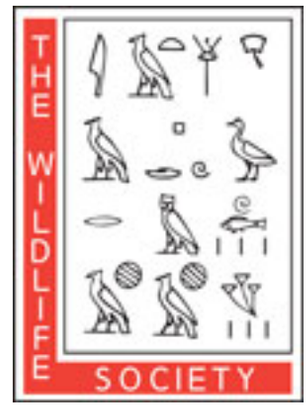

DIETS OF BOBCATS IN ARKANSAS WITH SPECIAL REFERENCE TO AGE AND SEX DIFFERENCES[1]

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Abstract: Relationships between diet of bobcats (*Lynx rufus*) and season, region, age, and sex were studied in Arkansas, based on contents of 150 stomachs collected between June 1970 and April 1972. Rabbits (*Sylvilagus* sp.), squirrels (*Sciurus niger*, *S. carolinensis*, *Tamias striatus*, *Glaucomys volans*), and rats and mice (*Sigmodon hispidus*, *Neotoma floridana*, *Peromyscus* sp., *Microtus pinetorum*, *Reithrodontomys* sp.) were found in 39, 22, and 21 percent of stomachs, respectively. Consumption of rabbits and deer (*Odocoileus virginianus*) peaked in autumn. Occurrence of rabbits ($P < 0.025$) and rats and mice ($P < 0.01$) was greater in stomachs from the Gulf Coastal Plain region; occurrence of squirrels ($P < 0.005$) was greater in the Interior Highlands. Diets of kittens, juveniles, and adults were similar. Occurrence of rats and mice was greater in females than in males ($P < 0.025$), suggesting that females selected smaller or more abundant prey.

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Food habits of the bobcat have been studied in some parts of its range, and regional differences are reported (Young 1958). In the south-central United States, Fooks (1961) analyzed stomach contents of 26 bobcats from 2 areas of Arkansas but found no conclusive seasonal or regional differences. Different diets of different sexes and age cohorts have not been reported but might be expected because of the sexual dimorphism in body size (Hall and Kelson 1959:968–969) and possible age-related differences in hunting proficiency.

The objectives of this study were to determine foods important to bobcats in Arkansas and to examine relationships between the diet and season, region, age, and sex.

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METHODS

Bobcat carcasses were provided by Arkansas Game and Fish Commission personnel, sportsmen, taxidermists, fur buyers and private trappers. Stomachs were removed soon after death and preserved in 10–25 percent formalin, or carcasses were frozen until stomachs could be fixed. Analyses of stomach contents followed procedures recommended by Korschgen (1969). Prey was identified macroscopically when possible. Identification of hairs was based mainly on comparison with a reference collection and use of hair keys (Mayer 1952, Stains 1958). Microscopic examination of hair scale patterns was necessary in a few cases (Adorjan and Kolenosky 1969, Carter and Dilworth 1971). Rodents were identified at least to genus and, when possible, to species. For analyses and discussion, sciurids were grouped and referred to as squirrels; cricetids were grouped as rats and mice.

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Table 1. Food items in 150 bobcat stomachs from Arkansas (1970–72).

Food item	Frequency of occurrence	Percent occurrence	Percent volume
Rabbits	58	39	41
Squirrels			
Fox squirrel	13	9	3
Gray squirrel	11	7	3
Eastern chipmunk	7	5	3
Southern flying squirrel	2	1	1
Total	33	22	10
Rats and mice			
Hispid cotton rat	10	7	4
Eastern woodrat	8	5	5
White-footed mouse	8	5	<1
Woodland vole	5	3	<1
Harvest mouse	1	1	<1
Total	32	21	10
Virginia opossum	13	9	8
White-tailed deer	11	7	16
Unidentified mammal	11	7	<1
Birds			
Unidentified	6	4	<1
Sora rail	1	1	<1
Meadowlark	1	1	<1
Bobwhite	1	1	<1
Cardinal	1	1	<1
Total	10	7	2
Raccoon	7	5	4
Striped skunk	6	4	2
Domestic animals			
Chicken	2	1	3
Cow	1	1	1
Goat	1	1	<1
Total	4	3	4
Miscellaneous mammals			
Red fox	2	1	<1
Muskrat	1	1	<1
Woodchuck	1	1	<1
Total	4	3	1
Snakes			
Timber rattlesnake	1	1	2
Rat snake	1	1	<1
Total	2	2	2

