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Food Habits of the Federally Threatened Leopard Darter (Percina pantherina)

ABSTRACT.—We examined food habits of the federally threatened leopard darter in six rivers in southeastern Oklahoma and southwestern Arkansas using guts collected from 1994 to 1997. The families Baetidae and Chironomidae were the most common food items selected by leopard darters. In general, leopard darters are selecting food items that are relatively common in the environment; thus, food availability may not be a factor limiting abundance.

INTRODUCTION

The leopard darter, *Percina pantherina*, is a U.S. federally threatened species endemic to the Little River system in southeastern Oklahoma and southwestern Arkansas (Zale *et al.*, 1994; Williams *et al.*, 1999). Factors limiting the recovery of the leopard darter include, but are not limited to, water quality degradation caused by timber and agricultural industries (Eley *et al.*, 1975; Rutherford *et al.*, 1992), drought (Williams *et al.*, 1999), poorly constructed road crossings (Toepfer *et al.*, 1999; Schaefer *et al.*, 2003) and impoundments (Zale *et al.*, 1994). Ultimately, availability of suitable habitat for growth and spawning is likely the greatest limiting factor for a species like the leopard darter that lives approximately 18 mo and spawns once during its lifetime (James *et al.*, 1991; Zale *et al.*, 1994).

Since its description (Moore and Reeves, 1955) and subsequent listing as threatened (U.S. Fish and Wildlife Service, 1978), the leopard darter has received considerable attention from researchers. Despite extensive surveys to document its distribution (Zale *et al.*, 1994), population size and viability (Williams *et al.*, 1999; Toepfer *et al.*, 2000), life-history (James *et al.*, 1991) and genetic structure (Echelle *et al.*, 1999), no comprehensive diet study has been conducted because of the lack of available specimens. From 1994 to 1997, 131 leopard darters were collected from seven sites (five rivers) to provide tissue samples for a survey of genetic variation (Echelle *et al.*, 1999). Because we had to sacrifice specimens to obtain the tissues necessary for genetic analysis, we also dissected and preserved the guts of each fish for a diet survey. Prior to our study, only two previous reports of diet had been published and from only very limited sample sizes, seven (Robison, 1978) and 19 (James *et al.*, 1991) specimens. In this study, we examined the guts collected during the genetic survey (Echelle *et al.*, 1999) to describe diet of the leopard darter. Our study represents the most comprehensive analysis of diet for this species to date, a potentially critical component to any successful recovery plan.

METHODS AND MATERIALS

From October 1994 to October 1997, a total of 131 leopard darters were collected from seven sites in the Little River basin (Fig. 1). Of those original collections, we examined 122 guts. Specimens from Big Eagle Creek were not examined for diet because they had been used in a captive swimming speed experiment (Toepfer *et al.*, 1999) and were, thus, being fed a commercial diet prior to dissection. All other specimens were preserved in liquid nitrogen in the field. In the laboratory, fish were thawed and guts (esophagus, stomach, and small intestine) removed and stored in 70% ethanol solution for permanent storage. Gut contents were examined for each fish specimen and contents identified (usually to family) and counted (Williams *et al.*, 2003).

RESULTS

We found a total of nine families of macroinvertebrates representing six orders in the 122 leopard darter guts that were examined, 23 of which were empty (Table 1). The most common families in guts were Baetidae (at all sites), Chironomidae (at all sites except Robinson Fork) and Heptageniidae (all sites). A number of taxa were found in guts at only one site (Table 1), with the majority from Mountain Fork River which had the greatest number of guts examined.

DISCUSSION

Several recent studies indicate that leopard darter populations may be relatively secure at present (Williams *et al.*, 1999; Toepfer *et al.*, 2000; Schaefer *et al.*, 2003), although the species is particularly

