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**SYSTEMATIC STUDIES OF DARTERS OF THE
SUBGENUS *CATONOTUS* (PERCIDAE), WITH
THE DESCRIPTION OF A NEW SPECIES
FROM CANEY FORK, TENNESSEE**

By

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In the middle 1960's Warren U. Brigham, then at Tennessee Technological University, collected a previously unknown darter while conducting a census of the fishes of Putnam County, Tennessee. This darter, an endemic of Caney Fork and nearby tributaries of the Cumberland River, is herein described and compared with its closest relative, *Etheostoma squamiceps* Jordan. *Etheostoma squamiceps* is a polytypic form under examination by several investigators. Discussion of *E. squamiceps* herein is limited to a comparison with the new species.

METHODS

Characters.—Characters examined were numbers of lateral scales, pored lateral line scales, unpored lateral scales, transverse scales above and below the lateral line, infraorbital canal pores, supraorbital canal pores, supratemporal canal pores, preoperculo-mandibular canal pores, lateral canal pores, coronal pores, dorsal fin spines and rays, branched caudal fin rays, anal fin spines and rays, pelvic fin spines and rays, and pectoral fin rays; pigmentation patterns; squamation of head, nape and breast; head length/standard length (HL/SL), body depth/SL (BD/SL), caudal peduncle depth/SL (CPD/SL), pectoral fin length/SL (P1L/SL), pelvic fin length/SL (P2L/SL), preorbital length/HL (PreOL/HL), eye

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diameter/HL (ED/HL), first dorsal fin height/first dorsal fin base length (DH/D1L).

Counts and measurements were made as described by Hubbs and Lagler (1964) and Page and Braasch (1976) with the following exceptions. The number of transverse scales was counted from the anal fin insertion anteriop dorsally to the base of the first dorsal fin and expressed as two variables—scales above lateral line and scales below lateral line. The lateral line row was arbitrarily included in the ventral count and all scales no matter how small were counted. First dorsal fin height was the length of the first dorsal spine.

Cheeks, opercles, nape and breast were classified as scaled if scales were exposed with free margins, embedded if scales were covered with skin (no exposed margins), and unscaled if no scales were present.

Analysis.—Counts and measurements were compared among samples determined by sex (dimorphic), by age (ontogenetic), and by stream system (geographic). A multivariate test (Stepwise Discriminant Analysis BMD07M, KU Comp. Center) and one-way analysis of variance were used to determine significances of differences in means of samples.

Etheostoma olivaceum, new species

Dirty Darter

Holotype.—Illinois Natural History Survey 75734, an adult male 50.5 mm SL (Fig. 1), collected in Rock Springs Branch at Rock Springs Church, 2 km N Buffalo Valley (36° 10' N, 85° 47' W), Putnam County, Tennessee, on 14 June 1975 by B. M. Burr and L. M. Page.



FIG. 1.—*Etheostoma olivaceum* holotype (INHS 75734), male, 50.5 mm SL, Rock Springs Branch, Putnam Co., Tennessee, 14 June 1975.

Paratypes.—A total of 87 specimens deposited as follows: 18—Illinois Natural History Survey (INHS 75735, 10 specimens, 36-58 mm SL, same collection data as holotype; INHS 75576, 8 specimens, 35-64 mm SL, same locality as holotype, 11 Dec. 1976); 6—U. S. National Museum (USNM 216895, 34-46 mm SL, same collection data as holotype); 6—University of Michigan Museum of Zoology (UMMZ 200208, 35-48 mm SL, same collection data as holotype); 6—University of Tennessee (UT 91.1332, 37-45 mm SL, same collection data as holotype); 6—Tulane University (TU 101391, 37-50 mm SL, same collection data as INHS 75576); 6—University of Alabama (UAIC 5341.01, 39-48 mm SL, same collection data as INHS 75576); 6—Northeast Louisiana University (NLU 35160, 41-51 mm SL, same collection data as INHS 75576); 33—The University of Kansas (KU 11442, 34-59 mm SL, Dry Fork, 3 km W Gordonsville, Smith Co., TN, 7 April 1966).

