

The Fringed Darter, *Etheostoma crossopteron*, in the Cache River Basin of Southern Illinois (Percidae: Subgenus *Catonotus*)¹

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ABSTRACT. *Etheostoma crossopteron* is known for the first time in Illinois, occurring in streams of the Cache River basin of southern Illinois. The Cache River basin population was considered *Etheostoma squamiceps* in all past accounts, but recent collections of breeding males (with diagnostic dorsal fin characters developed) permitted reidentification of this darter population as *E. crossopteron*. Nineteen sites were investigated (one in each of 19 streams) to determine if only *E. crossopteron* or both *E. crossopteron* and *E. squamiceps* occurred in the Cache River basin. Museum specimens were examined as well and, although no breeding males were present among the museum material examined, we concluded that all records of *E. squamiceps* in the Cache River basin refer to *E. crossopteron* based on 1997 collections of breeding males. In 1997, breeding occurred from at least 24 April to 21 May.

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INTRODUCTION

The Fringed Darter, *Etheostoma crossopteron* (subgenus *Catonotus*), was described by Braasch and Mayden in 1985; they listed *Etheostoma squamiceps* Jordan, 1877 as the species present in the Cache River basin. Page and others (1992) also considered the Cache River population to be *E. squamiceps*. We collected a large (69.0 mm SL) breeding male of the *Etheostoma squamiceps* species group in Big Creek (Union County) on 11 April 1997 and examination of the dorsal fin indicated it was *E. crossopteron* (SIUC 28412) and not *E. squamiceps* (fin characters given in Braasch and Mayden 1985, Page and others 1992). Additional breeding males collected soon thereafter agreed with the first male specimen (SIUC and INHS collections). Dr. Lawrence M. Page (Illinois Natural History Survey) kindly confirmed the identification. An examination of data given in Braasch and Mayden (1985) showed that the Cache River population of "*E. squamiceps*" resembled other *E. crossopteron* populations based on mean total lateral line scale counts. Additional collections were made to determine if *E. crossopteron* was the only species of the *E. squamiceps* species group in the Cache River basin, and museum collections were searched for past records of "*E. squamiceps*."

MATERIALS AND METHODS

We surveyed 19 sites in 19 streams (one site per stream) on 24 and 30 April; 4, 6, 12, 13 and 21 May; and 4 July 1997. Fishes were collected with a seine, preserved in 10% formalin, washed in water, transferred to 70% EtOH, and cataloged in the Southern Illinois University at Carbondale Fluid Vertebrate Collection (SIUC). All preserved *E. crossopteron* were measured to the nearest 0.1 mm with dial calipers and were sexed by external characteristics or by examination of gonads. In the field, notes were taken on substrate, temperature, and nests. Museum records were gathered from the National Museum of Natural History (USNM), the Illinois Natural

History Survey (INHS), the University of Kansas Museum of Natural History (KU), and SIUC. Two collections taken on 27 April 1997 by L.M. Page, M.H. Sabaj, and T.J. Near (INHS) and 1 collection taken on 23 July 1997 by K.M. Cook and T.M. Hiland (SIUC) were also included on the distribution map and in Appendix A.

RESULTS AND DISCUSSION

We collected 89 *E. crossopteron* from 6 streams, including 2 streams in northeastern Alexander County never reported to have any member of the *E. squamiceps* species group present (Table 1, Appendix A). We preserved 66 *E. crossopteron* consisting of 15 breeding males, 11 nonbreeding males, and 40 females (most were gravid). In addition, 2 collections made on 23 April 1997 (INHS 41066 and 41141) contained 1 and 12 breeding males, respectively. All breeding males collected in 1997 had dorsal fin characteristics of *E. crossopteron*, and we consider the entire Cache River basin population to be *E. crossopteron*. There is only 1 record of "*E. squamiceps*" from the eastern portion of the drainage in Little Cache Creek (INHS 2221, n = 1), and recent collections have not yielded additional specimens from this area. Presently, *E. crossopteron* may occur only in the western portion of the drainage in Big Creek, Mill Creek, and their tributaries (Fig. 1). Other members of the subgenus *Catonotus* in the Cache River drainage are the Stripetail Darter (*Etheostoma kennicotti* (Putnam, 1863)) and the Fantail Darter (*E. flabellare* Rafinesque, 1819).

