19
Caudal peduncle depth	M	80.76	74–86	3.30	13
	F	82.70	73–88	4.27	10
	J	83.32	78–86	2.79	19
Caudal fin length	M	200.23	177–224	12.38	13
	F	193.09	185–199	4.69	11
	J	196.74	175–206	7.71	19
Longest dorsal spine	M	119.46	100–146	15.08	13
	F	117.10	82–147	22.56	10
	J	124.72	99–154	18.25	18
Longest dorsal soft ray	M	152.08	135–173	11.02	12
	F	139.80	132–151	6.97	10
	J	138.56	127–154	7.23	18
Length of anal spine	M	72.85	61–83	6.39	13
	F	65.80	53–71	5.47	10
	J	71.29	61–78	4.12	17
Occiput to dorsal fin origin	M	131.38	117–147	9.09	13
	F	138.82	113–140	10.30	10
	J	128.70	115–138	7.53	19
Snout length	M	90.77	80–98	5.10	13
	F	86.36	80–91	3.88	11
	J	82.26	72–93	5.99	19
Trans pelvic width	M	87.31	77–104	7.67	13
	F	84.82	80–93	4.77	11
	J	82.63	74–91	4.56	19

TABLE 8. (Continued)

Characters		$\bar{x}$	W	S_x	N
Maximum body depth	M	209.17	183–240	14.67	12
	F	208.00	186–233	14.95	11
	J	186.47	167–204	9.42	19
Caudal peduncle length	M	156.30	144–171	8.18	13
	F	162.18	140–174	11.19	11
	J	169.16	154–186	11.19	19
Spinous dorsal fin length	M	269.31	236–291	15.17	13
	F	257.00	224–277	15.51	11
	J	254.53	232–275	12.01	19
Soft dorsal fin length	M	295.93	254–349	28.93	13
	F	279.91	252–326	20.63	11
	J	287.32	246–306	12.94	19
Anal fin length	M	343.23	282–414	37.32	13
	F	248.09	228–264	10.89	11
	J	266.11	238–244	18.08	19
Longest anal ray	M	179.92	134–244	35.09	13
	F	134.80	116–151	11.75	10
	J	128.21	113–140	7.93	19
Occiput to soft dorsal fin origin	M	412.69	366–443	20.98	13
	F	418.00	398–442	16.16	11
	J	406.53	391–423	7.08	19
Occiput to first saddle	M	124.20	108–137	10.34	10
	F	127.50	113–147	9.58	10
	J	122.37	99–140	11.24	19
Occiput to second saddle	M	369.92	346–386	12.80	13
	F	365.72	339–389	13.50	11
	J	360.32	333–379	11.59	19
Occiput to third saddle	M	557.38	523–574	17.60	13
	F	558.91	532–585	14.05	11
	J	543.16	513–564	12.94	19
Occiput to fourth saddle	M	702.77	650–721	21.13	13
	F	704.45	665–726	16.42	11
	J	690.84	662–710	12.56	19
Standard length	M	57.3	49.7–65.3	4.38	13
	F	54.8	50.2–63.8	4.25	11
	J	44.0	38.2–49.3	2.31	19

Additional specimens examined but not designated as types: Two specimens collected at the type-locality, 23 April 1975, have been given to the Tennessee Wildlife Resources Agency, Nashville, Tenn. Two additional specimens, currently in the possession of the Tennessee Valley Authority, Norris, Tenn., were briefly examined and included in the counts in Tables 2–7, as follows: Type-locality, 1 specimen, 10 Nov. 1974; and Little Tennessee River at River Mile 4, Greene Farm, Loudon County, Tenn., 6 Jan. 1975.

