Food Habits of *Peromyscus* and *Reithrodontomys* in the Wichita Mountains Wildlife Refuge, Oklahoma

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Food habits of three sympatric species of *Peromyscus* (*P. attwateri, P. leucopus, P. maniculatus*) and *Reithrodontomys fulvescens* were studied in the Wichita Mountains Wildlife Refuge in Comanche County, Oklahoma, from March through October 1988, to determine if significant dietary overlap occurred among these species. Stomach contents were examined and identified microscopically. Coefficients of total dietary overlap between species of *Peromyscus* were all significant. Dietary overlap coefficients between the three species of *Peromyscus* and *Reithrodontomys* were not significant. Diets of *P. attwateri, P. leucopus* and *P. maniculatus* consisted of 45.8%, 41.7% and 50% plant matter and 54.2%, 58.3% and 50% animal matter, respectively. The diet of *P. fulvescens* consisted of 40% plant matter and 60% animal matter. Due to the extent of dietary overlap among species of *Peromyscus*, competition for food resources does not appear to be intense during the study period.

INTRODUCTION

Many studies of the trophic relations among small mammals have been conducted in the last three decades and many have focused on microtine rodents (*1*, *2*). The few recent studies on non-microtine rodent food habits have been geographically scattered (*3*-*8*). In these studies, food items of individual species were listed, but few compared the extent of dietary overlap among members of a genus in a particular community (e.g., *3*-*5*). This study examined the degree of dietary overlap (*9*) in food habits of *Peromyscus attwateri*, *P. leucopus*, *P. maniculatus* and *Reithrodontomys fulvescens* in the Special Use Area of the Wichita Mountains Wildlife Refuge in Comanche County, Oklahoma. This area consists of low, rounded granite mountains permeated by mixed-grass plains biota. Mesophytic forests border streams and a xeric forest composed mostly of blackjack oak (*Quereus marilandiea*) and post oak (*Q. stellata*) occur on lower granite hills (*10*).

METHODS

Two parallel trap lines, 20 m apart, were used at three different sites. Each trap line had 40 stations (10 m apart) consisting of two traps, one Museum Special and one McGill snap trap. Trapping took place from March through October. This period was divided into a wet sampling period, from March to June, (SP1) and a dry sampling period, from July to October (SP2). Trapped specimens were placed on ice in the field and frozen as soon as possible. Stomachs were removed in the lab and preserved in F.A.A. solution (100 ml 40% formaldehyde, 5 ml 70% ethanol, and 5 ml glacial acetic acid). Stomach contents were emptied onto filter paper, vacuum filtered, and physically homogenized by stirring. For each animal, two samples were removed, mounted on separate microscope slides, stained with hematoxylin, and used for analysis of stomach contents. Twenty randomly selected fields (ten on each slide) were examined microscopically at 40X and 100X to identify food items. A binocular dissecting scope (15X) was used to qualitatively identify other dietary items on the filter paper. Fields containing no food items were not counted. A coefficient of dietary overlap (*9*) and a diversity of food items (*11*, *12*) were calculated. A t-test was used to test for differences between sampling period food item diversity values among species (*13*). Vegetation was sampled in May, August, and October. Vegetation at each site was sampled using quadrats (*14*). Quadrats for herbaceous plants (1 m^2 at 10-m intervals) and woody plants (10 m^2 at 50-m intervals) were placed along a transect contiguous with each trap line. Plant

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voucher specimens were deposited in the herbarium at the University of Central Oklahoma, Edmond, Oklahoma. Sample fragments from various parts of each plant species were mounted on microscope slides for use as a reference collection to aid in identifying stomach contents (*15-17*). Invertebrates were collected at each site using pitfall traps. Sample fragments from various parts of each invertebrate specimen were mounted on microscope slides for use as a reference collection.

RESULTS

Forty-one *P. attwateri*, 28 *P. maniculatus*, 14 *P. leucopus*, and 10 *R. fulvescens* were captured. Twenty-two *P. attwateri* and 20 *P. maniculatus* were taken in SP1, but only five *P. leucopus* and six *R. fulvescens* were taken. In SP2, 19 *P. attwateri* were collected, but only nine *P. leucopus*, eight *P. maniculatus*, and four *R. fulvescens* were taken. Voucher specimens were deposited in the University of Central Oklahoma Collection of Vertebrates.

