

- , AND R. HILSHEIMER. 1974a. Evaluations and modifications of media for enumeration of *Clostridium perfringens*. Appl. Microbiol. 27:78–82.
- , AND ———. 1974b. Enumeration of food borne *Clostridium perfringens* in egg-yolk-free tryptose-sulfite-cycloserine agar. Appl. Microbiol. 27:521–526.
- , R. J. GILBERT, S. M. HARMON, M. F. O'KEEFE, AND R. VAHLEFELD. 1977. ICMSF methods studies. VIII. Comparative study for the enumeration of *Clostridium perfringens* in foods. Can. J. Microbiol. 23:884–892.
- HOLDEMAN, L. V., E. P. CATO, AND W. E. C. MOORE. 1977. Anaerobe laboratory manual, 4th ed. Virginia Polytechnic Institute and State University, Blacksburg.
- MAHONY, D. E. 1974. Bacteriocin susceptibility of *Clostridium perfringens*: a provisional typing scheme. Appl. Microbiol. 29:172–176.
- , AND C. A. SWANTEE. 1978. Bacteriocin typing of *Clostridium perfringens* in human feces. J. Clin. Microbiol. 7:307–309.
- MARSHALL, R. S., J. F. STEENBERGEN, AND L. S. MCCLUNG. 1965. Rapid technique for the enumeration of *Clostridium perfringens*. Appl. Microbiol. 13:559–563.
- MATCHES, J. R., J. LISTON, AND D. CURRAN. 1974. *Clostridium perfringens* in the environment. Appl. Microbiol. 28:655–660.
- MOLONGOSKI, J. J., AND M. J. KLUG. 1976. Characterization of anaerobic heterotrophic bacteria isolated from freshwater lake sediments. Appl. Environ. Microbiol. 31:83–90.
- SKINNER, Q. D., J. C. ADAMS, P. A. RECHARD, AND A. A. BEETLE. 1974. Enumeration of selected bacterial populations in a high mountain watershed. Can. J. Microbiol. 20:1487–1491.
- STARGEL, W. D., F. S. THOMPSON, S. E. PHILLIPS, G. L. LOMBARD, AND V. R. DOWELL, JR. 1976. Modification of the minitek miniaturized differentiation system for characterization of anaerobic bacteria. J. Clin. Microbiol. 30:29–30.

Trans. Ky. Acad. Sci., 43(3–4), 1982, 131–136

Distribution and Habitat of *Etheostoma atripinne* in Kentucky

GLEN J. FALLO AND MELVIN L. WARREN, JR.

Kentucky Nature Preserves Commission, Frankfort, Kentucky 40601

ABSTRACT

Recent collecting efforts and examination of museum material resulted in a reassessment of the distribution of *Etheostoma atripinne* in Kentucky and contributed to the understanding of its habitat preferences. The range of *E. atripinne* as now defined is continuous from Fishing Creek, Pulaski County, Kentucky, downstream in the Cumberland River of Tennessee to Little River, Trigg County, Kentucky. *Etheostoma atripinne* was taken primarily from cobble-pebble riffles in streams ranging from third to fifth order. Gradients ranged from 0.7–3.2 m/km with velocities of 0.098–0.690 m/s. Water quality analyses indicated that *E. atripinne* inhabits well-buffered, hardwater streams with little or no siltation.

INTRODUCTION

Present distributional data suggest that *Etheostoma atripinne* is relatively uncommon in Kentucky. Burr (1980) noted only 6 Kentucky localities, exclusive to the Cumberland River basin, although *E. atripinne* is widespread in the Cumberland River of Tennessee (Etnier 1980).

The biology of this darter was recently studied by Page and Mayden (1981) (as *E. simoterum*), and Dr. D. A. Etnier

(pers. comm.) is currently revising the systematics of *E. atripinne* and the closely related *E. simoterum*, both of which belong to the subgenus *Nanostoma* (Page 1981). Current evidence suggests that *E. atripinne* is conspecific with *E. simoterum* (Etnier 1980).

