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Food of the Evening Bat (*Nycticeius humeralis*) and Red Bat (*Lasiurus borealis*) from Southern Illinois

George A. Feldhamer[1], John O. Whitaker, Jr. [2], Jean K. Krejca[1], and Steven J. Taylor[1]

[1]Department of Zoology,
Southern Illinois University,
Carbondale, IL 62901

[2]Department of Life Sciences,
Indiana State University,
Terre Haute, IN 47809

ABSTRACT

Coleopterans represented the primary food item by volume for 13 evening bats (68.1%) and 7 red bats (68.7%) collected from July to September 1993 on Horseshoe Lake Conservation Area, Alexander County, Illinois. The single most important food for evening bats (23.5% of total volume) was the spotted cucumber beetle, a significant agricultural pest. This species made up only 7.9% of the food volume of red bats. The overall feeding overlap between these two species of bats appeared to be low.

INTRODUCTION

There is little information concerning feeding habits of the evening bat (*Nycticeius humeralis*), with the only published work from Indiana. The stomach contents of two evening bats were described by Ross (1967), and two others by Whitaker (1972). Whitaker and Clem (1992) examined 20 fecal pellets per week from May through October to determine foods eaten by evening bats at a maternity colony in Clay County, Indiana. Likewise, feeding habits of red bats (*Lasiurus borealis*) are poorly documented (Humphrey 1982). Whitaker (1972) reported on foods from 128 red bat stomachs from Indiana. Ross (1967) examined digestive tracts of 27 red bats from Indiana and Illinois. Here we report on foods consumed by evening bats and red bats captured from the same location and time period during a survey of bat fauna at Horseshoe Lake Conservation Area (HLCA).

MATERIALS AND METHODS

Study Area

The HLCA is located in Alexander County, in southern Illinois. It includes swamps of bald cypress (*Taxodium distichum*) and tupelo gum (*Nyassa aquatica*), bottomland hardwood forests dominated by an overstory of sweet gum (*Liquidamber styraciflua*),

slippery elm (*Ulmus rubra*), and pin oak (*Quercus palustris*), croplands of corn, soybeans, and winter wheat, and wetland areas dominated by emergent plants. Horseshoe Lake is a shallow (mean depth = 0.9 m), eutrophic lake about 796 ha in size (Brandon et al. 1994).

Bat Collection

Mist netting was done on 15 nights from 7 May through 10 September 1993 on 6 sites throughout HLCA. We used a layered mistnet 10 m high and 13.3 m long, with a pulley system to raise and lower it (Gardner et al. 1989). The net was in place by 2000 h and was left up each evening until about midnight, and was checked every 20 minutes. Age (juvenile or adult), reproductive condition, and body weight were determined for each bat. The bats were held separately in cloth bags for 0.5 h to obtain fecal pellets, marked on the back with a drop of red fingernail polish to determine recaptures, and released.

Food Analysis

The average percent volume (of each food type in the total sample) and percent frequency occurrence (percentage of individuals eating each food type) were estimated from fecal pellets using techniques discussed by Whitaker (1988). An index to resource overlap (MacArthur and Levins 1967) between the two bat species (*i* and *j*) was calculated as $\alpha_{ij} = \Sigma U_i U_j / \Sigma(U_i)^2$, where U is the proportional use of each food by each bat species, based on the most specific identifiable resource taxa. Because α is a ratio of resource use between both species (numerator) vs. individuals of the same species (denominator), values of $\alpha <$ 1 suggest intraspecific interactions are stronger than interspecific factors.

RESULTS AND DISCUSSION

Of seven species of bats mist netted (Brandon et al. 1994), only evening bats and red bats were caught in large enough numbers to allow meaningful analysis of foods eaten. All evening bats (n = 13) and red bats (n = 7) from which fecal material was obtained were captured on one of four nights from 4 July through 8 September from one site. It was located 1.2 km S of Olive Branch, Alexander County, on Pigeon Roost Creek, a tree-lined stream corridor on HLCA. There were no recaptures for either bat species.

We identified only five orders of insects in the diet of evening bats from HLCA, with beetles comprising 68.1% of the material consumed (Table 1). The spotted cucumber beetle (*Diabrotica undecimpunctata*) was the single most important food of evening bats. This was also the case for evening bats in Indiana captured from August through October (Whitaker and Clem 1992).

Coleopterans comprised 68.7% of the food of red bats, with scarabaeids (June bugs) most of the total. Percentage volume and frequency of food types for red bats, however, was fairly distinct from that of evening bats (Table 1). Whitaker (1972) found lepidopterans were the primary food of red bats, followed by scarabaeids. One red bat had fed on crickets (Table 1), suggesting the possibility of ground foraging, although certain species of crickets are arboreal and could be taken by foliage gleaning. Jackson (1961) and Whitaker (1972) also reported red bats feeding on crickets.

Overall, the amount of overlap in diets was limited, despite the fact that both bat species forage early in the evening (Layne 1958), and samples were collected at the same place

and time period. The α - index for evening bats was 0.386 while that for red bats was 0.556, suggesting intraspecific overlap was more important than interspecific overlap between these species. Although the volume of beetles in red bats was essentially the same as in evening bats, red bats took only about one third the amount of *D. undecimpunctata* taken by evening bats during the period of this study. Limited forage overlap might be expected based on the mean length of the primary prey items bats consumed. The average length of *D. undecimpunctata*, the most common prey of evening bats in this study, is 5 mm (Swan and Papp 1972). June bugs, which were consumed 5.6 times more by red bats than by evening bats, average about 25 mm in body length. Ross (1961), based on limited data, reported red bats fed on small moths 10 to 16 mm long, but occasionally took moths as large as 30 mm. Similar data are not available for evening bats. Insect availability varies seasonally with resultant changes in the diet of bats (Whitaker and Clem 1992). Although our data are too limited both spatially and temporally to define these trends, they suggest an interesting line for future investigation of the feeding ecology of evening bats and associated species.

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Table 1. Frequency and total volume of foods of the evening bat (*Nycticeius humeralis*) and red bat (*Lasiurus borealis*) from Horseshoe Lake Conservation Area, Alexander County, Illinois determined by analysis of fecal pellets.

	Evening Bats		Red Bats	
	% Volume	% Frequency	% Volume	% Frequency
Coleoptera: Beetles				
Chrysomelidae				
Diabrotica undecimpunctata	23.5	38.5	7.9	28.6
Others	5.4	23.1	7.1	14.3
Scarabaeidae	8.8	23.1	49.4	85.7
Carabidae	8.8	23.1	4.3	14.3
Dytiscidae	5.4	7.7		
Others	16.2	53.8		
Homoptera: Leafhoppers and allies				
Cicadellidae				
Others	10.4	30.8	9.3	42.9
Paraphlepsius irroratus	1.9	7.7		
Delphacidae	0.4	7.7		
Hemiptera: True bugs				
Miridae	4.6	7.7		
Lygaeidae	1.5	7.7	4.9	42.9
Other	1.9	7.7		
Diptera: Flies	5.8	23.1		
Lepidoptera: Moths	5.4	15.4	15.7	71.4
Orthoptera: Grasshoppers and allies				
Gryllidae			1.4	14.3
TOTALS	100.0		100.0	