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Laboratory Observations of Spawning Behavior in Two Species of Snubnose
Darters, *Etheostoma colorosum* and *E. tallapoosae*

Laboratory Observations of Spawning Behavior in Two Species of Snubnose Darters, *Etheostoma colorosum* and *E. tallapoosae*

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ABSTRACT

Laboratory observations of spawning behavior of the coastal darter (*Etheostoma colorosum*), and the Tallapoosa darter (*Etheostoma tallapoosae*) were made during April 1989 and April and May 1998. Spawning behavior was previously unreported for both of these relatively recently described species. Like other species of snubnose darters, both the coastal darter and the Tallapoosa darter are egg-attachers, using vegetation, rocks and logs for spawning substrate. Eggs are laid singly or in groups of two, and neither parent provides parental care. Like other species of egg-attaching darters, the two study species are non-territorial, but males are aggressive.

INTRODUCTION

The coastal darter (*Etheostoma colorosum*) and the Tallapoosa darter (*Etheostoma tallapoosae*) are both relatively recently described species of snubnose darters (Suttkus and Bailey, 1993; Suttkus and Etnier, 1991, respectively) confined to the southeastern United States. The Tallapoosa darter has a limited distribution, occurring only in the Tallapoosa River system in Alabama and Georgia above the Fall Line (Suttkus and Etnier, 1991), while the coastal darter is more widespread, occurring throughout the coastal drainages of southern Alabama and the Florida panhandle (Suttkus and Bailey, 1993). Virtually nothing is known about the biology of either of these species.

Our objective was to document the spawning behavior of these two poorly known species via observation in aquaria.

METHODS

A total of 11 (6 male and 5 female) coastal darters was collected at two localities: tributary, Spring Creek (Conecuh River drainage), 7.0 mi E Burnt Corn, Conecuh Co., AL, 11 April 1998, 5 males and 4 females, water temperature 16 C; Big Juniper Creek (Blackwater River drainage), 2.0 mi W Munson, Santa Rosa Co., FL, 12 April 1998, 1 male and 1 female, water temperature 16 C.

Two sets of spawning observations were made for the Tallapoosa darter. One set (made by HLB) was based on four

males and eight females collected from Gold Branch, county road 407, Elmore Co., AL, 27 April 1989, water temperature 19 C. The fish were placed in a refrigerated 84-liter aquarium set at 17 C with constant aeration. They were fed frozen blood worms once per day and maintained on a 12 h light schedule. The aquarium was provisioned with the following spawning substrata: large cobble piled to form cavities, vegetation-covered cobble, and patches of gravel and sand substrate. The aquarium was allowed to warm to room temperature, in order to induce spawning, prior to observation. Observations were made over a two-hour period, and several spawning bouts were photographed.

The second set of spawning observations for Tallapoosa darters was based on a total of 27 fish collected in 1998 from the following localities in the Tallapoosa River drainage: Gold Branch, county road 407, Elmore Co., AL, 27 April 1989, 4 males and 8 females; tributary, Cane Creek, 2.0 mi W Fruithurst, Cleburne Co., AL, 5 April 1998, 2 males and 3 females, water temperature 15 C; same locality, 8 April 1998, 1 male and 2 females; Elkahatchee Creek, county road 259, Tallapoosa Co., AL, 28 April 1998, 1 male and 1 female, water temperature 17 C; Jaybird Creek, county road 57, Tallapoosa Co., AL, 28 April 1998, 1 male and 4 females, water temperature 19 C.

In all 1998 observations involving coastal and Tallapoosa darters, fishes (separated by species) were introduced into 84-liter aquaria in the laboratory. Water temperature was 19-20 C, and constant aeration and filtration were maintained. Fishes were fed frozen blood worms twice a day, and maintained on a 10 h light schedule. Each aquarium was provisioned with all spawning substrates known to be used by darters, including: rock cavities (used by egg-clusterers and egg-clumpers), large rocks, a log and vegetation (used by egg-attachers) and gravel and sand substrate (used by egg buriers). Spawning was observed in *E. colorosum* every day from 13-20 April 1998. Spawning was observed in *E. tallapoosae* on 29 April 1989, and 8, 17 and 30 April 1998. Observation periods ranged from 15 min to 2 h. Most observations were videotaped, and detailed observations of behaviors were confirmed by reviewing tapes. Eggs recovered from aquaria were measured to the nearest 0.1 mm with an ocular micrometer, and placed in aerated gallon containers for incubation.