The first record of *E. crossopteron* from the Cache River drainage was collected on 1 December 1893 by J.E. Hallinen from Big Creek near Anna (USNM 125117). The next voucher records available were collected from "Roaring Springs Creek" (Mill Creek headwaters) in 1954 by G.E. Gunning and assistants (SIUC 12238 and 12239), but the vouchers were not mentioned in Gunning and Lewis (1956). Other Illinois specimens referable to *E. crossopteron* are listed in Appendix A.

Zoogeography

The drainage history and biogeographic explanation given by Braasch and Mayden (1985) for the *E. squamiceps*

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TABLE 1

*Nest collection times and water temperature data from Cache River basin streams containing *Etheostoma crossoptermum*. Females were not captured in Trib. Hartline Creek because only nest-guarding males were sought. At least 1 breeding male was preserved from each site.*

Stream	Date (1997)	Water Temperature (° C) Mean (Range)	Number of Nests	Number of Darters [†]
Big Creek	11 April	14.7	0	1, 0, 1 [‡]
	24 April	12.4 (11.5 - 13.4)	2	4, 1, 3
Little Creek	30 April	22.4 (22.2 - 23.0)	3	5, 6, 11
Crooked Creek	30 April	20.4 (20.3 - 20.8)	0	2, 1, 8
Lingle Creek	30 April	17.9 (17.8 - 17.9)	1	1, 0, 14
You-Be Hollow	21 May	not recorded	7	7, 3, 12
Trib. Hartline Creek	21 May	not recorded	9	9, 0, 0

[†]Refers to number of breeding males, nonbreeding males, and females of *Etheostoma crossoptermum*, respectively; some darters were released, and some nest-guarding males were observed only.

[‡]All darters were not recorded on 11 April.

species group accounts for the presence of *E. crossoptermum* in the Cache River drainage (see their Figure 20). The lower Cache River valley was formerly part of the old Ohio River channel (Burr and Page 1986), which later merged with the old Cumberland River channel, thereby connecting the Cache River to the Cumberland River channel (modern lower Ohio River) and allowing dispersal of *E. crossoptermum* into the Cache River basin.

Biological Notes

Page (1974) studied the life history of *E. crossoptermum* in Ferguson Creek, KY (this population was known as *E. squamiceps* at that time). We gathered limited data on the Cache River basin population in 1997. Females were usually more numerous than males (Table 1; tributary of Hartline Creek was not seined but searched only for nests guarded by males). Breeding occurred from at least 24 April until 21 May based on the presence of nests. Water temperatures between 24 April and 30 April ranged from 11.5 to 23.0° C but were likely higher on 21 May (temperatures not recorded; Table 1). Nest-guarding males collected on 21 May had less dark pigmentation, and most eggs had reached advanced developmental stages, indicating that the spawning season was likely near its terminus. One nest collected in Little Creek on 30 April contained 1,040 eggs. Nest sites were all slab rocks, except 1 large nest in a tributary of Hartline Creek was on the underside of a metal barrel lid. Page (1980) found nests of the Dirty Darter (*Etheostoma olivaceum* Braasch and Page, 1979) on a metal can and a piece of tile, and Piller and Burr (in press) found 43% of Relict Darter (*Etheostoma chienense* Page and Ceas, 1992) nests on various artificial substrates such as tires and a metal air conditioner cover in streams with few natural slab rocks available. The largest male *E. crossoptermum* collected

was 69.8 mm SL, and the largest female was 63.4 mm SL (both SIUC 28511); 61 mm was the maximum female size reported for *E. crossoptermum* previously (Braasch and Mayden 1985, Page and others 1992).