A recent aquatic biota and water-quality survey of the upper Cumberland River basin of eastern Kentucky (Harker et al. 1980) yielded new distributional and

habitat information concerning *E. atripinne* in Kentucky. Subsequent searches of the Kentucky Department of Fish and Wildlife Resources ichthyological collection (KFW) revealed additional specimens. The purpose of this paper is to present these new findings in order to develop a better understanding of the distribution and habitat of *E. atripinne* in Kentucky.

MATERIALS AND METHODS

Field work was conducted between 13 June 1979 and 9 August 1980. Seven sites were sampled for fishes using minnow seines and/or sodium cyanide as outlined by Tatum (1968). Quantitative fish samples were made at Fishing, Sulphur, and Meshack creeks. These samples were obtained using a 1.8×3.0 m, 3.2 mm square-mesh seine. A stream section composed of a representative riffle-pool habitat was seined for 10 minutes by a four-man team. At Meshack Creek 3 similar riffle-pool habitats were quantitatively sampled for fishes.

Specimens were fixed in 10% formalin and subsequently preserved in 35–40% isopropanol. The nomenclature used conforms to that of Robins et al. (1980). Voucher specimens are deposited at the Kentucky Nature Preserves Commission (KNP) in Frankfort, Kentucky; the University of Tennessee ichthyological collections (UT), Knoxville, Tennessee; Cornell University (CU), Ithaca, New York; Southern Illinois University (SIUC), Carbondale, Illinois; and the University of Michigan Museum of Zoology (UMMZ), Ann Arbor, Michigan.

Meshack, Fishing, and Sulphur creeks were sampled for water quality, substrate size, macroinvertebrates, and other physical characteristics during the summer of 1979. Harker et al. (1980) provided detailed information regarding the methods utilized in obtaining this data. Per cent relative abundance of fishes was calculated from the quantitative collections by dividing the total number of individuals per species by the total number of all individuals.

A list of field stations and examined

museum collections is presented in the following section. The stream name, locality, date of collecting, and museum number are followed in parentheses by the number of specimens of *E. atripinne*. All streams are within the Cumberland River drainage of Kentucky.

COLLECTING LOCALITIES

Fishing Creek, 1.9 km S confluence of Fishing Creek and Rock Lick Creek, Pulaski County, 31 July 1979, KNP-CO2PUL (7), UT 91.200 (3). Otter Creek, directly above KY 200 bridge, Wayne County, 23 April 1980, KNP uncat. (1). Marrowbone Creek (Station A), 0.9 km below the mouth of Slate Creek, Metcalfe County, 13 June 1979, UT 91.657 (1). Marrowbone Creek (Station B), 100 m above the mouth of Dutch Creek, Cumberland County, 18 October 1979, UT 91.259 (1). Marrowbone Creek, at Waterview on KY 100, Cumberland County, 25 September 1981, SIUC uncat. (4). Bear Creek, approximately 4.8 km SE of Burkesville on KY 90, Cumberland County, 25 September 1981, SIUC uncat. (5). Sulphur Creek, 1.4 km above mouth, Monroe County, 28 August 1979 and 24 September 1981, KNP-CO2MON (2), UT 91.976 (1), SIUC uncat. (1). Meshack Creek, 1.9 km S of junction KY 100 and Meshack-Center Point Rd., Monroe County, 11 July 1979, KNP-CO1MON (67), UT 91.975 (10). Meshack Creek, 3.2 km NNW Center Point on KY 100, Monroe County, 24 September 1981, SIUC uncat. (15). McFarland Creek, 3.2 km SW of Vernon, Monroe County, 24 September 1981, SIUC uncat. (1). Whippoorwill Creek, at Gordonsville, Logan County, 16 March 1981, SIUC uncat. (3). Red River, on state road E of Keysburg, Logan County, date not recorded, UMMZ (B. M. Burr, pers. comm.). West Fork Red River, 4.8 km NW of Trenton on US 41, Todd County, 16 March 1981, SIUC uncat. (5). North (West) Fork Red River, at US 41E (US 41) about 12.9 km SW of Elkton, Todd County, August 1960, CU (B. M. Burr, pers. comm.). Donaldson Creek, at lower Donaldson School, Trigg County, 8 August 1961, and 26 June 1967, KFW

