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AN ANALYSIS OF STOMACH CONTENTS OF THE OUACHITA MADTOM *(NOTURUS LACHNERI)* IN THREE STREAMS OF THE UPPER SALINE RIVER DRAINAGE, ARKANSAS

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ABSTRACT

A study was conducted to identify typical foods eaten by the Ouachita madtom *(Noturus lachneri)*, an endemic ictalurid of central Arkansas, and to compare these foods to the invertebrate community. Fish and invertebrate samples were collected in August and October, 1990, from a pool and adjacent riffle habitat in each of 3 streams in the upper Saline River drainage. Kick-net and electrofishing samples were collected at each site and the invertebrate organisms were identified to the lowest possible taxa. Stomachs from the *N. lachneri* specimens were removed and the contents were identified to order. Frequency of occurrence of each taxon was compared between stomach contents and kick-net samples. Similarities between kick-net samples and stomach contents indicate that *N. lachneri* specimens were not highly selective in food preference in the riffle and pool habitats of these Ouachita Mountain streams.

INTRODUCTION

The Ouachita madtom (*Noturus lachneri* Taylor) is an endemic ictalurid of the upper Saline and Ouachita rivers located in the Ouachita Mountains of central Arkansas (Robison and Buchanan, 1988). This species is not federally protected but has been considered threatened because of its small population size and habitat vulnerability (Robison and Harp, 1985). The possibility of habit degradation due to land management practices and road and bridge construction has increased the need for ecological studies of this species.

Robison and Harp (1985) reported that *N. lachneri* inhabits clear, high gradient streams, having a cobble, gravel, or fine substrate. Individuals are found in the quiet backwater areas of these streams.

Preliminary studies indicated that *N. lachneri* feeds mostly at night (Robison and Harp, 1985) as do several other members of the genus *Noturus* (Pfleiger, 1975). Nineteen specimens of *N. lachneri* were examined by Robison and Harp (1985) for food items. Insect larvae of the orders Ephemeroptera and Diptera were the most prevalent. The objective of the present study was to further characterize the foods eaten by *N. lachneri* and to compare these to the aquatic invertebrate community.

METHODS

Collections were made from 3 streams within the Saline River drainage. These streams included: (1) Cypress Creek near Paron Arkansas, (2) Alum Fork upstream of Lake Winona, and (3) Bread Creek, a tributary of Alum Fork. Six sample sites were selected. We chose one pool and an adjacent riffle habitat in each of the three streams. Each sample site was characterized with respect to physical parameters as described by Platts *et al.* (1987) and McCain *et al* (1990). Variables included widths, depths, and substrate composition (Table 1). Sample sites were selected with regard to density of *N. lachneri* collected in previous samples (Tatum, unpublished data). Benthic macroinvertebrates and *N. lachneri* specimens were collected on 8-13-90, 8-24-90, and 10-28-90. Fish were collected the day following invertebrate collections.

Table 1. Physical variables of three streams of the upper Saline River drainage, Saline County, Arkansas.

	Alum Fork		Bread Creek		Cypress Creek	
	Pool	Riffle	Pool	Riffle	Pool	Riffle
Average Depth (cm)	52	17	25	4	17	7
Average Width (m)	9	9	8	2	7	3

	Substrate Composition (%)		
	Boulder[1]	Cobble[2]	Gravel[3]
Alum Fork, riffle	30	50	20
Alum Fork, pool	25	50	25
Bread Creek, riffle	20	40	40
Bread Creek, pool	25	60	15
Cypress Creek, riffle	40	50	10
Cypress Creek, pool	30	60	10

[1] >20 cm
[2] >8 cm <20 cm
[3] <8 cm

Aquatic invertebrates were dislodged by systematically kicking the substrate in each site for five minutes. The dislodged organisms were collected in a 25 cm x 40 cm hand-held net (1 mm mesh) and preserved in 70% ethanol. In the laboratory, benthic organisms were identified to family using keys by Pennak (1978) and Merritt & Cummins (1984). Individuals were counted (Table 2) and stored in a reference collection (Arkansas Tech University). Betty Cochran (fisheries biologist, U.S.

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Forest Service, personal communication, 2-15-91) verified the identifications. Frequency of occurrence and relative frequency values were determined for each order.

Table 2. Numbers of aquatic invertebrates from kick-net samples from upper Saline River drainage, Saline County, Arkansas.