Comparative material of other species: *Percina uranidea* (Jordan and Gilbert): Arkansas: Saline River system: NLU 16831 (49 of 205, less 1 specimen reidentified as *P. ouachitae* (Jordan and Gilbert), Saline River approximately 10 km south of Johnsville, Bradley-Ashley County line, 30 July 1970; NLU 14582 (60), Saline River at end of Ark. Highway 172, Drew Co., 6 Nov. 1969; NLU 14624 (16), Saline River at Vince Bluff, west of Herbine, Cleveland Co., 18 Nov. 1969; HWR 72-23 (1), Saline River 5 km east of Poyen at U.S. Highway 270 bridge, Grant Co., 10 June 1972; HWR 71-19 (2), Saline River 12 km north of Johnsville, Bradley Co., 12 Oct. 1971; HWR 74-108 (2), Saline River southeast of Johnsville, R. 8 W., T. 15 S., S. 31, Ashley Co., 26 Oct. 1974. Arkansas: White River system: TU 66011 (10 of 46), Current River 7 km northwest of Success along Ark. Highway 211, Randolph and Clay counties, 9 Oct. 1970; TU 66806 (30), same locality as TU 66011, 21 Nov. 1970; TU 92950 (25), Strawberry River at Ark. Highway 115 bridge, 1.6 km northeast of Jessup, Lawrence Co., 28 Sept. 1974; NLU 13874 (37), White River below Lock and Dam No. 1, Batesville, Independence Co., 14 July 1969. Indiana: Wabash River system: USNM 40922 (4), Wabash River at Vincennes, Knox Co., 1888; USNM 66971 (3), same locality, 15 Sept. 1888; USNM 125337 (1), same locality, 1888; USNM 40942 (1), Wabash River at New Harmony, Posey Co., 1888.

Diagnosis: The affinities of this species are within *Imostoma* and with the saddle-backed members of the subgenus. Differing from *P. ouachitae* in having the posterior margin of the fourth saddle positioned on the anterior dorsal insertion of the caudal fin (this saddle completely anterior to the anterior dorsal insertion of the caudal fin in *P. ouachitae*). Differing from the Conasauga River form in having the anteriormost dorsal saddle positioned under the anterior three to five dorsal spines (this saddle entirely anterior to the dorsal fin in the Conasauga River form). Most closely related to *P. uranidea*, but differing from that species in having shorter paired fins (Tables 1 and 3); a more robust body (see Table 1: interorbital width, width below origin of soft dorsal fin, and width below origin of third saddle). Dorsal saddles of *P. tanasi* are wider than those of *P. uranidea* from the Saline and Wabash river systems, and much wider than those of *P. uranidea* from the White River system (Table 1.). *P. tanasi* has a modal value of 12 soft anal fin rays (11 for *P. uranidea*) and 16 caudal rays (16 or 17 for *P. uranidea*) (Table 6). Background coloration of dorsum in live speci-