Etymology.—The name *olivaceum* refers to the olive color of nonbreeding individuals. The common name, dirty darter, was suggested by Dr. David A. Etnier, University of Tennessee, and refers to the drab color and indistinct mottling on the sides.

Diagnosis.—The subgenus *Catonotus* of *Etheostoma* was diagnosed by Kuehne and Small (1971). The presence of an uninterrupted infraorbital canal in *E. olivaceum* and *E. neopteron* Howell and Dingerkus (1978) requires that the subgeneric description of the infraorbital canal be modified to "infraorbital canal interrupted or uninterrupted." In addition, the cheek, breast, nape and prepectoral area may be scaled or unsealed.

Etheostoma olivaceum is distinguished from all other members of the subgenus by the following combination of characteristics: an uninterrupted infraorbital canal with eight infraorbital pores, 10 preoperculomandibular pores, 13 or more pored lateral line scales, scales present on nape and prepectoral area, scales absent on cheek and opercle, distinct black vertical bands on caudal fin, branchiostegal membranes slightly connected, no bar pattern on cheek, no red or blue pigments, no dark suborbital bar, usually nine dorsal spines, 12-13 dorsal rays, and seven or eight anal rays.

Comparisons.—*Etheostoma olivaceum* is separated from all species of *Catonotus* except *E. neopteron* by the uninterrupted infraorbital canal and from *E. neopteron* by the absence of scales on the opercle. *E. olivaceum* is further separated from the barecheek species of *Catonotus* (*virgatum*, *obeyense*, *barbouri*, *smithi*, *striatulum*) by the lack of the bar pattern on the cheek, lack of red and blue pigments, and modally 7-8 anal rays; from *E. flabellare*, *E. kennicotti*, and the barecheeks by the presence of scales on the nape and prepectoral area; and from its closest relative, *E. squamiceps*, by the absence of scales on cheeks and opercles, absence of a dark suborbital bar, modally seven scales above the

lateral line (Table 1), modally 12 pectoral rays (Table 2), and modally 12 dorsal rays (Table 3).

Description.—*Etheostoma olivaceum* is a moderately large species of *Catonotus*, largest specimen 67 mm SL; infraorbital canal uninterrupted, normally with 8 pores (9 in 8%); preoperculo-mandibular canal with 10 pores (9 in 8%); supraorbital canal with 4 pores (5 in 24%); supratemporal canal interrupted medially, pores 2—2; premaxillary frenum moderate to broad; branchiostegal rays six; branchiostegal membranes with slight to moderate fusion; preopercle entire.

Head unscaled; body including nape scaled, breast unscaled or with embedded scales, prepectoral area scaled (often embedded); 44-58 lateral scales; 13-46 pored lateral line scales; 10-37 unpored lateral scales; 5-8 (usually 6-7) transverse scales above lateral line; 7-12 (usually 8-10) scales below lateral line.

First dorsal fin with 8-10 (usually 9) spines, with small terminal knobs in both sexes; second dorsal fin with 11-14 (usually 12-13) rays; 2 anal spines; 6-9 (usually 7-8) anal rays; 14-16 branched caudal rays; 11-13 (usually 12) pectoral rays; 1 pelvic spine; 5 pelvic rays.

Body proportions: HL/SL, \bar{X} =0.29; BD/SL, 0.21; CPD/SL, 0.13; P1L/SL, 0.23; P2L/SL, 0.19; PreOL/HL, 0.25; ED/HL, 0.27; DH/D1L, 0.26.

Color of freshly preserved specimens: Basic body color of females and nonbreeding males (Fig. 2) varies from yellowish tan to dark olive-brown. Pale individuals have dark markings on sides varying from an indistinct mottling to 8-10 fairly distinct vertical bars; bars do not connect dorsally or ventrally. Dark spots are sometimes present at base of caudal fin but are never darker than other markings. Dark individuals show no pattern and are uniformly olive-brown laterally.