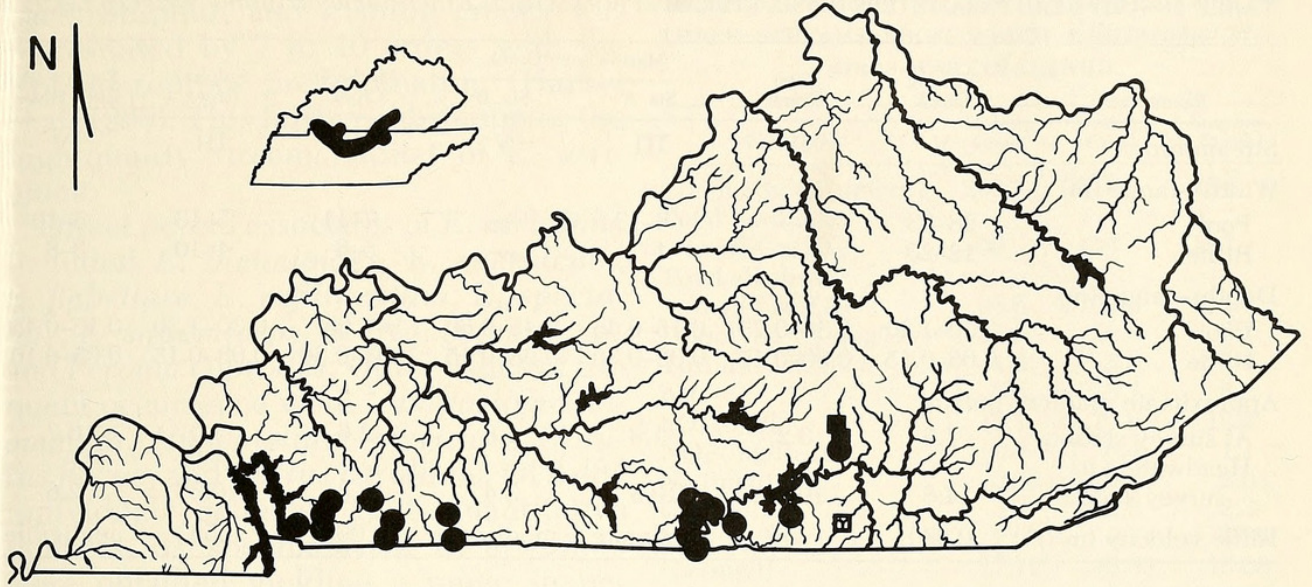


FIG. 1. The known distribution of *Etheostoma atripinne* in Kentucky. Solid circles represent new records, solid squares represent previous modern records, and the open square represents the only record prior to 1900. The shaded portion of the inset map represents the total range of *E. atripinne*.

1460 (9), KFW 1702 (2). South Fork Little River, 5.0 km above the mouth of Rock Bridge Branch, Christian County, 9 August 1980, UT 91.1032 (2). Sinking Fork Little River, 3.2 km W of Caledonia, Trigg County, 16 August 1961, KFW 1492 (9). Casey Creek, lower 100 m of course, Trigg County, 9 August 1961, KFW 1467. Little River, riffle below bridge on Co. Rd. 1253, Trigg County, 9 August 1961, KFW 1479 (5).

RESULTS

The Cumberland snubnose darter is presently considered a middle Cumberland River endemic (Etnier 1980). The easternmost and most upstream record of *E. atripinne* in the Cumberland River is from Kennedy (=Canada) Creek, Wayne County, Kentucky, a tributary to the Little South Fork Cumberland River (Kirsch 1893). Recent efforts to collect specimens from this locality have been unsuccessful (Comiskey and Etnier 1972, Harker et al. 1980).

Data presented here greatly augment the known distribution of *E. atripinne* in Kentucky (Fig. 1). The easternmost and most upstream viable population of *E. atripinne* persists in Fishing Creek, Pulaski County. West of Fishing Creek the

species was discovered in several Cumberland River tributaries downstream to McFarland Creek, Monroe County, near the Tennessee-Kentucky state line.