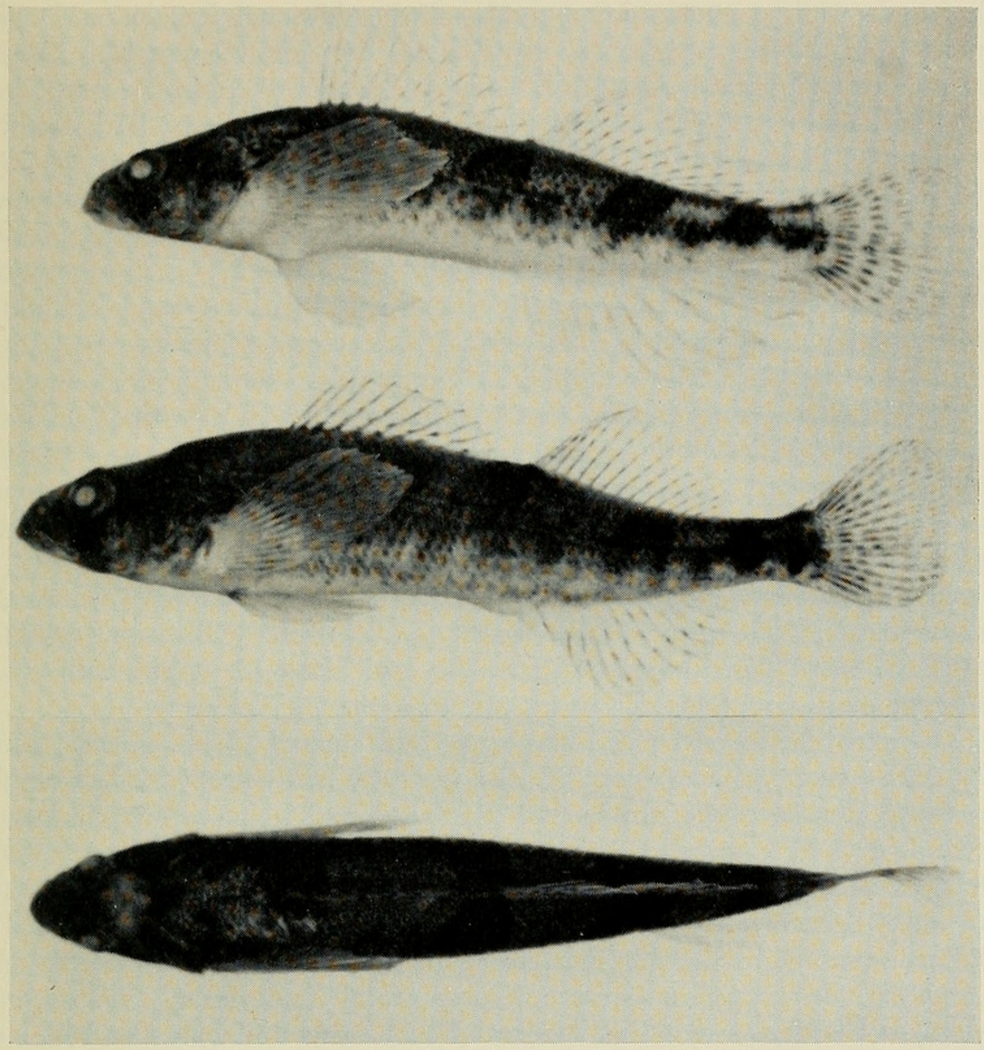

FIG. 1. *Percina tanasi*, UT 91.1074 (paratypes), Little Tennessee River at Coytee Spring, River Mile 7, Loudon County, Tennessee, 23 April 1975. Top, male, 61 mm SL; middle, female, 66 mm SL; bottom, dorsal view of male, 58 mm SL.

mens brownish gray with traces of green (russet brown in *P. uranidea*, Thompson, in lit.). Nuptial males with cheek entirely black to mostly black, the posterior one-third brown with occasional gold flecks (bright metallic gold in *P. uranidea*, Thompson, in lit.). Exposed ctenoid scales entirely absent from lateral areas of breast, or rarely with one or two ctenoid scales in these areas (nuptial males in *P. uranidea* with exposed ctenoid scales usually present on lateral areas of breast, these often forming a transverse band across the middle of the breast). Nuptial males with pelvic fin tubercles confined to the median four rays (pelvic fin tubercles on pelvic spine and adjacent four rays in *P. uranidea*).

Description: *Percina tanasi* (Fig. 1) is the most robust of the saddle-backed members of the subgenus *Imostoma*. The largest specimen is a female, UT 91.1074, 66.5 mm SL. Two additional females and one male from this series, taken 23 April 1975, are over 60 mm SL. Minimum fleshy interorbital width (Table 1) greater than in *P. uranidea*, and much greater than for *P. ouachitae* or *P.* (*Imostoma*) sp. Body width (nearly 170 thousandths of SL) much greater than that of *P. ouachitae* or *P.* (*Imostoma*) sp.—both about 140 or less; the caudal peduncle tapers less rapidly than in *P. uranidea* (see width below origin of soft dorsal fin and width below origin of saddle 3, Table 1). It is so robust that the first specimen, seen underwater, was mistaken for a sculpin. Measurements of these and additional characters, expressed as thousandths of standard length, appear in Tables 1 and 8.

Lateral-line scales usually 49–56 (extremes 48–57), with 1 (0–2) pored scales posterior to hypural plate. Transverse scale rows, counted obliquely forward from first anal spine, 16–17 (15–19). Minimum caudal peduncle scale rows 20 (19–22). Frequency distributions for scale counts appear in Tables 2 and 4.

Dorsal spines X–XI (IX–XII); dorsal soft rays 14–16 (13–17). Anal spines 2; anal soft rays modally 12, often 11 (10–13). Principal caudal rays 16 (15–17). Pectoral rays modally 14, often 13, occasionally 15. Frequency distributions of fin ray counts appear in Tables 5–7.