Dorsum usually lighter than sides, with 0-10 dark blotches. Venter much lighter than sides, ranging from olive or gray to white. Large dark humeral spot present. Anterior lateral line pores unpigmented and conspicuous on darker individuals. Head with dark pre- and postorbital bars; no suborbital bar (teardrop); head above bars dark, checks and throat light.

First dorsal fin colorless except for a gold or brown subdistal band, and scattered melanophores concentrated on membranes along subdistal band and along basal part of fin; basal part of fin thickened; light colored knobs present on tips of spines. Second dorsal fin with four to seven dark bands; rays often produced beyond membranes making distal edge of fin appear ragged; basal part of fin thickened. Caudal fin with melanophores clustered along rays forming 6-9 dark bands; distal margin of fin clear. Anal and pelvic fins clear. Pectoral fins with 6-9 indistinct bands.

TABLE 1.—Counts of scales above and below lateral line in *Etheostoma squamiceps* and *E. olivaceum*.

Species & Drainage	No. Scales Above							No. Scales Below									
	N	5	6	7	8	\bar{X}	SD	CV	7	8	9	10	11	12	\bar{X}	SD	CV
<i>Etheostoma squamiceps</i> lower Cumberland middle Cumberland	66	4	58	4	4	6.0	0.35	5.9	2	21	41	8	8	8.9	0.61	6.8	
	59	6	41	12	12	6.1	0.55	9.0	—	34	2	2	2	8.6	0.62	7.2	
TOTALS:	10	99	16	0	0	—	—	—	2	38	75	10	—	—	—	—	
<i>Etheostoma olivaceum</i> Caney Fork	100	2	37	55	6	6.7	0.62	9.4	2	16	42	32	7	1	9.3	0.92	9.9

TABLE 2.—Counts of pectoral rays in *Etheostoma squamiceps* and *E. olivaceum*.

Species & Drainage	No. Rays						N	\bar{X}	SD	CV
	10	11	12	13	14	15				
<i>Etheostoma squamiceps</i> lower Cumberland middle Cumberland	2	50	14	—	—	—	66	11.2	0.46	4.1
	11	47	1	—	—	59	10.8	0.43	4.0	
TOTALS:	13	97	15	—	—	—	—	—	—	—
<i>Etheostoma olivaceum</i> Caney Fork	4	84	12	—	—	100	12.1	0.39	3.2	

TABLE 3.—Counts of dorsal rays in *Etheostoma squamiceps* and *E. olivaceum*.

Species & Drainage	No. Rays				N	\bar{X}	SD	CV
	11	12	13	14				
<i>Etheostoma squamiceps</i> lower Cumberland middle Cumberland	2	25	37	2	66	12.6	0.61	4.8
	2	32	24	1	59	12.4	0.59	4.8
TOTALS:	4	57	61	3	—	—	—	—
<i>Etheostoma olivaceum</i> Caney Fork	4	60	35	1	100	12.3	0.57	4.6