Previously, the most downstream and westernmost records for *E. atripinne* in the entire Cumberland River system were from the Red River system and directly below its mouth (Burr 1980 and pers. comm., Etnier 1980). Our collections, and those of the KFW, revealed additional western populations in the Little River system of Trigg and Christian counties. The western or downstream edge of the range of *E. atripinne* is thus extended approximately 118 km from the Red River to the Little River in Trigg County.

The habitat of *E. atripinne* has been characterized as small to medium-size streams in areas of gravel riffles and slab-rock pools with current (Etnier 1980, Page and Mayden 1981). Our investigation indicated that *E. atripinne* occurs in streams no smaller than third order and no larger than fifth order (Table 1). Specimens were almost exclusively taken in or very near riffle areas, although several adults were observed in slower current directly above riffles at Meshack Creek. At all 7 sites the riffle areas ranged from

TABLE 1.—PHYSICAL PARAMETERS OF SIX STREAMS FROM WHICH *Etheostoma atripinne* WAS COLLECTED

Parameters	Fishing Creek	Otter Creek	Marrowbone Creek		Meshack Creek	Sulphur Creek	South Fork Little River
			Sta. A	Sta. B			
Stream order	V	IV	III	V	IV	III	IV
Width—range (m)							
Pool	28-33	—	8-13	—	7-11	5-13	5-10
Riffle	12-20	—	4-7	—	5-8	4-10	3-8
Depth—range (m)							
Pool	0.30-1.30	0.30-0.75	0.15-0.45	0.45-0.60	≤1.00	0.30-1.30	0.15-0.45
Riffle	0.08-0.45	0.30-0.45	0.08-0.30	0.08-0.15	0.08-0.30	0.08-0.15	0.05-0.10
Approximate gradient (m/km)							
At survey station	1.6	3.2	1.9	1.8	2.6	3.0	0.7
Headwaters to survey station	14.6	10.2	10.8	3.4	8.3	10.6	2.6
Riffle velocity (m/s)	0.690	swift	moderate	moderate	0.098	0.533	negligible

0.05-0.45 m deep and 3-20 m wide. The approximate gradients at these sites ranged from 0.7-3.2 m/km with velocities of 0.098-0.690 m/s.

Field estimates of grain sizes in riffles harboring *E. atripinne* revealed that the substrate at the 3 intensively sampled sites consisted of at least 90% cobble and pebble with cobble predominating at two of these sites (Table 2). Similar results were obtained from analysis of the pool substrates at two of these sites. Observations at the four other sites indicated that pebble and cobble generally represented the predominant substrate size within the riffles. The most upstream Marrowbone Creek site was exceptional in that bedrock chutes with some slab boulder and cobble represented the major constituents of riffle substrate. *Etheostoma atripinne* was infrequently taken

in habitats which exhibited these conditions.

Laboratory analyses of the fine fraction of the riffle substrate (pebble and smaller) indicated that pebble was the predominant substrate size (66% or more) at the 3 intensively sampled sites. Sand, silt, and clay were negligible at all sites sampled.

Analysis of water quality of the 3 intensively sampled sites (Table 3) indicated that *E. atripinne* thrives in well-buffered, hardwater streams that contain a relatively high amount of dissolved constituents. Each of these streams exhibited a pH of approximately 8.0. Turbidity was low and dissolved oxygen concentrations were high. Other streams containing the Cumberland snubnose darter were also clear and appeared to be of high quality. The diverse macroinvertebrate fauna of Mes-

TABLE 2.—FIELD ESTIMATES OF AREAL COVERAGE OF GRAIN SIZES IN THREE STREAMS FROM WHICH *Etheostoma atripinne* WAS COLLECTED

Size term	Size range (mm)	Fishing Creek		Meshack Creek		Sulphur Creek	
		Pool %	Riffle %	Pool %	Riffle %	Pool %	Riffle %
Boulder	>256	1	<1	ND	0	0	0
Cobble	64-256	5	40	ND	75	5	80
Pebble	5-63	73	50	ND	20	70	15
Granule	2.1-4	5	5	ND	<5	15	2
Sand	0.0625-2.0	15	5	ND	<5	10	3
Silt and clay	0.0625	1	<1	ND	<1	<1	0
Bedrock	—	0	0	ND	0	0	0

hack, Sulphur, and Fishing creeks was represented by 7 to 10 orders with the Ephemeroptera predominating (Harker et al. 1980). This further substantiates the high-quality stream habitat of *E. atripinne*.