RESULTS

Spawning in *E. colorosum* was promiscuous, and males were aggressive but not territorial. Three females and four males participated in various spawning events. On at least three occasions females switched partners. During courtship and aggressive encounters with other males, the orange and blue breeding coloration of the male(s) intensified, and a dark black vertical bar developed that ran through the eye. Males often exhibited lateral displays to other males with the body held rigid and the dorsal fins extended. Males courted females by following them and occasionally making contact by rubbing the backs of females with their chins, breasts and pelvic fins. Females engaged in the substrate searching behavior described by Porterfield (1998); females would move slowly about the tank, occasionally stopping to inspect an area of substrate. When ready to spawn, females usually exhibited head jabs, where the female appeared to bite at the substrate. Immediately following a head jab (1-4 jabs, mean=2.35, SD=1.08), the female would be mounted by the male and the pair would vibrate (mean duration of vibration=1.23 s, SD=0.31), presumably depositing 1-2 fertilized eggs. Eggs were abandoned after spawning. A total of 17 spawning events was observed, and in every case eggs were attached to objects in the tank or the glass aquarium wall. Five eggs (mean diameter=1.0 mm, SD= 0.07) were recovered from the tank; two from the log (two together), one from a large rock and two (separate) from the outside of a nest tile. Attempts to raise eggs to hatching were unsuccessful.

In 1989 observations of *E. tallapoosae*, males appeared to be past peak spawning coloration when collected. In the field, males released milt and females expressed eggs on slight pressure, suggesting that they were actively spawning. In the aquarium, only the largest of the four males spawned. In the 1998 observations, large and small males spawned (three males and four females). In both sets of observations, males displayed intensified coloration during courtship and aggressive encounters with other males. Spawning was promiscuous, and no territoriality was observed. Courtship and spawning were as described above for *E. colorosum*: females displayed 2-4 head jabs (mean=2.6, SD=0.64) and the mean duration of spawning vibration=1.18 s, SD=0.23. Twelve spawning events were observed for four pairs; ten eggs were recovered from the aquarium walls, and three were deposited on ceramic tiles (mean diameter=1.2 mm, SD=0.08). Two larvae were raised to post-hatching (5 mm TL), preserved, and vouchered in the Auburn University Fish Collection.

DISCUSSION

Our observations demonstrate that both *E. colorosum* and *E. tallapoosae* are egg-attaching species. Other modes of spawning in darters include egg-burying, egg-clumping and egg-clustering (Page, 1985). Egg-attaching behavior has been described for numerous species of darters, including other species of snubnose darters (Winn, 1958; O'Neil, 1981; Page and Mayden, 1981; Page et al., 1982; Carney and Burr, 1989; Keevin et al., 1989; Bauer et al. 1995; Johnston and Haag, 1996; Johnston and Shute 1997; Porterfield, 1998), and darters in other subgenera, including: *Belophlox* (Collette and Yerger, 1962); *Boleichthys* (Fletcher, 1957; Braasch and Smith, 1967; Schenck and Whiteside, 1977; Burr and Page, 1978, 1979); *Etheostoma* (Fahy, 1954); *Fuscatelum* (Johnston, 1994); *Ioa* (Winn and Picciolo, 1960); *Oligocephalus* (Strawn, 1956; Seesock et al., 1978; Page et al., 1982); *Ozarka* (Boschung, 1979; Johnston, 1995); *Vaillantia* (Page et al., 1982; Bart, 1992); and *Villora* (Williams, 1976). As discussed by Page (1985), the attachment of small eggs over a wide area may reduce egg predation, because the eggs may be difficult for predators to locate.

Although egg-attaching is a widespread spawning mode in darters, there appears to be very little variation in behavior among species. Our results suggest that the spawning behavior of *E. colorosum* and *E. tallapoosae* is superficially similar, and is also similar to the spawning behavior of other snubnose darters. Similarities include the lack of territoriality, male following behavior, number and small size of eggs laid, and female behavior (head jabs and substrate searching) as described by Porterfield (1998). It is possible, however, that a detailed assessment of courtship behavior, habitat selection and spawning substrate selection may reveal differences among species of egg attachers, including *E. colorosum* and *E. tallapoosae*. Although we did not have enough data for statistical tests, the number of head jabs and duration of spawning vibration may differ between our two study species. Porterfield (1997) found differences in spawning microhabitat for two sympatric species of snubnose darters, *Etheostoma flavum* and *Etheostoma simoterum*. Such differences may be important clues to the evolutionary histories of these diverse fishes, and may also assist conservationists in habitat protection efforts.