Opercles and nape covered with exposed ctenoid scales. Cheek and breast squamation variable. Cheeks typically with embedded cycloid scales posterior to eye. In juveniles and subadults cheeks often appear naked. In adults embedded cycloid scales often more extensive on lower half of cheek; the entire cheek occasionally scaled. One adult male (USNM 214697) has about five exposed ctenoid scales on each cheek. Breast squamation variable dependent on age and apparently on sexual condition. In juveniles breast and prepectoral areas usually naked, or nearly so, with a few embedded scales in prepectoral region and/or on breast proper medial to pectoral fin base. Adults typically with embedded scales in these areas, and rarely with a transverse band of scales extending across breast between pectoral bases, as typical of *P. uranidea*. These scales occasionally ctenoid, often bearing low, rounded tubercles in nuptial males. Belly naked lateral to midventral row of modified scales.

Gill membranes weakly connected, occasionally separate. Branchiostegal rays 6-6, an occasional specimen with 7 rays on either side. Frenum varying from moderately developed to absent. Infraorbital canal complete, typically 8 pores per side. Preoperculomandibular canal with 10 pores per side. Supratemporal canal complete; supraorbital canal complete with 3 pores per side; coronal pore single.

Vertebral counts, 9 specimens, 39 (3), 40 (5), 41 (1), suggesting modal value of 40. Modal value for other saddle-backed *Imostoma* 39 (Thompson, in lit.).

Dorsum background color in life brown to brownish gray with traces of green, this pigmentation continuing ventrally to or nearly to lateral line. Dorsum crossed by four conspicuous chocolate-brown saddles. Anterior margin of saddle one at, or slightly anterior or posterior to base of first dorsal spine. Posterior margin of this saddle between bases of third to fifth dorsal spines. Saddle two under posterior end of spinous dorsal fin, extending from base of last dorsal spine to or slightly behind base of first dorsal soft ray. Anterior margin of saddle three between bases of ninth to eleventh dorsal soft rays; it extends posteriad to base of thirteenth to fourteenth soft ray. Saddle four on caudal peduncle, with its posterior margin in contact with the unpigmented middorsal line extending forward from caudal fin. This unpigmented line represents the dorsal connective tissue insertion of caudal fin. Distances of saddles from occiput appear in Table 8. All saddles narrowest on midline, extending down and forward to lateral line. Saddle one occasionally inconspicuous in both living and preserved specimens. Ventral extensions of dorsal saddles interrupted at lateral line, but otherwise continuous with series of similarly colored lateral blotches extending about one-half scale row above, and three to four scale rows below lateral line. Paler areas below lateral line, alternating with dark lateral blotches, mottled pale green to greenish yellow in life, mottled in preservative. Belly typically immaculate, or with cluster of dark chromatophores in vicinity of anus. Lower sides adjacent to anal fin and ventral portion of caudal peduncle vary from virtually immaculate to darkly mottled with continuation of midlateral pigmentation. Breast pigmentation in juveniles and subadults varies from immaculate to sparsely freckled with dark chromatophores, especially at base of pelvic spine, in prepectoral area, and near depression in middle of breast. In adults dark chromatophores typically abundant at bases of pelvic spines and often between pelvic bases; an immaculate to weakly pigmented area immediately anterior to pelvic bases; anterior portion of breast moderately to completely freckled with dark chromatophores.

Head dark olive brown dorsally. Opercles and cheeks mottled brown and yellow. In life, iris orange-yellow adjacent to pupil, becoming brownish toward periphery. A black suborbital bar, wider than pupil, extends down and slightly posteriad from eye, terminating over interoperculum. In nuptial specimens, suborbital bar expands posteriad and occupies virtually entire cheek. Anterior portion of interoperculum and rami of lower jaw irridescent pale blue in life. Ventral surface of head with scattered groups of dark chromatophores in juveniles, and liberally freckled with dark chromatophores in adults.

