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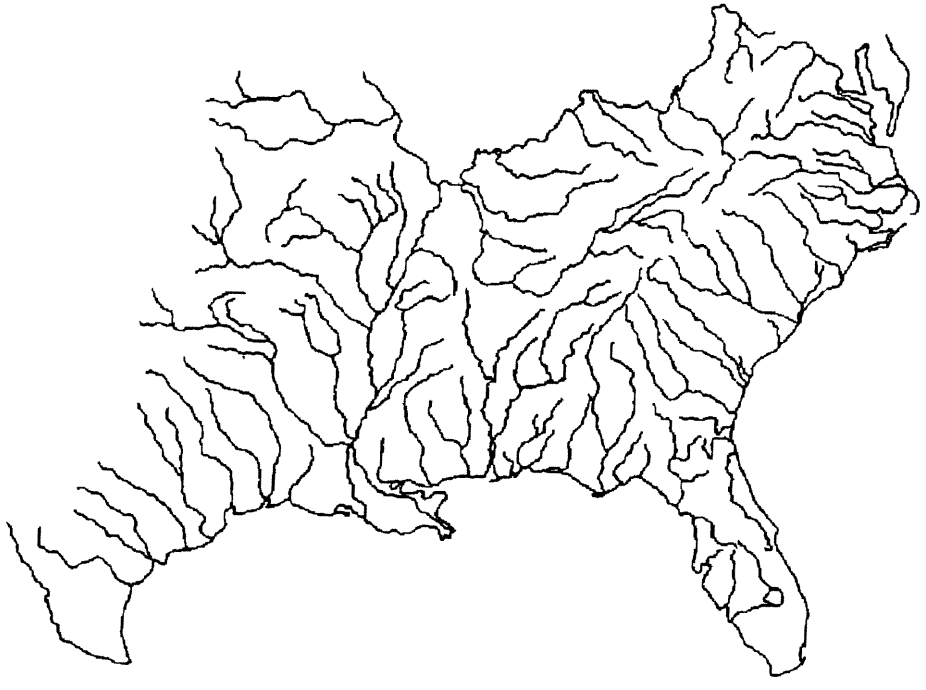

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# Observations of Watersnake (*Nerodia*, Colubridae) Predation on Darters (Percidae)

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## ABSTRACT

We report observations of predation by watersnakes (*Nerodia*, Colubridae) on darters (Percidae) and summarize other literature documenting this relationship. We observed two midland watersnakes, *Nerodia sipedon pleuralis*, preying on darters (Percidae) in the Sipsey Fork of the Black Warrior River (Mobile Basin), Bankhead National Forest, Winston County, AL on 7 and 8 August 2002. We observed the snakes (about 250 and 500 mm total length) with their captured darters in separate, shallow (<0.6 m) runs. We identified the darters as an adult river darter, *Percina shumardi*, and an adult Tuskaloosa darter, *Etheostoma douglasi*, two of the most abundant benthic fishes in shallow flowing waters of the river. Compilation of our observations and the literature on *Nerodia* diets revealed 12 species of darters (seven *Etheostoma* and five *Percina*) are documented prey of *Nerodia*. Our results suggest watersnake predation is a frequent, but relatively poorly known, source of mortality for darters.

## INTRODUCTION

Watersnakes of the genus *Nerodia* (Colubridae) are among the most widespread and conspicuous vertebrates along shorelines of streams, wetlands, and lakes of the eastern United States (Conant and Collins, 1998; Ernst et al., 2003). Darters of the genera *Etheostoma* and *Percina* (Percidae) are the most diverse and abundant benthic fishes in shallow-water habitats of eastern streams (Page and Burr, 1991). *Nerodia* frequently forage in these habitats (Brown, 1958; Drummond, 1983; Savitzky and Burghardt, 2000). *Nerodia* rely primarily on aquatic organisms as prey, and fishes are the predominant dietary component during at least one life stage of the snakes (Brown, 1958; Greene et al., 1994; King, 1986; Mushinsky and Hebrard, 1977; Mushinky et al., 1982). We document field observations of predation by small *Nerodia* on darters in a southeastern river and summarize other literature documenting the predator-prey relationship of *Nerodia* and darters.

## RESULTS

We observed two midland watersnakes, *Nerodia sipedon pleuralis*, preying on darters (Percidae) in the Sipsey Fork of the Black Warrior River, Bankhead National Forest, near the mouth of Hurricane Creek, Winston County, AL (34°15'09"N, 87°22'00"). We observed one snake (about 250 mm total length) at mid-morning (1000 h, 7 August 2002) and another, larger snake (about 500 mm total length) in mid-afternoon (1400 h, 8 August 2002) in habitats separated by about 300 m. In both cases, we observed the snakes swimming across shallow (<0.6 m), flowing, rocky runs with live fish in their mouths. After the snakes reached shore and repositioned the prey in their mouths, we identified the fishes as an adult river darter (*Percina shumardi*, about 70 mm total length) and an adult Tuskaloosa darter (*Etheostoma douglasi*, about 50 mm total length). The snakes swallowed the live darters head first shortly after reaching shore. These two darter species are among the most abundant, small benthic fishes in flowing waters of this section of the river (Powers et al., 2003; unpublished data, M. Warren and W. Haag). Ours is the first detailed, published field observation of watersnakes consuming live darters, although Page (1983:172) noted an unpublished observation (by P.W. Smith) of *Nerodia* feeding on *Percina sciera* in the Brazos River, TX.

Compilation of literature and our observations revealed that 12 darter species consisting of seven species of *Etheostoma* and five species of *Percina* are known prey of *Nerodia* (Table 1). We found three additional reports that did not identify darters to species (i.e., Brown, 1958; Hamilton, 1951; King, 1986). Occurrence of darters in the diets of *Nerodia* are reported in a variety of aquatic habi-

tats from New York and the Great Lakes states south to Texas, Georgia, and Alabama and involve at least three species of *Nerodia* (Table 1).

## DISCUSSION

The importance of *Nerodia* predation as a source of darter mortality is not well-documented, but the data we compiled suggest frequent predation on darters, particularly by small snakes. In New York, Ohio, and Michigan, darters occurred in 13.6 to 22.3% of all *Nerodia sipedon* stomachs examined (Brown, 1958; Hamilton, 1951; Raney and Roecker, 1947), but percentages were higher (31.5%) when only smaller snakes (<380 mm total length) were included (Brown, 1958). In Georgia streams, 7.1% of *Nerodia taxispilota* stomachs contained darters (Camp et al., 1980). The orangethroat darter, *Etheostoma spectabile*, occurred in 3.4% of the stomachs of neonates (snout-vent length <300 mm) of riverine *Nerodia harteri*, but did not occur in stomachs of juveniles or adults (Greene et al., 1994). In a reservoir population of *N. harteri*, the bigscale logperch (*Percina macrolepida*), occurred more frequently (35.4%) than any other organism despite being among the least abundant potential prey (Greene et al., 1994).

The small size and benthic habits of darters and their general association with shallow, flowing water and complex cover are all attributes considered to limit success of piscivorous predators in streams (Matthews, 1998). In most cases, darters comprise an almost incidental component in the diet of their predators (mostly other fishes, occasionally mammals or birds) (Page, 1983), but our observations and review suggest watersnake predation on darters is not incidental. Foraging strategies of *Nerodia* include underwater substrate crawling with frequent crevice probing in shallow, structurally-complex habitats (Drummond, 1983; Savitzky and Burghardt, 2000). These tactics are likely highly effective for locating and capturing darters, suggesting that predation by watersnakes is an underappreciated source of mortality for darters.

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