

# Nest Substrates and Spawning Time of *Etheostoma crossopterum* in Southern Illinois

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## ABSTRACT

Fifty-two nests of the fringed darter (*Etheostoma crossopterum*) were located in southern Illinois during April-June 2000. Two nests were found as late as 24 June in Mill Creek. In several stream segments that lacked suitable rocks for nest sites, eggs were deposited on logs, boards, tires, and metal objects. Reproduction occurred in a degraded and silted section of Mill Creek. Fringed darters were found in a tributary of Mill Creek where they had not been collected previously.

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## INTRODUCTION

The fringed darter is a small fish that generally occurs in rocky-bottomed streams in portions of Alabama, Tennessee, Kentucky, and Illinois (Braasch and Mayden, 1985; Page et al., 1992; Poly and Wilson, 1998). The fringed darter was unknown in Illinois until Poly and Wilson (1998) identified the species from streams in the Cache River basin in Union and Alexander counties. In the Cache River basin, the fringed darter previously had been identified as spottail darter (*Etheostoma squamiceps*), which occurs in southeastern Illinois, Indiana, Kentucky, and Tennessee (Braasch and Mayden, 1985; Page et al., 1992). Page (1974) and Poly and Wilson (1998) reported ecological and life history information on fringed darters in Kentucky and Illinois, respectively. Eggs typically are attached to the undersides of slab rocks. In 1997 fringed darters were found in six streams in the lower portion of the Cache River basin but were absent at many other sites within the basin (Poly and Wilson, 1998; unpubl. data). Because tributaries of the Cache River have been modified to various extents and these modifications often result in increased siltation, fringed darters and their nests were sought in both mildly and severely modified habitats to determine if they inhabited, and reproduced in, the more degraded sites.

## METHODS AND MATERIALS

Rocks and other objects in the streams were checked for the presence of eggs, and any adult fishes with a nest of eggs were recorded. Notes were taken on nest sites of fringed darters in Lingle Creek (14 April, 12 June 2000), Mill Creek (14 April, 1, 20, 28 May, 12, 24 June 2000), and an unnamed tributary of Mill Creek (20 May 2000). The amount of

effort for searches varied. When a nest was located, the nest substrate and number of adult males and females at the nest were recorded. Most nests and adult fishes were returned to the stream at the capture site (males guarding nests return promptly and do not abandon nests; Page, 1974; W. Poly, pers. obs.). Repeated visits to the same site were made at intervals that would allow for eggs from nests found previously to have hatched (Page, 1974), and different stream segments were searched as well to avoid repeated observation of the same nests. Adult and young-of-the-year specimens from an unnamed tributary of Mill Creek, an unnamed tributary of Big Creek, and two other sites on Mill Creek were preserved and deposited in the University of Tennessee Vertebrate Collection (UT) (Appendix A). All young-of-the-year darters were measured to the nearest 0.1 mm SL with a dial caliper.

## RESULTS

Fifty-two nests were found, and many of them were on objects other than rocks (Table 1). Nests were found on rocks (73%) at sites where rocks were abundant, whereas in stream segments with few suitable rocks, eggs were deposited on other objects (27%) such as tires, boards, logs, and metal objects. Two nests occurred on the same object in four cases, and three nests were found on one tire (Table 1). One site on Mill Creek was channelized and silted severely, yet two nests were found on a metal barrel (ca. 30 cm apart), and numerous young-of-the-year occurred at the site. Two nests were found on 24 June in upper Mill Creek (water temp. 20.5°C); eggs in the smaller nest were well-developed, whereas eggs in the larger nest had been laid recently based on their lack of development. The nuptial condition of male fringed darters in upper Mill Creek was waning on 24 June. In an unnamed tributary of Mill Creek, four nests were found, and adults and young-of-the-year were captured in this tributary, which had been channelized and had a heavy silt load. Young-of-the-year darters were 12.7 – 21.7 mm SL (mean = 18.2, n = 25; 20 May, Mill Creek and trib.) and 16.5 – 26.4 mm SL (mean = 21.0, n = 13; 24 June, trib. of Big Creek) and probably represent offspring from the earliest spawning activity.

## DISCUSSION

Late-June is the latest date known for nesting by fringed darters, although other species in the subgenus *Catnotus* spawn in mid-June or later (Page and Burr, 1976; Braasch and Mayden, 1985; Layman, 1984, 1991). Page (1974) reported spawning in a northern Kentucky population of fringed darters from late March through late May 1973 and noted that spawning might occur in early June. In northern Alabama, breeding adults were found from late March into early June (Mettee et al., 1996). Nests of the relict darter (*Etheostoma chienense*) were found as late as 8 June 1995 (Piller and Burr, 1999). The spawning season might have been longer in upper Mill Creek due to this stream being spring-fed and also because this site is at the northern edge of the species' distribution. Even though the weather was unseasonably warm during winter and spring of the year 2000, the water temperature in upper Mill Creek was 20.5°C on 24 June. The number of nests (n = 18) in upper Mill Creek on 12 June compared with other dates likely was due to more searching effort and the presence of many slab rocks rather than being an indication of peak spawning period.