Food items in the combined sample of stomachs were recorded by percent occurrence and percent volume (Korschgen 1969:246). Percent or frequency of occurrence was used in regional, seasonal, age, and sexual comparisons. Trap bait, mud, pebbles, sticks, bark, leaves, and grass ingested by trapped bobcats were not considered food. Results were grouped by major physiographic region of Arkansas (Interior Highlands, Gulf Coastal Plain), season (spring, summer, autumn, winter), sex, and age. Dental criteria, together with capture date and estimated birth date, were used to estimate ages of all bobcats (Crowe 1975*a*, Fritts and Sealander in press). Each specimen was assigned to 1 of 3 age-classes which were believed to correspond roughly to stages in predatory capability of bobcats: mother-dependent kittens (<7 months), juveniles (7–20 months), and adults (>20 months). Statistical comparison of frequency of occurrence of foods was made by chi-square (Snedecor and Cochran 1967:215) when size of the samples permitted.

RESULTS AND DISCUSSION

Rabbits were by far the most important food, followed by squirrels, and rats and mice (Table 1). Fooks (1961) found rabbits in 23 percent, squirrels in 23 percent, and rats and mice in 31 percent of 26 bobcat stomachs from Arkansas. These figures do not differ from ours ($P > 0.10$). Rabbit populations undergo annual variation (Lord 1963:63), so some corresponding variation in occurrence of this food in the diet was expected (Beasom and Moore 1977). The high percent volume of rabbit remains in stomachs (41%) implies considerable importance of rabbit in the diet.

The 3 leading food categories showed strong regional dissimilarities which probably were related to abundance and availability of prey. Comparing bobcat diets on the Gulf Coastal Plain with those from the Interior Highlands, more rabbits

Table 2. Frequency of occurrence of foods from bobcat stomachs by season.

Food	Spring (N = 33)	Summer (N = 13)	Autumn (N = 27)	Winter (N = 76)
Rabbits	11	5	16	26
Squirrels	7	1	4	21
Rats and mice	8	1	8	14
Opossum	3	2	1	7
Deer	1	0	3	7
Birds	3	1	1	4
Raccoon	1	0	0	5
Skunk	2	1	0	3
Domestic animals	1	1	0	2
Miscellaneous mammals	2	0	1	1
Snakes	1	0	1	0

Table 3. Frequency of occurrence of foods from bobcat stomachs by age.

Food	<7 months (N = 12)	7–20 months (N = 22)	>20 months (N = 115)
Rabbits	6	9	42
Squirrels	2	3	25
Rats and mice	1	9	28
Opossum	0	1	12
Deer	1	2	8
Birds	1	2	6
Raccoon	0	1	6
Skunk	0	1	4
Domestic animals	0	0	4
Miscellaneous mammals	1	1	2
Snakes	1	0	1

($P < 0.025$) and rats and mice ($P < 0.01$) but fewer squirrels ($P < 0.005$) were eaten on the Gulf Coastal Plain. Relatively few squirrels are available on the Gulf Coastal Plain which has little suitable habitat for gray and fox squirrels. In the Interior Highlands bobcat diets were similar to those in southern Missouri where Korschgen (1957:55) found rabbits, squirrels, and rats and mice in 52, 22, and 15 percent of stomachs, respectively. Missouri bobcats were collected from the same Ozark Highlands physiographic region that extends into northwestern Arkansas. Occurrence of the 3 leading foods in stomachs from Arkansas' Gulf Coastal Plain more closely resembled findings in Alabama (same physiographic region) where rabbits, squirrels, and rats and mice occurred in 67, 8, and 24 percent of stomachs (Davis 1955:31).