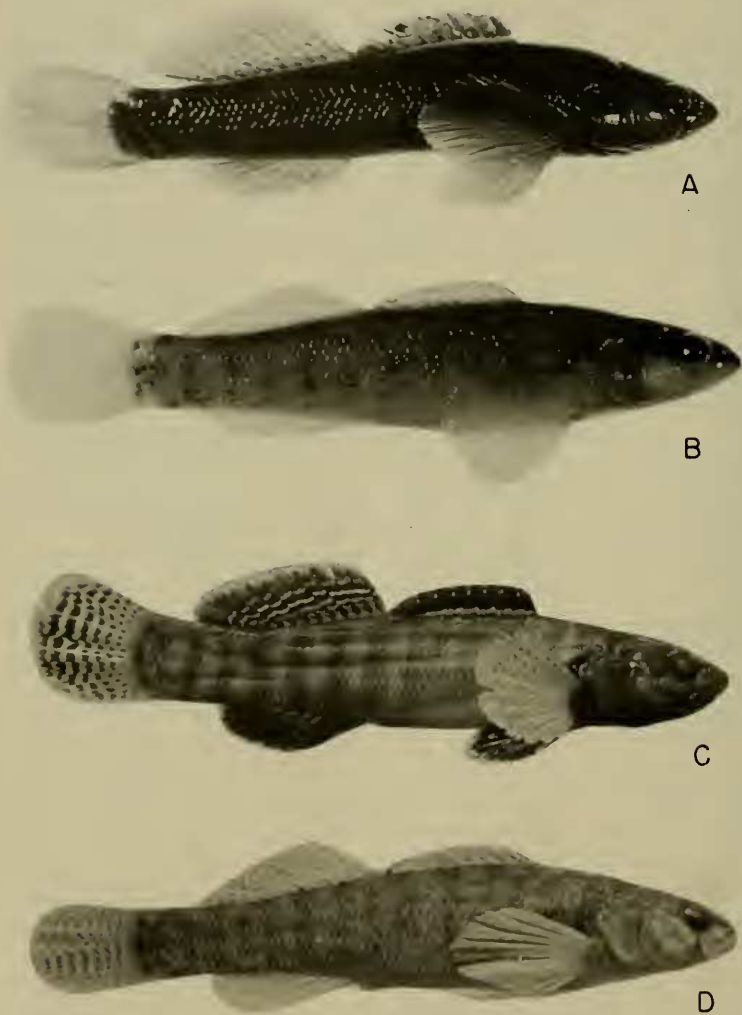


FIG. 2.—(A) *Etheostoma olivaceum* male, 54 mm SL; (B.) *E. olivaceum* female, 46 mm SL, both Rock Springs Branch, Putnam Co., TN., 14 June 1975; (C.) *E. squamiceps* male, 63 mm SL, 26 April 1975; (D.) *E. squamiceps* female, 58 mm SL, 18 Jan. 1972, both Ferguson Creek, Livingston Co., KY.

Breeding males very dark. Sides and head uniform brown to black; dorsum somewhat lighter; venter lighter but still heavily pigmented. No markings on head or sides. Flesh of head swollen. First dorsal fin black with white knobs on tips of spines and small light or unpigmented windows juxtaposed medially behind each spine; on large males a small black spot behind each spine distally; light area at base of fin extends up a short distance into

membranes; membranes swollen at base. Second dorsal fin dark with 3-5 narrow wavy gold bands, a broad distal light margin, and a narrow basal light area; rays produced beyond membranes. Caudal fin with a broad white margin and with 5-10 narrow gold bands alternating with an equal number of black bands. Anal fin dark with broad white margin; membrane around first spine greatly thickened; fin membrane swollen at base. Pectoral fin dark gray except for white margin and narrow light basal band. Pelvic fin dark with white knobs on spines and lighter area at base of fin. Breeding tubercles absent.

Variation.—*Etheostoma olivaceum* shows little variation except in color. Only one characteristic showed significant ($\alpha=.005$) sexual dimorphism. Males have deeper caudal peduncles in relation to standard length ($\bar{X}=0.131$) than do females ($\bar{X}=0.119$). To test for ontogenetic variation specimens were divided into two classes, those under 40 mm SL and those over 40 mm SL. Only one characteristic showed significant variation; small individuals have a larger eye diameter in relation to head length ($\bar{X}=0.28$) than do large individuals ($\bar{X}=0.26$). No geographic variation was found.