Dorsal fin membranes lack bright colors. In spinous dorsal fin, dark chromatophores concentrated on margin of membrane posterior to tip of each spine, forming obscure marginal dark band. Additional dark chromatophore concentrations at or near base of each membrane, more concentrated on posterior half of each membrane, and restricted to basal one-third of membrane. Membrane of spinous dorsal fin clear elsewhere. Dorsal spines pale yellow with dark chromatophores concentrated near tip and middle of each spine. Dorsal soft rays pale yellow with four to five dark marks alternating with somewhat longer clear portions of each ray. Caudal fin pigmentation similar to that of soft dorsal fin. Anal and pelvic fin pigmentation similar to that of soft dorsal fin, but dark chromatophores and pale yellow pigment on spines and rays less evident in adult males. In nuptial males these fins may be virtually immaculate. In nuptial females both anal and pelvic rays bright yellow-orange. Pectoral fins of both sexes have a yellow orange base, clear membranes, and pale yellow to orange-yellow rays, each of which marked with about five dark chromatophore concentrations. Concentrations of dark chromatophores on spines and rays of all fins neither sufficiently discrete nor aligned to form distinct bands.

Sexual dimorphism: As is typical of the subgenus *Imostoma*, the anal fin is much longer in adult males than in adult females. This character permits easy sex recognition. Anal fin length in specimens larger than 50 mm SL readily separates sexes in *P. tanasi*. Sex of *P. uranidea* specimens was easily determined in specimens of about 40 mm SL. Two male *P. uranidea* from the Saline River, HWR 74-108, collected 26 Oct. 1974, were tuberculate at 35.3 and 37.3 mm SL. Examination of the data in Tables 1 and 8 indicates that males differ from females in the following additional characters: longer snout, more slender body (probably attributable to gonad size), shorter caudal peduncle, greater length of all fins (see also Table 3), longer first anal spine, dorsal fins positioned closer to occiput, and possibly a narrower fourth saddle. *P. uranidea* exhibits similar dimorphism in these characters. *P. ouachitae* and *P.* (*Imostoma*) sp. are not measurably dimorphic in snout length, caudal peduncle length, caudal fin length, paired fin length (possibly slightly longer in male *P.* (*Imostoma*) sp.), spinous dorsal fin length, anal spine length, position of dorsal fin relative to occiput, or width of the fourth saddle.

Tubercles are conspicuous on males from early November through late April. In males with maximum development, uniserial tubercles are present on anal rays, on lower surface of the medial four pelvic rays, and on the principal caudal rays (plus two adjacent procurrent rays) on the lower half of the caudal fin. Tubercles are not present on either the pelvic or anal spines, but are present on one or both of these areas in other *Imostoma*. Although it is possible that examination of additional tuberculate specimens of *P. tanasi* might reveal the presence of tubercles on these spines, it seems rather unlikely, since the six nuptial males from UT 91.1074, collected 23 April 1975, are as tuberculate as any *Imostoma* I have examined. In several of these specimens the pelvic spines are very fleshy, but neither tubercles nor tubercle scars are present on the pelvic spine or on the adjacent pelvic ray. Tubercles are well developed on the remaining four pelvic rays. The tubercles on the anal fin had begun to slough off on these specimens, and might have already been lost from the anal spines. Branchiostegal rays have small, pointed tubercles. Single, low, rounded tubercles are present on scales on the cheek and breast, on three to four scale rows adjacent to the naked midventral area, on the modified midventral scales, on scales adjacent to the base of the anal fin, and on scales on the lower