Darters of the subgenus *Catonotus* usually deposit eggs on the undersides of slab rocks (Page, 1974; Page and Mayden, 1979) but will use other objects when rocks are scarce. In this study, 27% of fringed darter nests were on objects other than rocks. In 1997, one fringed darter nest was found on a metal barrel lid in a tributary of Hartline Creek, Illinois (Poly and Wilson, 1998). The relict darter occurs in streams containing few natural slab rocks, and 43% of their nests were on a variety of unnatural items such as tires, glass bottles, and a metal air conditioner cover (Piller and Burr, 1999). Page (1980) found nests of the dirty darter (*Etheostoma olivaceum*) on a tile and a metal can.

Degradation of aquatic habitats remains a threat to the fringed darter and other aquatic organisms in Illinois. Fortunately, the fringed darter seems to be capable of maintaining populations even in degraded streams; however, populations from other streams in the drainage might be the source of immigrants that help maintain the species at the degraded sites. The ability to use a variety of nesting substrates coupled with the strategy of laying eggs on the undersides of objects with the male parent tending the eggs likely enables the fringed darter to persist in areas where other darters (i.e., egg burying species) might perish because of increased siltation.

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Table 1. Nest substrates used by *Etheostoma crossopterum* in Mill Creek and its tributaries from April to June 2000.

Nest Substrate	Number of objects	Number of nests	Date	Stream
Rocks (73.0%)	4	4	14 April	Lingle Creek <sup>1</sup>
	4	4	14 April	Mill Creek <sup>2</sup>
	1	1	1 May	Mill Creek <sup>3</sup>
	4	4	20 May	trib. Mill Cr. <sup>4</sup>
	5	5	28 May	Mill Creek <sup>2</sup>
	18	18	12 June	Mill Creek <sup>2</sup>
	2	2	24 June	Mill Creek <sup>2</sup>
Logs (5.8%)	1	2	14 April	Mill Creek <sup>2</sup>
	1	1	28 May	Mill Creek <sup>2</sup>
Tires (7.7%)	2	4	1 May	Mill Creek <sup>3</sup>
Boards* (5.8%)	1	2	14 April	Mill Creek <sup>2</sup>
	1	1	1 May	Mill Creek <sup>3</sup>
Metal** (7.7%)	2	2	1 May	Mill Creek <sup>3</sup>
	1	2	20 May	Mill Creek <sup>5</sup>
Total	47	52		

Nests were not found on 12 June 2000 in Lingle Creek or on 24 June in an unnamed tributary of Big Creek. \*wooden board and "press board," \*\*shovel spade, barrel, scrap metal. Localities: (1) at St. Rt. 127 bridge, Union Co., Illinois (T13S, R1W, Sec. 30, SE 1/4), (2) at Miller Rd. (Co. Rd. 1500E), 7 km W Dongola, near quarry, Union Co., Illinois (T13S, R1W, Sec. 20, SW 1/4), (3) upstream and downstream of Lake Road (Co. Rd. 035N) adjacent to town of Mill Creek, Union Co., Illinois (T13S, R1W, Sec. 32, SW 1/4), (4) at road bridge 3.5 km NW Ullin, Alexander Co., Illinois (T14S, R1W, Sec. 10, SW 1/4), (5) at road bridge 2.2 km WNW Ullin, Alexander/Pulaski Co. border, Illinois (T14S, R1W, Sec. 22, NW 1/4)

Appendix A. Sites from which specimens of *Etheostoma crossopterum* were preserved.

UT 91.5755 (2 adult males, 6 juveniles), Mill Creek, at road bridge 2.2 km WNW Ullin, Alexander/Pulaski Co. border, Illinois (T14S, R1W, Sec. 22, NW 1/4, 37°17'06"/89°12'25"), 20 May 2000, W.J. Poly & J.E. Wetzel; UT 91.5750 (3 adult males, 1 adult female), Mill Creek, upstream and downstream of Lake Road (Co. Rd. 035N) adjacent to town of Mill Creek, Union Co., Illinois (T13S, R1W, Sec. 32, SW 1/4, 37°20'29"/89°14'57"), 1 May 2000, W.J. Poly & J.E. Wetzel; UT 91.5753 (5 adult males, 8 adult females, 19 juveniles), tributary (unnamed) of Mill Creek, at road bridge 3.5 km NW Ullin, Alexander Co., Illinois (T14S, R1W, Sec. 10, SW 1/4, 37°18'19"/89°12'28"), 20 May 2000, W.J. Poly & J.E. Wetzel; UT 91.5757 (2 adults, 13 juveniles), tributary (unnamed) of Big Creek, at U.S. Rt. 51 bridge (Co. Rd. 1975E/1980E) in Dongola, Union Co., Illinois (T13S, R1W, Sec. 25, NE 1/4, 37°21'53"/89°09'48"), 24 June 2000, W.J. Poly