Distribution and Habitat.—*Etheostoma olivaceum* occurs sporadically in direct tributaries of the Cumberland River in Trousdale and Smith counties and more abundantly in small tributaries of the lower Caney Fork system in central Tennessee (Fig. 3). The closely related *E. squamiceps* is not sympatric but is found in tributaries of Collins River in the upper Caney Fork system and in other tributaries of Cumberland River only a few miles west of Caney Fork. *E. olivaceum* inhabits small streams with an abundance of large rocks or bedrock. In streams only 1-2 m wide it is sometimes the most abundant species of fish. Many individuals, particularly females and young are found in pools; larger males are often in riffles. Brigham (1966) found the species in Putnam Co. in streams having a mean width of 3.7m, depth of 0.2m, gradient of 7.6m/km, and water velocity of 0.2m/sec.

MATERIAL EXAMINED

Numbers in parentheses are numbers of specimens examined. Complete locality data are available from the authors.

Etheostoma olivaceum.—*Caney Fork*: Rock Springs Br., Putnam Co., Tn.: INHS 75734 (1), 75735 (10), 75576 (8), USNM 216895 (6), UMMZ 200208 (6), UT 91.1332 (6), TU 101391 (6), UAIC 5341.01 (6), NLU 35160 (6); Indian Cr., Putnam Co., Tn.: KU 13043 (31), MEB (M. E. Braasch) 73 (5), MEB 20 (14); Little Indian Cr., Putnam Co., Tn.: MEB 74 (8); Mine Lick Cr., Putnam Co., Tn.: INHS 75873 (13), TTU (Tennessee Technological University) (5), TTU (3); Dry Fork, Smith Co., Tn.: KU 11442 (33), MEB 51 (13), KU 16207 (6), UT 91.34 (9); Dry Cr., DeKalb Co., Tn.: KU 16214 (6), UT 91.57 (35), UT 91.281 (79); Saunders Fork, Wilson Co., Tn.: MEB 41 (1); Saunders Fork, Cannon Co., Tn.: INHS 75879 (20). *Cumberland*: trib., Dixon Cr., Trousdale Co., Tn.: INHS 80586 (1); trib., Dixon Cr., Trousdale Co., Tn.:

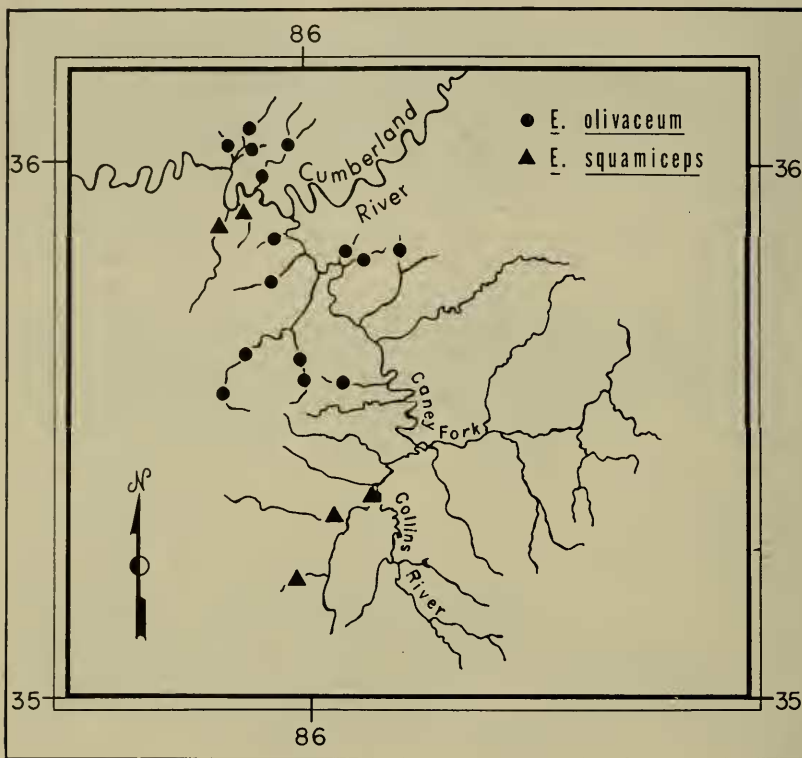


FIG. 3.—Caney Fork System and adjacent tributaries of Cumberland River with distribution of localities from which *Etheostoma olivaceum* has been collected and nearby localities for *E. squamiceps*. Localities include those in Brigham (1966).