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LITERATURE CITED

- Bart, H.L. 1992. Spawning behavior of *Etheostoma davisoni* Hay. *Copeia* 1992:537-539.
- Bauer, B.H., D.A. Etnier and N.M. Burkhead. 1995. *Etheostoma (Ulocentra) scotti* (Osteichthyes: Percidae), a new darter from the Etowah River system in Georgia. *Bull. Ala. Mus. nat. Hist.* 17:1-16.
- Boschung, H. 1979. Report on the breeding habits of the slackwater darter (Percidae: *Etheostoma boschungii*) in the Cypress Creek watershed. Submitted to U.S. Department of Agriculture Soil Conservation Service, Auburn, AL.
- Braasch, M. E. and P. W. Smith. 1967. The life history of the slough darter, *Etheostoma gracile* (Pisces: Percidae). *Ill. Nat. Hist. Surv. Biol. Notes* 58. 12 p.
- Burr, B. M. and L. M. Page. 1978. The life history of the cypress darter, *Etheostoma proeliare*, in Max Creek, Illinois. *Ill. Nat. Hist. Surv. Biol. Notes* 106. 15 p.
- Burr, B. M. and L. M. Page. 1979. The life history of the least darter, *Etheostoma microperca*, in the Iroquois River, Illinois. *Ill. Nat. Hist. Surv. Biol. Notes* 112. 15 p.
- Carney, D. A. and B. M. Burr. 1989. Life histories of the bandfin darter, *Etheostoma zonistium*, and the firebelly darter, *Etheostoma pyrrhogaster*, in western Kentucky. *Ill. Nat. Hist. Surv. Biol. Notes* 134. 16 p.
- Collette, B. B. and R. W. Yерger. 1962. The American percid fishes of the subgenus *Villora*. *Tulane Stud. Zool.* 9:213-230.
- Fahy, W. E. 1954. The life history of the northern greenside darter, *Etheostoma blennioides blennioides* Rafinesque. *J. Elisha Mitchell Sci. Soc.* 70:139-205.
- Fletcher, A. M. 1957. A rare darter-spawning. *Aquarium* 26:202-203.
- Johnston, C. E. 1994. Spawning behavior of the goldstripe darter (*Etheostoma parvipinne* Gilbert) (Percidae). *Copeia* 823-825.
- Johnston, C. E. 1995. Spawning behavior of the paleback darter (*Etheostoma pallidorsum* Distler and Metcalf) (Percidae). *Southwest. Nat.* 40:422-425.
- Johnston, C. E. and W. R. Haag. 1996. Life history of the Yazoo darter (Percidae: *Etheostoma raneyi*), a species endemic to north-central Mississippi. *Tulane Stud. Zool. Bot.* 30:47-60.
- Johnston, C. E. and J. R. Shute. 1997. Observational notes on the spawning behavior of the blue shiner (*Cyprinella caerulea*) and the holiday darter (*Etheostoma brevirostrum*), two rare fishes of the Conasauga River, Georgia and Tennessee. *Proceed. Southeast. Fish. Council.* 35:1-2.
- Keevin, T. M., L. M. Page and C. E. Johnston. 1989. The spawning behavior of the saffron darter (*Etheostoma flavum*). *Trans. Ky. Acad. Sci.* 50:55-58.
- O'Neil, P. E. 1981. Life history of *Etheostoma coosae* (Pisces: Percidae) in Barbaree Creek, Alabama. *Tulane Stud. Zool. Bot.* 23:75-83.
- Page, L. M. 1985. Evolution of reproductive behaviors in percid fishes. *Illinois Nat. Hist. Surv. Bull.* 33:275-295.
- Page, L. M. 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* 117:1-11.
- Page, L. M., M. E. Retzer and R. A. Stiles. 1982. Spawning behavior in seven species of darters (Pisces: Percidae). *Brimleyana* 8:135-143.
- Porterfield, J. C. 1997. Separation of spawning habitat in the sympatric snubnose darters *Etheostoma flavum* and *E. simoterum* (Teleostei, Percidae). *Trans. Ky. Acad. Sci.* 58:4-8.
- Porterfield, J. C. 1998. Phylogenetic systematics of snubnose darters (Percidae, *Etheostoma*), with discussion of reproductive behavior, sexual selection, and the evolution of male breeding color. Doctoral thesis, University of Illinois at Urbana-Champaign. 153 p.
- Schenck, J. R. and B. G. Whiteside. 1977. Reproduction, fecundity, sexual dimorphism, and sex ratio of *Etheostoma fonticola* (Osteichthyes: Percidae). *Amer. Midl. Nat.* 98:365-375.
- Seesock, W. E., J. S. Ransey and F. L. Seesock. 1978. Life and limitation of the coldwater darter (*Etheostoma ditrema*) in Glencoe Spring, Alabama. *Assoc. Southeast. Biol. Bull.* 25:56.
- Strawn, K. 1956. A method of breeding and raising three Texas darters. Part II. *Aquarium Journal* 27:12-14, 17, 31-32.
- Suttkus, R. D. and R. M. Bailey. 1993. *Etheostoma colorosum* and *E. bellator*, two new darters, subgenus *Ulocentra*, from southeastern United States. *Tulane Stud. Zool. Bot.* 29:1-28.
- Suttkus, R. D. and D. A. Etnier. 1991. *Etheostoma tallapoosae* and *E. brevirostrum*, two new darters, subgenus *Ulocentra*, from the Alabama River drainage. *Tulane Stud. Zool. Bot.* 28:1-24.
- Williams, J. S. 1976. Life history of the brown darter, *Etheostoma edwini* (Pisces: Percidae), in northwestern Florida. M.S. Thesis. University of West Florida, Pensacola. 39 p.
- Winn, H. E. 1958. Comparative reproductive behavior and ecology of fourteen species of darters (Pisces-Percidae). *Ecol. Monog.* 28:155-191.
- Winn, H. E. and A. R. Picciolo. 1960. Communal spawning of the glassy darter *Etheostoma vitreum* (Cope). *Copeia* 1960:186-192.