Direct percid associates of *E. atripinne* included *E. blennioides*, *E. caeruleum*, *E. flabellare*, *E. rufilineatum*, *E. spectabile*, *E. squamiceps*, *E. (Nanostoma) sp.*, and *Percina caprodes*. Other fishes of frequent occurrence were *Campostoma anomalum*, *Hypentelium nigricans*, *Noturus flavus*, and *Cottus carolinae*. Of 2,484 individuals collected in 5 quantitative samples, 81 specimens of *E. atripinne* were obtained yielding a range in percent relative abundance of 0.3–8.9%.

DISCUSSION

The range of the Cumberland snubnose darter as presently known is continuous from Fishing Creek, Pulaski County, Kentucky, downstream to and including the Little River, Trigg County, Kentucky (Fig. 1). Distributional evidence presented here and by others (Bouchard 1977, Etnier 1980) suggests that competitive exclusion may exist between *E. atripinne* and other members of the subgenus *Nanostoma*. East of Fishing Creek an undescribed species of *Nanostoma* occupies the Rockcastle River, Big South Fork Cumberland River (exclusive of the Little South Fork), and the upper Cumberland River (above the falls). In Tennessee, *E. atripinne* is widespread in the Cumberland River with the exception of the upper Caney Fork River which harbors another *Nanostoma*, *E. etnieri*. *Etheostoma atripinne* has been taken with only one other member of the subgenus, an undescribed form occupying portions of the western range of *E. atripinne* (Etnier 1980). Examination of our collections and material at KFW indicates that although sympatric, one species far outnumbers the other in areas of syntopy. Further study of the ecology and distribution of the subgenus is warranted to clarify these relationships.

The Cumberland snubnose darter is much more common in Kentucky than

TABLE 3.—WATER QUALITY CHARACTERISTICS OF THREE STREAMS FROM WHICH *Etheostoma atripinne* WAS COLLECTED

Parameter	Fishing Creek	Meshack Creek	Sulphur Creek
Conductivity (umhos)	209	279	264
Total hardness (mg/l CaCO ₃)	90	154	150
Total alkalinity (mg/l CaCO ₃)	96.6	139.6	154.6
Dissolved O ₂ (mg/l)	11.5	10.4	8.7
Turbidity (NTU)	4.0	5.0	5.4
pH	8.3	8.1	8.2
SO ₄ (mg/l)	13.7	17.9	12.0
NO ₃ (mg/l)	0.4	0.4	1.1
Na (mg/l)	3.32	3.20	2.94
Cl (mg/l)	3.0	2.3	2.3
Mg (mg/l)	7.08	8.74	7.36
Ca (mg/l)	27.72	48.53	45.08

was previously known. Few additional populations of *E. atripinne* are anticipated east of the Fishing Creek locality. Rather extensive collecting for nearly 100 years in this region including the immediate eastern Pitman and Buck creeks have thus far revealed only the Kennedy (=Canada) Creek population (Kirsch 1893; Comiskey and Etnier 1972; Harker et al. 1979, 1980; R. R. Cicerello, pers. comm.). Moreover, Comiskey and Etnier (1972) suggested that this population may have been the result of a relatively recent faunal transfer from a more westerly Cumberland River tributary. Although the ichthyofauna of streams west of the Little River are relatively well-known (Burr 1980), further collecting in high-quality streams of the area is needed to ascertain if other populations of *E. atripinne* exist.

ACKNOWLEDGMENTS

The authors thank the director, D. F. Harker, Jr., and the entire staff of the Kentucky Nature Preserves Commission for their assistance and support in the laboratory and field. Our gratitude is also expressed to KFW personnel for allowing us access to their fish collection. Drs. D. A. Etnier, University of Tennessee, and B. M. Burr, Southern Illinois University at Carbondale, kindly confirmed original identifications and provided locality in-

formation. Special thanks to R. R. Cicerello and K. E. Camburn for their review of the manuscript.