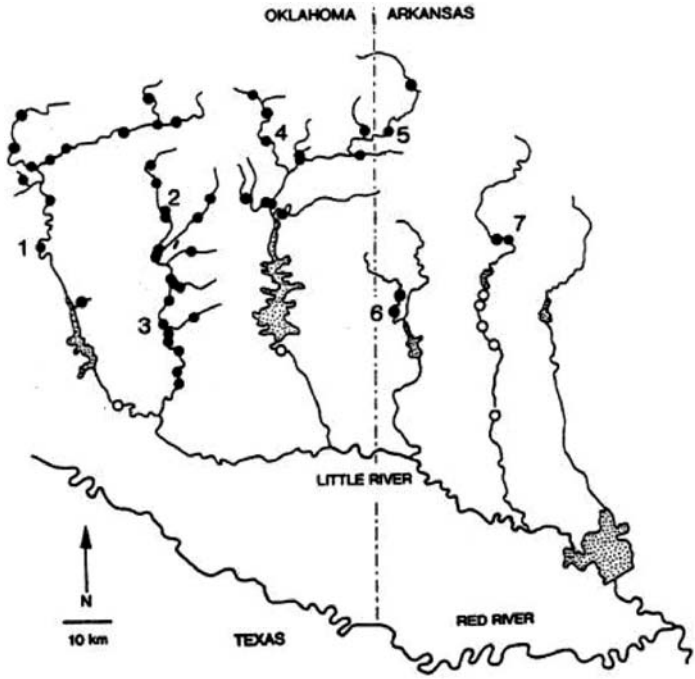

FIG. 1.—Map showing location of historical leopard darter sampling locations and sites sampled as part of this study

susceptible to drought conditions [Williams *et al.*, 1999, R. Standage (USFS) and K. Collins (USFWS), unpubl. data]. Although, genetic differences among populations (Echelle *et al.*, 1999) and small population sizes in the Arkansas rivers (Williams *et al.*, 1999) are a significant conservation concern.

Availability of food resources does not seem to be a factor limiting leopard darter population size. The three macroinvertebrate taxa most actively selected (Baetidae, Heptageniidae and Chironomidae) are quite abundant in the rivers we sampled and do not seem particularly vulnerable to anthropogenic disturbances (Voshell, 2002). In a recent macroinvertebrate survey of the same sites in 2004, these three families represented over 44% of the total catch (out of 47 families within 23 orders, L. Williams, unpubl. data). Although this macroinvertebrate survey was separated from gut samples by a decade for some specimens, we did not note significant changes in habitat among the sites. Two of the authors (LRW, MGW) were present for all the collections in 1994–1997 and 2004.

Our study did quantify some differences in diet as compared to previous work. Robison (1978) found Baetide, Coleoptera and three families of Dipterans (Chironomidae, Simuliidae and Chaoboridae) in

TABLE 1.—Relative abundance (%) of macroinvertebrate taxa found in guts of leopard darters 1994–1997

Order	Family	Total	Relative abund	Sites
Bivalvia		2	0.463	7
Diptera	Chironomidae	147	34.028	1–3, 5, 7
	Ephydridae	2	0.463	5
	Tabanidae	1	0.231	5
	Pupae	1	0.231	5
Ephemeroptera	Baetidae	231	53.472	1–3, 5–7
	Caenidae	2	0.463	5
	Ephemerellidae	1	0.231	1
	Heptageniidae	36	8.333	1–3, 5–7
	Isonychiidae	2	0.463	5
	Unknown	4	0.926	7
Isopoda	Asellidae	1	0.231	3
Plecoptera	*Unknown*	1	0.231	2
Tricoptera	*Unknown*	1	0.231	2
Grand Total		432		
Total Guts		122		
Empty		23		

Number of guts examined per site: Site 1 (17), Site 2 (28), Site 3 (22), Site 4 (0), Site 5 (35), Site 6 (5), Site 7 (15)

the guts of seven leopard darters. From 19 guts, James *et al.* (1991) found Baetidae, Heptageniidae, Simuliidae and Chironomidae. Through our examination of 122 guts, we added numerous taxa but did not find blackfly (Simuliidae) or ghost midge (Chaoboridae) larvae. While these taxa may certainly be important food items for leopard darters, their presence in the diet is likely seasonal and these food items were not available in significant numbers during our collections. The darters examined by Robison (1978) and James *et al.* (1991) were museum specimens that were likely collected across a range of years and seasons.

Until we have a better understanding of why leopard darters are threatened, it will continue to be difficult to effectively manage their populations in the future.

Additional studies of basic ecological and life-history characteristics of leopard darters are necessary to understand how current threats from anthropogenic disturbances affect population size (Williams *et al.*, 1999; Schaefer *et al.*, 2003).

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