Taxa	Pools	Riffles	Summer	Fall	Total
Coleoptera	107	104	138	73	211
Trichoptera	3	5	2	6	8
Ephemeroptera	261	358	150	469	619
Plecoptera	5	11	7	9	16
Megaloptera	7	18	8	17	25
Odonata	63	34	45	52	97
Diptera	11	9	14	6	20
Isopoda	35	54	22	67	89
Decapoda	10	22	9	23	32
Sample Size	6	6	6	6	12

Noturus lachneri specimens were collected by electrofishing. The two-man crew collected as many *N. lachneri* as possible in one pass through each site. One to seven specimens from each sample site were preserved in 10% formalin. Abdominal cavities were injected with 10% formalin to halt further digestion and to preserve the contents. Fish were collected between 2300 and 0100 hrs and between 0400 and 0700 hrs during the summer sample. A higher proportion of fish collected in the morning had full stomachs, therefore subsequent sampling was in the morning (0400 to 0700).

Within the next four months, stomachs were removed from each specimen. The contents were identified to order, counted (Table 3), and retained in individual vials in 70% ethanol. Frequency of occurrence and relative frequency values were determined for each taxon. The macroinvertebrate reference collection from our kick-net sampling was used for comparison with the stomach contents as an aid in identification.

Table 3. Numbers of aquatic invertebrates from stomach contents of the Ouachita madtom *(Noturus lachneri)*, upper Saline River drainage, Saline County, Arkansas.

Taxa	Pools	Riffles	Summer	Fall	Total
Coleoptera	3	11	12	2	14
Trichoptera	-	1	-	-	1
Ephemeroptera	32	42	46	28	74
Plecoptera	35	15	-	50	50
Megaloptera	20	24	36	8	44
Odonata	-	1	0	1	1
Diptera	66	83	99	50	149
Isopoda	12	15	16	11	27
Decapoda	3	1	1	3	4
Zooplankton	28	78	69	37	106
Sample Size	26	25	23	28	51

Frequency of occurrence values from stomach contents and kick-net samples were compared to determine if differences existed between organisms consumed and the availability of those organisms. Frequency of occurrence values of stomach contents and kick-net samples were also used to determine if differences existed between habitats and seasons.

RESULTS AND DISCUSSION

Of the 51 *Noturus lachneri* specimens examined, 45 had food in their stomachs. A total of 12 kick-net samples was taken to characterize the benthic macroinvertebrate communities. Comparisons were made to determine if habitat or seasonal variations existed with regard to prey availability and food preference. Comparisons of frequency of occurrence values revealed little difference between pool and riffle habitats in the kick-net samples and the stomach contents (Fig. 1). There was little seasonal difference in the kick-net samples. Fall stomach contents showed a lower frequency of occurrence of coleopterans and megalopterans than in summer samples, and a higher frequency of occurrence of trichopterans, plecopterans, odonates, and decapods (Fig. 2). Variation in the seasonal use of these taxa may be due to increased size and mobility of coleopterans and megalopterans than in summer samples, and a higher frequency of occurrence of trichopterans, plecopterans, odonates, and decapods (Fig. 2). Variation in the seasonal use of these taxa may be due to increased size and mobility of coleopterans and megalopterans during their development (Figures 1 and 2).

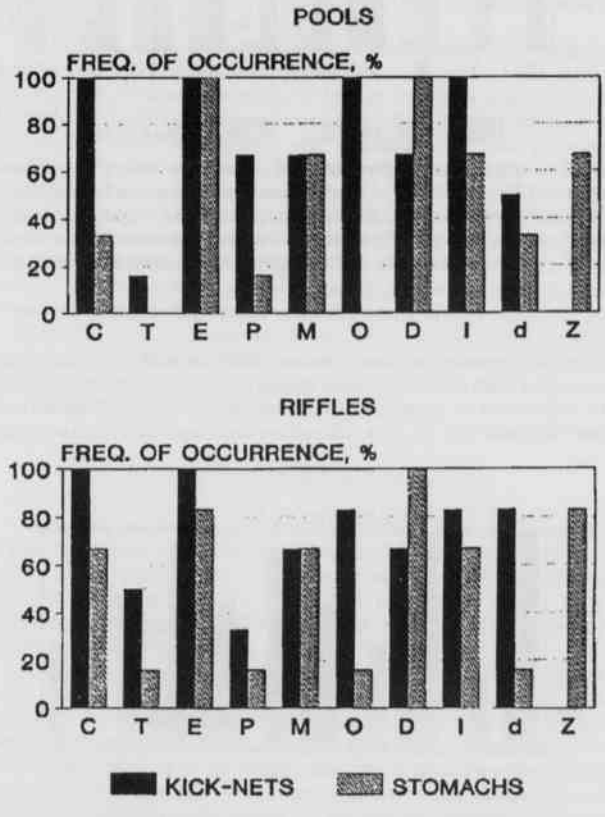

Figure 1. Comparisons of frequency of occurrence values of kick-net samples and *Noturus lachneri* stomach contents by habitat type from streams of the Saline River drainage, Saline County, Arkansas. Upper case letters on the X axis represent the first letter of the taxon (see Table 2), the lower case "d" represents decapods, and the upper case Z represents zooplankton.