Twenty-four different food items were identified in the stomachs of *P. attwateri* (Table 1). Common plant food items in SP1 diets were acorns (*Quercus* sp.) and Johnson grass (*Sorghum halapense*), while centipedes (*Chilopoda*) were a common animal food. The most common plant and animal food items in SP2 were prickly pear cactus (*Opuntia* sp.), darkling beetles (Tenebrionidae), and seed bugs (Lygaeidae). Food item diversities for SP1 and SP2 diets of *P. attwateri* were 1.10 and 1.18, respectively. Overlap for SP1 and SP2 diets of *P. attwateri* was 0.53.

Twelve food taxa were identified in stomachs of *P. leucopus* (Table 1). Common foods in the SP1 diets were acorns, roundleaf bladderpod (*Lesquerela ovalifolia*), ground beetles (Carabidae), and water penny beetles (Psephenidae). In SP2, the most common food items were dropseed grass (*Sporobolus* sp.), ants (Formicidae), seed bugs, and darkling beetles. Food item diversities for SP1 and SP2 diets of *P. leucopus* were 0.54 and 0.93. The SP1 and SP2 dietary overlap coefficient was 0.06.

Twenty-four taxa were identified in the stomachs of *P. maniculatus* (Table 1). Common SP1 foods were acorns, Johnson grass, dropseed grass, and ants. The diet in SP2 consisted mainly of acorns, prickly pear cactus, and cockroaches (Blatellidae). Food item diversities for SP1 and SP2 diets of *P. maniculatus* were 1.29 and 0.80. The dietary overlap coefficient for SP1 and SP2 was 0.45.

Ten food taxa were identified in stomachs of *R. fulvescens* (Table 1). Common SP1 foods were bluestem grass (*Andropogon* sp.), Johnson grass, short-horned grasshoppers (Acrididae), lady bird beetles (Coccinelidae), and darkling beetles. The only SP2 plant food found was dropseed grass. Animal foods in SP2 included cockroaches, noctuid moths (Noctuidae), and roundworms (Nematoda). Food item diversities for SP1 and SP2 were 0.75 and 0.58. The dietary overlap coefficient for *R. fulvescens* was 0.0.

Of the 20 different insect families from six orders found in the stomach contents, 60% were Coleoptera; 20% Orthoptera; and 5% each Hemiptera, Hymenoptera, Lepidoptera and Diptera. The Coleoptera, Orthoptera, Hemiptera, and Hymenoptera (Formicidae) are primarily ground dwelling insects, while the Lepidoptera and Diptera are flying insects. Ground dwelling beetles made up 90% of the insects taken and probably were easier for mice to capture than flying insects. Occurrence of nematodes in stomachs of some mice was due to either the ingestion of food items harboring these organisms or direct parasitism. Nevertheless, nematodes were included in the diet analysis. Soil matter was found in 7.6% of the stomachs but was not included in the analysis.

Food item diversity values were significantly different ($P<0.05$) for seasonal comparisons between all species except SP1 diets of *P. leucopus* and *R. fulvescens*, and SP2 diets of *P. maniculatus* and *P. leucopus*, and *P. maniculatus* and *R. fulvescens*. Combined SP1 and SP2 diets of all species, except *P. maniculatus*, included more animal matter than plant matter. The combined diet of *P. maniculatus* contained 50% animal matter and 50% plant matter.

DISCUSSION

All four species of mice were captured in the same habitat. In some cases, *P. leucopus* and *P. attwateri* were caught at the same trapping station on the same night.

TABLE 1. Relative frequency of occurrence of food items in the diets of *Peromyscus* and *Reithrodontomys* from the Wichita Mountains Wildlife Refuge, Oklahoma, during two sampling periods[a], SP1 and SP2.