Seasonal analysis of the diet was limited by the small number of stomachs available from summer (Table 2). Occurrence of rabbits in autumn was greater than in winter ($P < 0.025$) or spring ($P < 0.05$). Consumption of deer appeared greatest in autumn and winter, squirrels in spring and winter, and rats and mice in spring and autumn. Rodent populations in Arkansas often peak in late winter and spring and again in autumn (Sealander and Walker 1955, Smith 1966, Gipson 1968).

No age-related differences in diet were significant ($P > 0.10$), but these analyses were hindered by the small number of stomachs from mother-dependent kittens and juveniles (Table 3). Diets of kittens and adults appeared similar because females bring food to their young during the first few months of life (Bailey 1974). Kittens in the collection were 4–7 months old and were collected mainly from August to November. The rabbit population was high during that period. Rabbits brought to the young by the parent probably accounted for their presence in kitten stomachs.

We hypothesized that young bobcats should have difficulty obtaining food after maternal care was withdrawn. Limited observations of hunting by wild bobcats showed that most attempts to capture prey were unsuccessful (Provost et al. 1973:56–57, Hall and Newsom 1976), and Crowe's (1975*b*) observations of captive bobcats suggested that hunting skill was strongly related to experience. Therefore, relative to adults, the diet of bobcats from about 7 to 20 months of age was expected to consist of a greater proportion

Table 4. Percent occurrence of foods from bobcat stomachs by sex.

Food	Males (N = 92)	Females (N = 58)
Rabbits	35	46
Squirrels	21	22
Rats and mice	14	29
Opossum	10	7
Deer	10	3
Birds	5	7
Raccoon	5	3
Skunk	3	3
Domestic animals	3	2
Miscellaneous mammals	2	3
Snakes	1	2

of smaller and less agile prey. Most juveniles were collected in autumn and winter of their first year. No differences were significant ($P > 0.10$), but results did show fewer squirrels and more rats and mice in juvenile than in adult stomachs (Table 3). Considerable skill and experience probably is necessary to capture squirrels.

Rats and mice appeared more frequently in female bobcats ($P < 0.025$) than in males (Table 4). This was compared by sex within each physiographic region to remove possible biases related to regional differences in occurrence of this food and in size and sex-ratio of the bobcat sample. In the Interior Highlands occurrence of rats and mice was higher in females ($P < 0.025$). There was no difference between sexes in the Gulf Coastal Plain ($P > 0.10$), but sensitivity of the test was limited by a small sample of stomachs. When the analysis was restricted to adult bobcats from the Interior Highlands, rats and mice still occurred in a greater proportion of stomachs from females ($P < 0.05$). This finding apparently did not result from disproportionate collection of females during any period when rats and mice were most abundant, because there was no appreciable difference in sex ratio of the collection by season or month.

Adult females in our collection averaged 2.8 kg lighter than adult males ($\bar{x}$ for males 9.9 kg, $s^2 = 2.93$; $\bar{x}$ for females = 7.1 kg, $s^2 = 2.26$), which may have influenced the optimum prey size. Any tendency to exploit different sizes of prey might reduce competition for food between sexes (Vaughan 1972:263) if hunting ranges are shared. However, Bailey's (1974) study in Idaho revealed only about 15 percent male-female overlap in home range, and studies in Louisiana (Hall and Newsom 1976) produced similar findings. Therefore, little intersexual competition for food is expected if the same land tenure system exists in Arkansas.

Ranges of male bobcats are usually 2–5 times larger than female ranges (Provost et al. 1973:49, Bailey 1974, Hall and Newsom 1976). Females appear to utilize their smaller home ranges more intensively than do males, spending more time within distinct localities before moving on to a different part of their range and then reusing the same areas (Bailey 1974). This pattern of movement may require more efficient use of prey, that is, greater consumption of more abundant but smaller prey such as cricetid rodents and birds. Conversely, differential predation on smaller, more abundant prey by females might result in movement patterns indicative of intensive use.