INHS 80587 (7); Dixon Cr., Smith Co., Tn.: INHS 80588 (2); trib., Peyton Cr., Smith Co., Tn.: INHS 80589 (1); trib., Peyton Cr., Smith Co., Tn.: INHS 80590 (7).

Etheostoma squamiceps.—*Lower Cumberland*: Dry Fork, Lyon Co., KY.: KU 11581 (1), INHS 75877 (12); Donaldson Cr., Trigg Co., KY.: KU 10722 (1); Crab Cr., Lyon Co., KY.: UMMZ 174973 (7); Dry Cr., Caldwell Co., KY.: INHS 75740 (3); trib., Eddy Cr., Caldwell Co., KY.: UMMZ 174869 (7); Eddy Cr., Caldwell Co., KY.: UL 5080 (2); Livingston Cr., Caldwell Co., KY.: UL 6478 (2); Ferguson Cr., Livingston Co., KY.: INHS 75874 (12), INHS 75875 (23); Riehlend Cr., Livingston Co., KY.: INHS 75863 (14); Hickory Cr., Livingston Co., KY.: INHS 75876 (1); Little R., Christian Co., KY.: UMMZ 154770 (5); Sinking Fork Cr., Christian Co., KY.: UL 10780 (29). *Middle Cumberland*: Bradley's Cr., Rutherford Co., TN.: KU 11477 (8); Bushman's Cr., Rutherford Co., TN.: UMMZ 158764 (5); E.F. Stones R., Cannon Co., TN.: KU 11681 (1), INHS 75873 (2); Harpeth R., Williamson Co., TN.: INHS 75870 (1); Little Harpeth R., Williamson Co., TN.: UMMZ 1777581 (23); Rutherford Cr., Williamson Co., TN.: UMMZ 121546 (5); Jones Cr., Dickson Co., TN.: TU 14663 (1); trib., W.F. Red R., Christian Co., KY.: INHS 75792 (1); West Br. Montgomery Cr., Christian Co., KY.: UL

5323 (1); Richland Cr., Davidson Co., TN.: UMMZ 177570 (31), UMMZ 174481 (15); Cumberland system, Davidson Co., TN.: UMMZ 96371 (4); branch, Stones R., Davidson Co., TN.: UMMZ 96363 (53); Wills Cr., Houston Co., TN.: INHS 75814 (1); creek, Montgomery Co., TN.: INHS 75766 (2); Louise Cr., Montgomery Co., TN.: MEB 10 (1); creek, Montgomery Co., TN.: UMMZ 160995 (1); Dry Fork Cr., Logan Co., KY.: INHS 75800 (4); Whippoorwill Cr., Logan Co., KY.: UL 6690 (1), UL 5833 (2); Round Lick Cr., Smith Co., TN.: KU 12012 (5); Bledsoe Cr., Sumner Co., TN.: UMMZ 166402 (2), UAIC 2974 (9); spring and creek, Stewart Co., TN.: UMMZ 161005 (8); trib., Cumberland R., Stewart Co., TN.: UMMZ 168371 (1); W.F. Red R., Todd Co., KY.: UL 5323 (1); spring, Coffee Co., TN.: UAIC 2417 (1), UAIC 2536 (1).

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SUMMARY

Etheostoma olivaceum, herein described, is restricted to Caney Fork and nearby tributaries of the Cumberland River in central Tennessee. It is separated from all other species of *Catonotus* by the combination of an uninterrupted infraorbital canal and no scales on the opercle, and is further distinguished from its closest relative, *E. squamiceps*, by the absence of scales on cheeks and opercles, absence of a dark suborbital bar, and modally seven scales above the lateral line, 9-10 scales below the lateral line, 12 pectoral rays, and 12 dorsal rays.

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