Conservation Status

Etheostoma crossoptermum has no protected status in Illinois currently, but its limited distribution in the State places this species in danger of extirpation. Even within the Cache River drainage the species is restricted to western tributaries of the Cache River (Big Creek, Mill Creek, and their tributaries) in Union County and northeastern Alexander County. Siltation appears to be a problem in all streams in which *E. crossoptermum* was collected; however, the egg-laying strategy of this species (undersides of rocks) has probably been advantageous in areas where siltation has increased. Efforts to curtail siltation should be increased in this area because anthropogenic disturbances such as agriculture and construction projects (for example, recent work on State Route 51) continue to impact streams where *E. crossoptermum* occurs. Siltation and other agricultural pollution were considered factors likely to have reduced populations of *E. squamiceps* in southern Indiana (Page and others 1976). Davie and Lant (1994) studied the effects of Conservation Reserve Program (CRP) enrollment of farm land on sediment loads of two streams, Cypress Creek and Big Creek, in the Cache River drainage; they concluded that CRP enrollment reduced sediment loads very little, if at all, and gave two reasons why sediment load reductions may not have been observed: 1) the time period of their study was too short or 2) because most of the CRP land did not include streamside areas, these areas remained a major source of sediment input. Brigham (1978) examined macro-

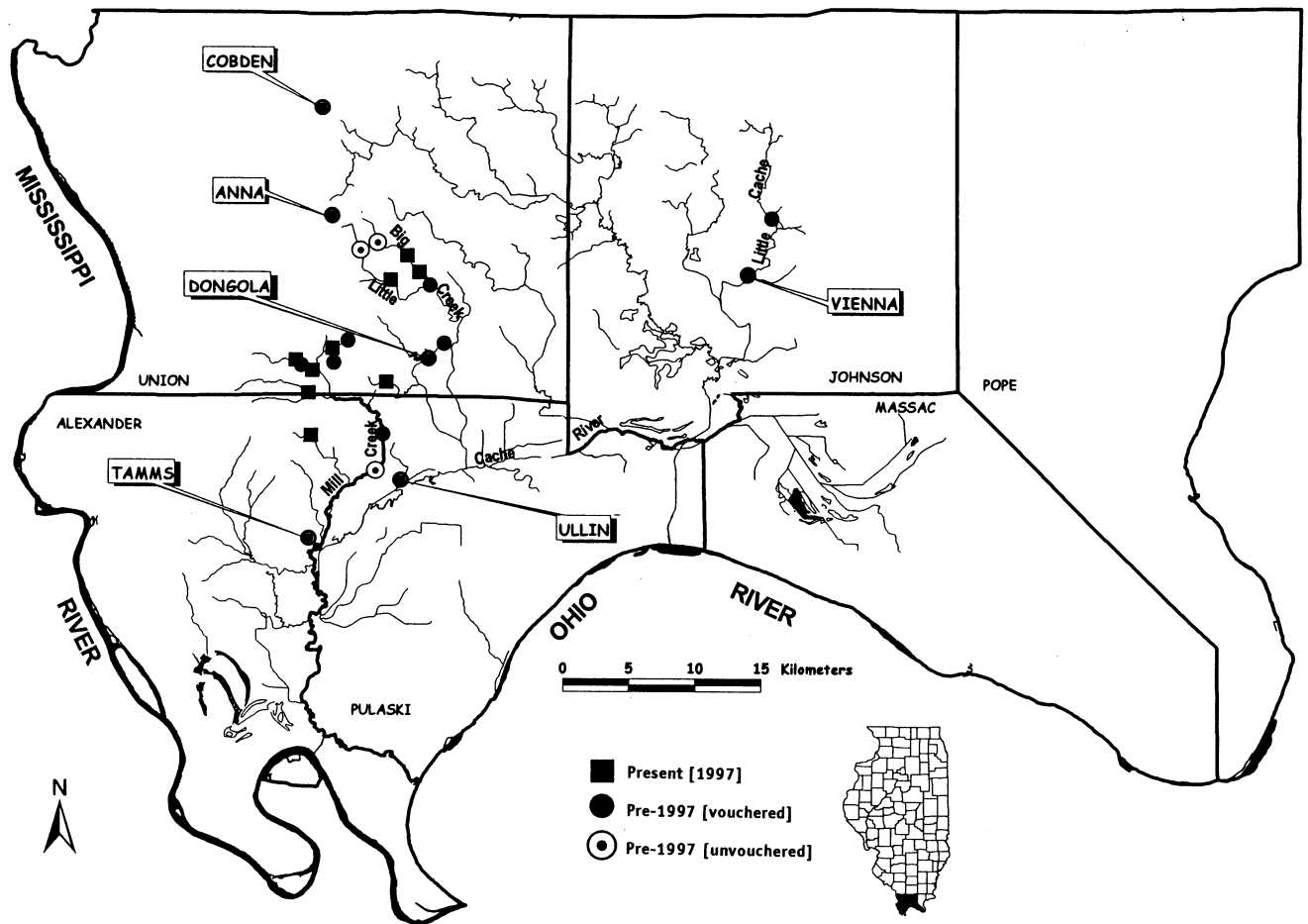


FIGURE 1. Distribution of the Fringed Darter, *Etheostoma crossopterum*, in the Cache River basin of southern Illinois. Some duplicate records (in Appendix A) are represented by a single point, and the USNM 125117 record was not plotted in upper Big Creek. Sites not yielding *E. crossopterum* ($n = 13$) were not included.

invertebrate communities in the Cache River basin to assess water quality and sampled all the streams in which *E. crossopterum* is known to occur; most of the 21 stations in *E. crossopterum* streams were categorized as unbalanced or semi-polluted (categories: balanced, unbalanced, semi-polluted, and polluted).