Remains of white-tailed deer were represented about equally in stomachs from the 2 regions of Arkansas and appeared mainly in autumn and winter in all age-classes. This food was found in proportionately more males than females, but the difference was not significant ($P > 0.10$). Most stomachs that contained deer had it in large quantities, indicating these bobcats had gorged themselves a few hours before being killed.

Bobcat predation on deer has been a concern of sportsmen and game man-

agers for many years in Arkansas. Deer are important in the autumn and winter diet of bobcats in the Northeastern, Lake, and Rocky Mountain States (Erickson 1955:65, Gashwiler et al. 1960, Hamilton and Hunter 1939, McCord 1974, Pollack 1951, Rollings 1945, Westfall 1956, Young 1958). We learned of 3 incidents of bobcats killing deer during the study; these occurred in January, July, and November and involved 2 male fawns and a 7-year-old doe.

Bobcats probably eat more deer in Arkansas during and shortly after the deer hunting seasons when wounded animals and carrion are available. Eight of 11 stomachs containing deer were collected during the November–December deer hunting seasons; the other 3 were collected later in winter. One stomach was from a male kitten shot while feeding from the fresh carcass of a deer that had been wounded 1 day earlier by a hunter. Another was from a 3-year-old male that had been feeding on a road-killed deer. Gipson (1974) found that consumption of deer (at least part of which was carrion) by Arkansas coyotes (*Canis latrans*) also peaked in autumn. Erickson (1955:65) reported that 23 of 26 deer eaten by bobcats in Michigan were carrion. Although our data do not indicate that bobcats are a significant cause of deer mortality in Arkansas, the possibility still exists that fawn losses are common during summer in certain areas of high deer and bobcat density. Beale and Smith (1973) showed that in some situations bobcats can be an important cause of mortality of pronghorn (*Antilocapra americana*) fawns. However, the rate of bobcat predation on deer fawns has been low where measured in southern states (Cook et al. 1971, Logan 1973, Carroll and Brown 1977).

Opossums (*Didelphis virginiana*) are abundant in Arkansas, and their occurrence in bobcat stomachs was higher than reported from most other areas. Birds, raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), and snakes have been reported as minor bobcat foods where available (Young 1958). Domestic animals were of very minor importance in the diet. Bailey (1972:26–27) concluded that bobcats generally do not prey on domestic animals where natural prey is abundant.

Because coyotes invaded and became highly successful in most of Arkansas during the past 50 yr (Gipson et al. 1974), they must be considered as possible competitors with the original fauna, including bobcats (Rosenzweig 1966). Rabbits and rodents (common bobcat prey) are major foods of coyotes in their original range, but Gipson (1974) found these prey to be of little importance in Arkansas and reported poultry carrion and persimmons as the major coyote foods. We, therefore, do not believe coyotes compete significantly with bobcats for the same food resources in Arkansas because little overlap in food habits exists.

CONCLUSIONS

In addition to expected regional and seasonal differences in diets of bobcats in Arkansas, this study demonstrated a significant sex-related difference manifested in greater utilization of cricetid rodents by females. This could reflect either selection of smaller prey by the smaller sex or greater utilization of more numerous prey individuals related to pattern and intensity of home range use. Our study failed to demonstrate any differences in diets between age classes, but, relative to mother-dependent kittens and adults, the data suggested that juveniles feed differentially on prey species that are easiest to capture. Age-related differences in diet might well be obscured by

variation in length of maternal care and rate of development of hunting proficiency. If rats and mice are important foods of newly independent bobcats during their first autumn and winter, population fluctuations of small rodents could have an impact on survival during this critical period of life. Availability of deer carrion may similarly influence survival of juveniles.

Hopefully, future research will shed more light on the relationship between diet and sex and age of bobcats. We believe more information in this area is important for understanding the biology of this species.

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