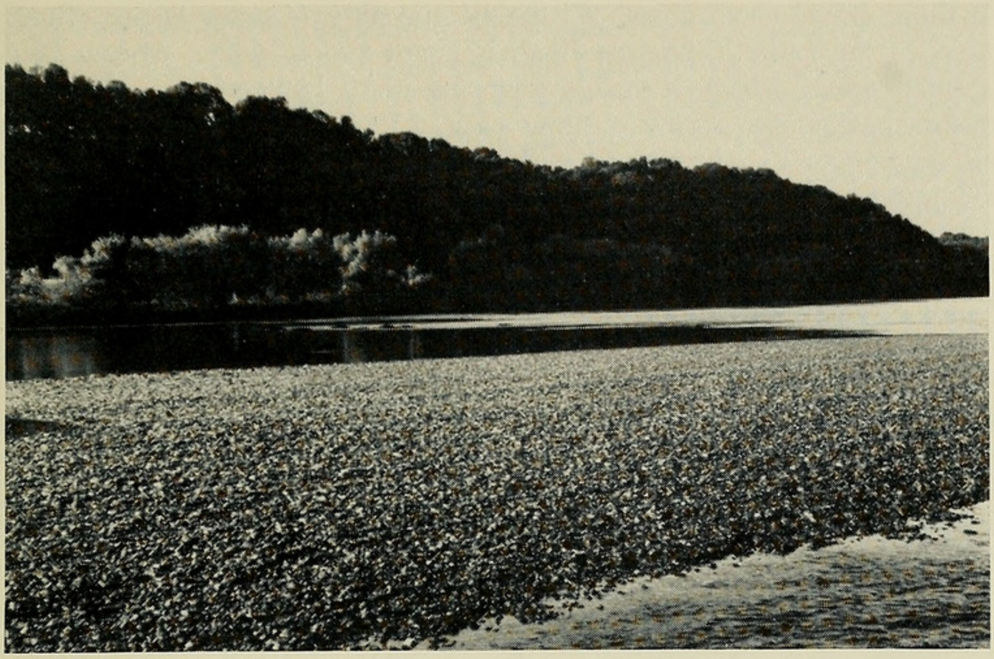

Fig. 2. Photograph of the type-locality, Little Tennessee River at Coytee Spring, River Mile 7, Loudon County, Tennessee, as seen during minimum flow looking downstream from the gravel island which is slightly upstream from the spring outflow.

caudal peduncle and lower caudal fin base. Similar tubercles that are not borne by scales occur on the cheeks and breast, and over the interoperculum, rami of the lower jaw, and lachrymal (anterior infraorbital). Cteni on scales along the anal fin base are elongate in tuberculate males.

The female urogenital papilla is nearly cylindrical, about twice the diameter of the base of the first anal spine. Its anterior and lateral surfaces have about six deep longitudinal creases, and its posterior surface is in contact with the first anal spine. In males the urogenital papilla is a small, laterally expanded flap, also in contact with the base of the first anal spine and bearing longitudinal creases. Urogenital papillae are similar in other species in the subgenus.

Etymology: Tanasi (tan-ah'-see) was the Cherokee name for a village at River Mile 26 on the south bank of the Little Tennessee River, Monroe County, Tennessee. According to Duane King, Assistant Professor, Department of Sociology and Anthropology, University of Tennessee at Chattanooga, Tanasi served as the capital for the Cherokee Nation until 1725. The altered spelling (Tennessee) was first used by Lt. Henry Timberlake in 1762 (Williams, 1927).

Biology: *Percina tanasi* is restricted to gravel shoal areas in approximately the lower 32 km of the Little Tennessee River. Seining and underwater observation in this area indicate that fishes are not abundant. A crew of five persons, utilizing a small mesh 12-ft-long by 6-ft-deep seine, would be fortunate to collect as many as 50 fish per hour in these gravel shoal areas. At the type-locality (Coytee Spring, River Mile 7) the Little Tennessee River is about 200 m wide. At low flow a small gravel island is visible near the north bank of the river, just upstream from the spring outflow (Fig. 2). The substrate is virtually all coarse gravel interspersed with sand, with areas of silt deposition along the banks, a few bedrock outcrops, and concentrations of boulders. Even during periods of minimum flow, current is swift over the gravel areas, and depths are uniformly about 1 m. *P. tanasi* is most often found in the swiftest current, but we have encountered specimens in moderate current. According to W. C. Starnes, who continues the life history study of the species, it typically avoids areas with abundant vegetation attached to the rocks and areas where manganese deposits have blackened the rocks. Our samples indicate that *P. tanasi* is the most abundant of the gravel shoal species at the type-locality. Species collected with *P. tanasi*: *Hybopsis aestivalis* (Girard), *Nocomis micropogon* (Cope), *Phenacobius uranops* Cope, *Hypentelium nigricans* (Lesueur), *Etheostoma blennioides* Rafinesque, *Etheostoma rufilineatum* (Cope), *Percina caprodes* (Rafinesque), *Percina evides* (Jordan and Brayton), *Cottus bairdi* Girard, and *Cottus carolinae* (Gill). *Etheostoma simoterum* (Cope), *Percina shumardi* (Girard), and species of *Notropis* and *Moxostoma* inhabit the more sluggish areas near the bank.