Only a small portion of this species' range coincides with State or Federal protected areas; the headwaters of Cooper and Lingle creeks lie within the boundaries of the Shawnee National Forest. Although the population occurs in a small area of the Cache River basin, it appears healthy. We feel the species is vulnerable to extirpation in Illinois and suggest that increased efforts to curtail channelization projects, clearing of riparian vegetation, and removal of gravel and rock from streams would benefit the species immensely.

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LITERATURE CITED

- Braasch ME, Mayden RL. 1985. Review of the subgenus *Catonotus* (Percidae) with descriptions of two new darters of the *Etheostoma squamiceps* species group. Occas Pap Mus Nat Hist Univ Kansas 119:1-83.
- Brigham AR (project coordinator, Illinois Natural History Survey). 1978. An assessment of the water quality of the Cache River basin derived from a biological investigation. Urbana, IL: Prepared for the Illinois Environmental Protection Agency. iv + 73 p.
- Burr BM, Page LM. 1986. Zoogeography of fishes of the lower Ohio-upper Mississippi basin. In: Hocutt CH and Wiley EO, editors, The Zoogeography of North American Freshwater Fishes. New York: J Wiley. pp. 287-324.
- Davie DK, Lant CL. 1994. The effect of CRP enrollment on sediment loads in two southern Illinois streams. J Soil Water Cons 49:407-12.
- Gunning GE, Lewis WM. 1956. Recent collections of some less common fishes in southern Illinois. Ill Acad Sci Trans 48:23-6.
- Page LM. 1974. The life history of the spottail darter, *Etheostoma squamiceps*, in Big Creek, Illinois, and Ferguson Creek, Kentucky. Illinois Nat Hist Surv Biol Notes 89:1-20.
- Page LM. 1980. The life histories of *Etheostoma olivaceum* and *Etheostoma striatulum*, two species of darters in central Tennessee. Illinois Nat Hist Surv Biol Notes 113: 1-14.
- Page LM, Burr BM, Smith PW. 1976. The spottail darter, *Etheostoma squamiceps* (Osteichthyes, Percidae), in Indiana. Am Midl Nat 95:478-9.
- Page LM, Ceas PA, Swofford DL, Buth DG. 1992. Evolutionary relationships within the *Etheostoma squamiceps* complex (Percidae; subgenus *Catonotus*) with descriptions of five new species. Copeia 1992:615-46.
- Piller KR, Burr BM. In Press. Reproductive biology and spawning habitat supplementation of the relict darter, *Etheostoma chienense*, a federally endangered species. Environ Biol Fish

APPENDIX A

Records of Etheostoma crossopeterum from the Cache River drainage of Illinois. Voucher records (number of preserved specimens in parentheses following catalog number):