	P. attwateri (n=41)		*P. maniculatus* (n=28)		*P. leucopus* (n=14)		*R. fulvescens* (n=10)	
Food Categories	SP1	SP2	SP1	SP2	SP1	SP2	SP1	SP2
Plant								
Allium sp.	3.57	2.70	6.06	9.09		7.69	25.00	
Andropogon sp.		2.70						
Bouteloua sp.		2.70						
Chrysopsis stenophylla		2.70						
Croton sp.		2.70						
Echinocereus sp.			3.03					
Elymus canadensis			3.03					
Eryngium leavenworthii	3.57							
Lespedeza virginica			3.03					
Lesquerela ovalifolia			3.03		16.67			
Linum sp.			3.03					
Opuntia sp.		10.81	3.03	18.18				
Quercus sp.	17.85	5.41	12.12	27.27	50.00			
Ratibida columnifera	3.57							
Sorghastrum nutans			3.03			7.69	25.00	
Sorghum halapense	7.14	5.41	9.09			15.38		40.00
Sporobolus sp.	3.57	5.41	6.06					
Lycopodiales			3.03	9.09			12.50	
Animal								
Acrididae	3.57	2.70	6.06				12.50	
Anobiidae						7.69		
Blattellidae	7.14	2.70		18.18				20.00
Carabidae					16.67	7.69		
Chilopoda	14.28	5.41	6.06					
Chrysomelidae	3.57	2.70						
Cicindellidae		2.70						
Cleridae			3.03					
Coccinelidae							12.50	
Diptera	7.14							
Formicidae		5.41	6.06	9.09		15.38		
Histeridae			3.03					
Lygaeidae		10.81				15.38		
Meloidae	7.14	5.41	6.06			7.69		
Nematoda			3.03					20.00
Noctuidae	7.14							20.00
Oedemeridae			3.03					
Phasmatidae		2.70						
Psephenidae					16.67			
Salticidae	3.57							
Silphidae			3.03					
Tenebrionidae	7.14	18.91	3.03				12.50	
Tettioonidae				9.09		15.38		

a See text for description of sampling periods.

Reithrodontomys fulvescens, P. attwateri, and *P. maniculatus* were trapped at consecutive trap stations on the same night. These rodents apparently use similar food resources. During the non-winter season, food resources were seemingly abundant and competition for food items was not intense. Total dietary overlap coefficients between species of *Peromyscus* were all significant [a coefficient of 0.60 or greater is significant; however, this should not be construed as statistical significance (*9*)] and probably are reliable indicators of the extent of dietary overlap. Insignificant seasonal coefficients of dietary overlap may be due to low numbers of individuals taken in a season. The only significant seasonal coefficients of dietary overlap were between *P. attwateri* and *P. maniculatus* in SP1 (0.64) and *P. attwateri* and *P. leucopus* in SP2 (0.70). Dietary overlap coefficients between the three species of *Peromyscus* and *Reithrodontomys* were not significant and may not have been a good indicator due to the low number (n = 10) of *R. fulvescens* captured.

Previous studies of food habits of *P. leucopus* and other *Peromyscus* species in New Mexico indicated animal and plant matter were consumed in relatively equal amounts over all four seasons (*5*). This study showed 41.7% of the SP1 and SP2 diets of *P. leucopus* was plant matter and 58.3% was animal matter. Alcoze (*4*) reported the diet of *P. maniculatus* in Texas consisted of 58% plant matter and 42% animal matter. O'Neill and Robel (*7*) found the diet of *P. maniculatus* in Kansas to be composed of 50.7% animal matter and 49.3% plant matter over all four seasons. The summer diet of *P. maniculatus* in northern Ontario was composed of over 65% animal matter (*6*), while *P. maniculatus* in Wyoming consumed mostly seeds in the summer (*17*). *Peromyscus maniculatus* in the Wichita Mountains had a diet that consisted of 50% plant matter and 50% animal matter. Food habits of *P. attwateri* have not been studied and appear to be similar to that of *P. maniculatus* and *P. leucopus*, consisting of 45.8% plant matter and 54.2% animal matter. The diet of *R. fulvescens* was composed of 40% plant matter and 60% animal matter.

During both sampling periods, insects probably were plentiful and not difficult to locate and capture. Although not sampled, winter diets would be expected to differ from non-winter diets. Winter diets probably would consist mainly of seeds and dried plant matter due to the scarcity of green plant material and insects.

This study examined the food habits of four sympatric species of mice in the Wichita Mountains Wildlife Refuge. Three sympatric species of *Peromyscus* had a significant overlap in diets. None of the *Peromyscus* diets significantly overlapped with the SP1 and SP2 diets of *R. fulvescens.* Diets consisted of 50-60% animal matter and 40-50% plant matter. The majority of animal and plant matter ingested was from insects and grasses, respectively. Significant overlap of diets in the three species of *Peromyscus* suggested that competition for food resources may not be intense during the non-winter months.

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