In spite of the abundance of aquatic insects, the major dietary component of *P. tanasi* appears to be small gastropods. *Anculosa, Ferrisia, Physa, Pleurocera,* and *Viviparous* are genera tentatively identified from stomach contents. Trichoptera (mostly *Brachycentrus etowahensis* Wallace) and occasional *Ephemeroptera* are found in stomachs of specimens taken in the spring; simuliid dipteran larvae are abundant in stomachs of specimens taken in mid-summer.

Specimens taken in early November included tuberculate males. Specimens from 23 April 1975 were apparently still involved in spawning activity (sexes were segregated, one female released several mature eggs when handled, males were still tuberculate), but most specimens were spent. Water temperature on this date was 14 C (57 F). Preliminary data indicates that sexual maturity is often reached between the second and third year, and that the life span is about four years.

Phylogeny: Because of their similarity in pigmentation, meristics, morphometry, and sexual dimorphism, *P. tanasi* and *P. uranidea* are considered to be closely related species, almost certainly derived from a common ancestor. This ancestral species was presumably widespread in swift streams and rivers with clear water and firm substrates in what is now the central and lower Mississippi River drainage. These populations have disappeared (as apparently has the Wabash River population of *P. uranidea*), presumably in response to silt and loess accumulation and lowered stream gradients. The present relict distribution, higher fin ray counts, and large maximum size of *P. tanasi* and *P. uranidea* suggest that these species are modified representatives of this ancestral species. I interpret *P. ouachitae* as a more recently evolved, generalized form that has invaded areas formerly occupied by the common ancestor of *P. uranidea* and *P. tanasi*, perhaps from a population originally evolved in response to conditions in the Gulf Coastal or extreme lower Mississippi River drainages. Since *P. ouachitae* continues to occur in the main channel of the Mississippi River in west Tennessee, dispersal through the lowlands of the central portion of the Mississippi River drainage would have been easy once suitable habitats were available. Alternate interpretations, considering *P. ouachitae* as the ancestral form that has given rise to other saddle-backed *Imostoma*, appear less likely. I interpret *P.* (*Imostoma*) sp. as an early isolate in the upper Coosa River system, probably derived from the hypothetical ancestor of *P. tanasi* and *P. uranidea*, but not closely related to any existing *Imostoma*.

Taxonomic status: The population of saddle-backed *Imostoma* in the Little Tennessee River differs from known populations of *P. uranidea* in body width, paired fin length, saddle width, nuptial tubercle pattern, several aspects of pigmentation, number of anal and caudal fin rays, and probably vertebral number. I assume that genetic differences are responsible for most, if not all of this divergence. That this divergence is sufficiently large to justify recognition of the Little Tennessee River population as a distinct species is suggested by several sources of information besides the characters listed above. A useful clue to the probable taxonomic status of allopatric populations involves comparing the amount of divergence between such isolates with that between similar sympatric species in the same group. *P. uranidea* and *P. ouachitae* are sympatric in both the White and Saline river systems. The observable differences between these sympatric species (not recognized by modern ichthyologists as being distinct until 1970) are similar in magnitude to those between *P. uranidea* and *P. tanasi*. This indicates that striking differences are not prerequisite to maintenance of genetic isolation between sympatric *Imostoma*. Since the Wabash River population of *P. uranidea* does not display character states intermediate between those of Ozarkian populations and *P. tanasi* (Tables 1, 3, and 6), clinal differences are not involved.

Conservation: The entire range of *P. tanasi* would be innundated by impoundment of Tellico Reservoir, now under construction by the Tennessee Valley Authority. Although adults might persist in this reservoir for a year or two, reproduction following impoundment would no longer be possible and the species would become extinct within a few years. The possibility of finding additional populations of *P. tanasi* outside the area to be impounded appear to be extremely remote, since the remaining river and large stream habitat in this region has been well collected. *P. tanasi* is not a difficult species of darter to collect using standard seining techniques. We have not failed to collect specimens at the type-locality during periods of low flow.

Percina tanasi, the snail darter, is an endangered species in the strictest sense. It was proposed for "endangered species status" in the U.S. Federal Register, Vol. 40, No. 117, p. 25597–98, 17 June 1975, and finally listed as such in the same volume, No. 197, p. 17505–06, 9 Oct. 1975.

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