National Museum of Natural History: USNM 125117 (1), Big Creek near Anna, IL, Union Co., 1 December 1893, JE Hallinen; **University of Kansas Museum of Natural History:** KU 7267 (6), Tributary of Lingle Creek, 1 mile N of Mill Creek, IL, Union Co., 1 November 1961, PW Smith and WD Zehr; **Illinois Natural History Survey:** INHS 2221 (1), Little Cache River (Creek), 1 mile N of Bloomfield, IL, Johnson Co., 18 April 1964, R Dysart and WH Luckman; INHS 17833 (27), Tributary of Mill Creek, 1 mile N of Mill Creek, IL, Union Co., 1 November 1961, PW Smith and WD Zehr; INHS 17838 (23), Tributary of Mill Creek, 1 mile N of Mill Creek, IL, Union Co., 6 October 1963, ME Braasch and PW Smith; INHS 17847 (8), Mill Creek, 2 miles NE of Mill Creek, IL, Union Co., 31 October 1961, PW Smith and WD Zehr; INHS 18033 (2), Tributary of Big Creek, 1 mile E of Dongola, IL, Union Co., 18 April 1968, PW Smith and LM Page; INHS 18110 (1), Crooked Creek, 2 miles S of Dongola, IL, Union Co., 13 September 1972, LM Page and BM Burr; INHS 41141 (29), Big Creek, 1.7 miles NE of Balcom, IL, Union Co., 27 April 1997, LM Page, MH Sabaj, and TJ Near; INHS 41066 (1), Lingle Creek, 1.8 miles N of Mill Creek, IL, Union Co., 27 April 1997, LM Page, MH Sabaj, and TJ Near; **Southern Illinois University at Carbondale Fluid Vertebrate Collection:** SIUC 12238 (2), "Roaring Springs Creek," Mill Creek headwaters near Mill Creek, IL, Union Co., 24 August 1954, GE Gunning, DE Louder, and C Peters; SIUC 12239 (20), "Roaring Springs Creek," Mill Creek headwaters between Jonesboro and Mill Creek, IL, Union Co., June 1954, GE Gunning and C Peters; SIUC 20160 (1), Mill Creek at road 2 miles SW of Wetaug, IL, Pulaski Co., 5 June 1992, R Sauer (IDOC); SIUC 25252 (4), Big Creek 3.5 miles N of Dongola, IL, Union Co., 17 June 1995, KM Cook and KJ Woodruff; SIUC 25526 (9), Little Creek ≈ 0.5 mile E of Balcom, IL, near junction of Balcom Road and State Route 51, Union Co., 10 February 1996, KR Piller, T Dempsey, and WJ Poly; SIUC 28412 (2), Big Creek ≈ 7 km SE of Anna, IL, Union Co., 11 April 1997, WJ Poly and AK Wilson; SIUC 28432 (7), Big Creek ≈ 7 km SE of Anna, IL, Union Co., 24 April 1997, WJ Poly and JB Ladonski; SIUC 28505 (10), Crooked Creek upstream of Mill Creek Road, Union Co., 30 April 1997, WJ Poly and AK Wilson; SIUC 28511 (10), Lingle Creek at State Route 127 bridge, Union Co., 30 April 1997, WJ Poly and AK Wilson; SIUC 28519 (16), Little Creek ≈ 0.5 mile E of Balcom, IL, near junction of Balcom Road and State Route 51, Union Co., 30 April 1997, WJ Poly and AK Wilson; SIUC 28714 (20), You-Be Hollow just upstream of road bridge near junction with Cooper Creek, Union/Alexander Co. border, 21 May 1997, WJ Poly and AK Wilson; SIUC 28715 (1), Tributary of Hartline Creek 0.4 km N of Elco, IL, Alexander Co., 21 May 1997, WJ Poly and AK Wilson; SIUC 30123 (2), Mill Creek (headwaters) downstream of gravel pit and Miller Road bridge ≈ 10 km S of Anna, IL, Union Co., 23 July 1997, KM Cook and TM Hiland.

Records without vouchers but considered valid (written records filed in the Southern Illinois University at Carbondale Fluid Vertebrate Collection):

(1), Mill Creek 1 mile W of Ullin, IL, Pulaski/Alexander Co. line, 27 August 1978, BM Burr and RL Mayden; (6), Little Creek ≈ 2.5 km SSE of Anna, IL, Union Co., 10 February 1996, KR Piller, T Dempsey, and WJ Poly; (1), Big Creek ≈ 3.5 km SE of Anna, IL, Union Co., 10 December 1996, WJ Poly and AK Wilson; (5), Big Creek ≈ 7 km SE of Anna, IL, Union Co., 10 December 1996, WJ Poly and AK Wilson.
