
Food Habits of the Banded Sculpin (*Cottus carolinae*) in Oklahoma With Reference to Predation on the Oklahoma Salamander (*Eurycea tynerensis*)

Renn Tumilson¹ and George R. Cline²

Oklahoma Cooperative Fish and Wildlife Research Unit and Department of Zoology, Oklahoma State University, Stillwater, OK 74078

¹Current address: Department of Biology, Henderson State University, Arkadelphia, AR 71999

²Current address: Department of Biology, Jacksonville State University, Jacksonville, AL 36265

In the Ozark Mountains of Arkansas and Oklahoma, the banded sculpin (*Cottus carolinae*) inhabits clear, cold-water streams with gravel bottoms (1,2). The Oklahoma salamander, *Eurycea tynerensis*, is endemic to the same clear gravel-bottomed streams located along the western slopes of the Ozark Mountains of Oklahoma, Missouri, and Arkansas (3). During our study of the distribution and habitat of this salamander (3,4), the abundance of sculpins at many sites led to a question of the impact of sculpins as predators of the salamanders.

The Oklahoma salamander is listed under Oklahoma state regulations as a "state species of special concern," and is provided some protection under State Title 800, Section 25-7-9. The Oklahoma Department of Wildlife Conservation (ODWC) developed a list of "Species of Greatest Conservation Need," and placed the Oklahoma salamander in Tier 2 of six tiers, with Tier 1 representing the highest conservation priority. The Oklahoma Natural Heritage program gave the salamander a global score of G3 and a state score of S3 (on a scale of 1-5, with one being most imperiled). The conservation interests for the Oklahoma salamander highlight the need for information pertaining to the impact of natural predators such as sculpins on populations of the salamander.

Banded sculpins have large mouths and act as ambush predators. They are known to consume a variety of prey, including crayfish, snails, fishes, and insects (1,2), but it is not known whether sculpins are significant predators of salamanders.

Our goal was to evaluate food habits of sculpins from waters supporting the Oklahoma salamander to interpret the relationship between these organisms.

During May of 1988, we collected 82 specimens of *C. carolinae* from five locations in Oklahoma: (a) Delaware Co., Cherokee Creek northeast of Colcord, S8 T21N R24E; (b) Cherokee Co., Rock Creek at Camp Egan, S11 T18N R23E; (c) Adair Co., Tyner Creek near US Hwy 62, S8 T17N R23E; (d) Adair Co., Courthouse Creek near Christie, S13 T17N R24E; and (e) Mayes Co., Snake Creek 3 km south of Locust Grove, S34 T20N R20E. All locations supported populations of the Oklahoma salamander at the time of sampling (3).

Sculpins were preserved, measured, and dissected to reveal food habits based on contents of the stomachs. In the field, we selected sculpins for our study on the basis of presumed adequate size to be able to prey on *E. tynerensis*. Although sculpins may attain a length of about 203 mm (1), most adult specimens are 65-125 mm in length (2,5). We included specimens as small as 43 mm in length and set no upper limit (standard length of specimens available at the time of sampling ranged between 43-93 mm, Table 1).

A total of 491 individual food items was recovered and identified. Ephemeropterans were the most common food item (Table 1) and accounted for 39.7% of the total number of items. Of those, 89.7% were of the family Baetidae, and the remainder were Heptageniidae.

TABLE 1. Number of food items recovered from the stomachs of 82 banded sculpins collected in northeastern Oklahoma, from streams supporting populations of Oklahoma salamanders. *N* represents the sample size of sculpins from each stream.

Site ^a	<i>N</i>	SL ^b (Range)	EPHEM ^c	DIPT	ISOP	AMPH	GAST	FISH	MISC	TOT
a. Cherokee	26	64.0(44-83)	105	126	21	39	0	0	6	297
b. Rock	46	66.1(53-93)	58	7	4	0	40	10	7	126
c. Tyner	4	59.3(43-83)	5	3	1	0	0	2	8	19
d. Courthouse	1	76.0 —	4	7	0	0	0	0	0	11
e. Snake	5	67.2(63-74)	23	8	5	0	0	0	2	38
TOTAL	82	65.3(43-93)	195	151	31	39	40	12	23	491

^a Site letters refer to creeks whose locations are described in text.

^b Values are mean standard length and range of lengths (mm) of sculpins for each site.

^c Abbreviations of food categories as follows: EPHEM, Ephemeroptera; DIPT, Diptera; ISOP, Isopoda; AMPH, Amphipoda; GAST, Gastropoda; FISH, Fishes; MISC, Miscellaneous; TOT, total number of items from the site.

The second most commonly taken prey were dipterans, which dominated the diet in sculpins from Cherokee Creek and composed 30.8% of the total number of items. Chironomids accounted for 98.0% of the dipterans, and the remainder was blackfly larvae (*Simulium* sp.)

Gastropods (genus *Physa*) made up 8.1% of the prey items, but these were from only two sculpins collected at Rock Creek, each with 26 and 14 individuals in the stomach. Amphipods (7.9% of the items) were found only in sculpins from Cherokee Creek and were present in 14 of the 26 sculpins collected there. The restriction of Amphipods to stomachs of the salamander from Cherokee Creek, part of the Spavinaw drainage, is consistent with the findings of food habits of sympatric *E. tynerensis* throughout the range (6), indicating opportunistic feeding by both species. Also common in sculpins from Cherokee Creek were Isopods (genus *Lirceus*), found in 11 of the 26 specimens. Isopods comprised 6.3% of the total prey items.

Sculpins also consumed other fishes, accounting for 2.4% of the items recovered. Of the 12 fishes (10 of which were from Rock Creek), five could not be identified, two were smaller creek chubs (*Semotilus atromaculatus*), and five were darters (genus *Etheostoma*). Three of the darters could be identified as fantail darters (*E. flabellare*), one of which was a gravid female.

The miscellaneous category was composed of one each of a spider (Araneae), aquatic oligochaete, caddisfly (Hydropterygidae), damselfly naiad (Zygoptera), and ostracod. Nine stoneflies (Plecoptera), two crayfishes (Decapoda), and six beetles (Coleoptera) were found. Of the beetles, one was a larval predaceous diving beetle (Dytiscidae), one was an adult riffle beetle (Elmidae), two were water scavenger beetles (Hydrophilidae), and the other two were unidentified adult and larval taxa.

Also in the miscellaneous category was one Oklahoma salamander, recovered from a sculpin collected in Snake Creek. An index of density (catch per unit effort) of Oklahoma salamanders at this site was eight per work hour (3). We observed sculpins foraging by day and night, but Greenberg and Holtzman (7) noted that banded sculpins fed primarily at night. Oklahoma salamanders appear to be lunarphobic (8) so may not be as accessible to sculpins as are other prey. Because of the apparent scarcity of this food item based on our sample of sculpins, it seems likely that sculpins do not pose a serious threat as a predator on populations of the Oklahoma salamander.

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