LITERATURE CITED

- BOUCHARD, R. W. 1977. *Etheostoma etnieri*, a new percid fish from the Caney Fork (Cumberland) River system, Tennessee, with a redescription of the subgenus *Ulocentra*. *Tulane Stud. Zool. Bot.* 19:105-130.
- BURR, B. M. 1980. A distributional checklist of the fishes of Kentucky. *Brimleyana* 3:53-84.
- COMISKEY, C. E., AND D. A. ETNIER. 1972. Fishes of the Big South Fork of the Cumberland River. *Tenn. Acad. Sci.* 47(4):140-145.
- ETNIER, D. A. 1980. *Etheostoma atripinne* (Jordan), Cumberland snubnose darter. P. 625. In D. S. Lee et al. *Atlas of North American Freshwater fishes*. N.C. State Mus. Nat. Hist., Raleigh, N.C.
- HARKER, D. F., JR., S. M. CALL, M. L. WARREN, JR., K. E. CAMBURN, AND P. WIGLEY. 1979. Aquatic biota and water quality survey of the Appalachian Province, eastern Kentucky. Technical Report, Ky. Nat. Pres. Comm., Frankfort, Ky.
- , M. L. WARREN, JR., K. E. CAMBURN, S. M. CALL, G. J. FALLO, AND P. WIGLEY. 1980. Aquatic biota and water quality survey of the upper Cumberland River basin. Technical Report, Ky. Nat. Pres. Comm., Frankfort, Ky.
- KIRSCH, P. H. 1893. Notes on a collection of fishes from the southern tributaries of the Cumberland River in Kentucky and Tennessee. *Bull. U.S. Fish Comm.* 11:259-268.
- PAGE, L. M. 1981. The genera and subgenera of darters (Percidae, Etheostomatini). *Occ. Pap. Mus. Nat. Hist., Univ. Kans.* 90:1-69.
- , AND R. L. MAYDEN. 1981. The life history of the Tennessee snubnose darter, *Etheostoma simoterum*, in Brush Creek, Tennessee. *Ill. Nat. Hist. Surv. Biol. Notes* 117. 11 pp.
- ROBINS, C. R., R. M. BAILEY, C. E. BOND, J. R. BROOKER, E. A. LACHNER, R. N. LEA, AND W. B. SCOTT. 1980. A list of common and scientific names of fishes from the United States and Canada. 4th ed. *Am. Fish. Soc. Spec. Publ.* 12. 174 pp.
- TATUM, W. R. 1968. Field observations on the use of sodium cyanide in stream surveys. 22nd Annu. Meet. South. Div. Amer. Fish. Soc., Baltimore, Md. 7 pp.

Trans. Ky. Acad. Sci., 43(3-4), 1982, 136-137

Observations on an Active Maternity Site for the Gray Bat in Jessamine County, Kentucky

JOHN R. MACGREGOR

KDFWR Nongame Wildlife Program, #1 Game Farm Road,
Frankfort, Kentucky 40601,

AND

ALBERT G. WESTERMAN

Department of Biological Sciences, University of Kentucky,
Lexington, Kentucky 40506

ABSTRACT

An active maternity site for the Federally-endangered gray bat, the first such site to be reported from Kentucky in 20 years, is briefly described.

The reproductive status of the gray bat (*Myotis grisescens*) in Kentucky has been unknown during the past 2 decades. The latest reports of active maternity sites studied in central Kentucky in the late 1950's and early 1960's were presented

by Hall and Wilson (1966). Barbour and Davis (1969) revisited some of these sites during the summers of 1963 and 1964 but failed to find any gray bats. More recently, Rabinowitz and Tuttle (1980) summarized the status of the Endangered



Fallo, Glen J. and Warren, Melvin L. 1982. "Distribution and habitat of *Etheostoma atripinne* in Kentucky." *Transactions of the Kentucky Academy of Science* 43(3-4), 131-136.

View This Item Online: <https://www.biodiversitylibrary.org/item/104559>

Permalink: <https://www.biodiversitylibrary.org/partpdf/337157>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: Permission_to_digitize_granted_by_rights_holder

Rights Holder: Kentucky Academy of Science

Rights: <https://www.biodiversitylibrary.org/permissions/>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.