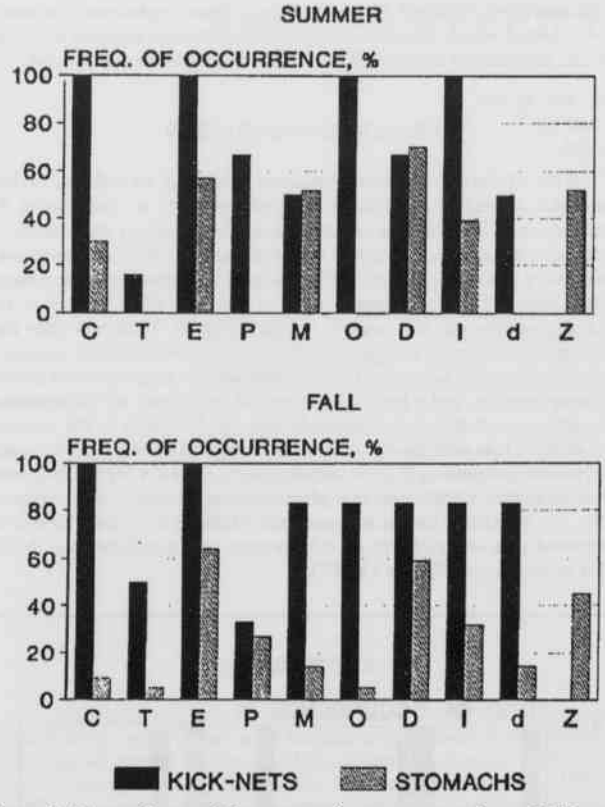

Figure 2. Comparisons of frequency of occurrence values of kick-net samples and *Noturus lachneri* stomach contents by seasons from streams of the Saline River drainage, Saline County, Arkansas. Upper case letters on the X axis represent the first letter of the taxon (see table 2), the lower case "d" represents decapods, and the upper case Z represents zooplankton.

Because we concluded that there was little seasonal or habitat variation, samples were combined for an overall comparison between frequency of occurrence of organisms from kick-net samples and those from stomach contents (Fig. 3). This comparison indicates that *N. lachneri* may be a largely opportunistic feeder. All organisms collected in the kick-net samples were found in at least one madtom stomach. Diptera, Ephemeroptera, Megaloptera, Isopoda, and zooplankton had the highest frequencies of occurrence in stomach contents. The kick-nets were not designed to capture zooplankton, though cladocerans and copepods appeared frequently in the stomach contents. The decapods consumed were small (<10 mm). Frequency of occurrence values of decapods in the kick-net samples were higher than in the stomach contents. However, most collected in the kick-nets were too large to be a prey source for *N. lachneri*. No organic detritus was found in any of the stomach contents. Though it has been indicated that some madtoms are known to be piscivorous, such as *Noturus exilis* (Madyen and Burr, 1981), none of the stomachs of *N. lachneri* examined in this study contained fish (Fig. 3).

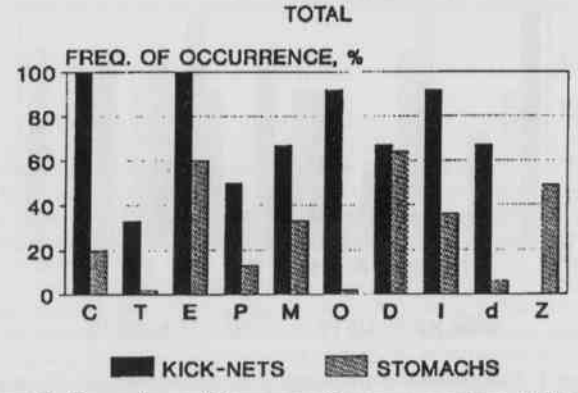

Figure 3. Comparisons of frequency of occurrence values of kick-net samples and *Noturus lachneri* stomach contents from streams of the Saline River drainage, Saline County, Arkansas. Upper case letters on the X axis represent the first letter of the taxon (see table 2), the lower case "d" represents decapods, and the upper case Z represents zooplankton.

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