PREY UTILIZATION BY BOBCATS ON QUAIL PLANTATIONS IN SOUTHERN ALABAMA [a]

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Abstract: Prey utilization by bobcats (*Lynx rufus*) was studied on 2 quail (*Colinus virginianus*) plantations in southern Alabama from 1975 through 1977. Estimates of relative densities of principal prey species were obtained by various procedures. Analysis of 136 stomachs, 137 large intestines, and 218 scats indicated that the cotton rat (*Sigmodon hispidus*) and the cottontail rbbit (*Sylvilagus floridanus*) were the 2 most important food items. The cotton rat had the highest frequency of occurrence and the cottontail rabbit was second for each month of the year. Mammals as a group were more important than birds in the bobcat's diet. Despite its high density on the study areas, the bobwhite quail was unimportant in the bobcat's diet. This study revealed that the bobcat is not a serious decimating factor of bobwhite quail in southern Alabama. Prey utilization was related to both prey availability and prey size.

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The bobcat is present throughout the state of Alabama and is found in a wide array of physiographic regions and habitats (Barkalow 1949). However, because of its elusive nature, the bobcat is infrequently observed in the wild.

Seton (1929) noted that the bobcat has been maligned as a destroyer of both domestic and game animals since its predatory habits were first observed. Although it does prey upon these animals the impact of bobcat depredation on wildlife populations is not fully understood. Over the past 3 decades, several investigators have studied the general food habits of bobcats in the southeastern United States (Table 1). These studies involved either state or regional surveys or focused primarily on 1 or 2 seasons of the year. Examining the results of these studies, one is impressed with the wide variability in the bocat's diet. The wide range of prey species utilized is generally attributed to seasonal changes in availabiity. Although this information is useful for defining bobcat food habits in general, it does little to elucidate the overall impact on any particular prey species.

To evaluate adequately the effects of predation, it is necessary to know more than merely what a predator eats. One must also be aware of the availability of prey species and have some estimates of relative densities of these species (Craighead and Craighead 1956). An estimate of predator density is also necesary (Latham 1951). Finally, these data must be available for each season of the year to present a complete picture of prey utilization.

In March 1975, a multi-faceted study of the role of the bobcat as a predator on quail plantations was initiated and data were collected on movements, home ranges, and population dynamics of bobcats. This project also examined prey utilization by bobcats on areas intensively managed for bobwhite quail.

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Table 1. Summary of studies pertaining to bobcat food habits in the Southeast since 1950.

Author	*Data collection date*	*Location of study*	*Food habits materials*	*Sample size*	*Highest frequency* (%)
Progulske (1955)	1951-52	North Carolina & Virginia	stomachs	57	rabbit 37.3
			large intestines	50	
			scats	124	
Davis (1955)	1937-54	26 counties of Alabama	stomachs	239	rabbit 63.2
Kight (1962)	1961-62	1 county in South Carolina	scats	317[a]	cotton rat 38.9
Fritts (1973)	1970-72	Statewide Arkansas	stomachs	150	rabbit 38.7
Hall (1973)	1972-73	2 parishes in Louisiana	stomachs	43	rabbit 74.4
			scats	390[b]	
Buttrey (1974)	1972-73	1 county in Tennessee	stomachs	15	rabbit 40.0
			scats	34	rabbit 32.4

[a]254 of these scats were collected from a single depository.

[b]Examined only for presence of white-tailed deer.

MATERIALS AND METHODS

Localtion and Description of Study Areas

The study was conducted primarily on 2 quail plantations (Bermingham and Three Notch) in the Hilly Coastal Plain Physiographical Province of Bullock County, Alabama (Hodgkins 1965). These areas are characterized by rolling to hilly topography, with elevations ranging from 80 to 163 m above sea level. The soils range from Susquehanna Clay to deep sand (Smith and Wilkinson 1913). Upon inspection, each area was readily divisible into 4 broad vegetational types: (1) loblolly pine (*Pinus taeda*) plantations; (2) mixed pine-hardwoods, primarily composed of loblolly and shortleaf pine (*P. echinata*), oaks (*Quercus* spp.), and hickory (*Carya* spp.); (3) stream-bottom hardwoods dominated by red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar stryaciflua*), and oak; and (4) open fields dominated either by broomsedge (*Andropogon spp*]) *or blackberry (Rubus* spp.), or cultivated fields in soybeans (*Glycine max*) or corn (*Zea maize*).

Both areas were managed for wildlife, timber, and agricultural crops. The most intensive wildlife mangement was for bobwhite quail, although other game species including white-tailed deer (*Odocoileus virginianus*), eastern wild turkey (*Meleagris gallopavo*), cottontail rabbit, and mourning dove (*Zenaida macroura*) were also abundant.

Additional data were collected from other managed areas within a 55 km radius of the principal study areas.

Collection of Food Habits Materials

The material used for food habits analysis consisted of stomachs, large intestines, and scats. The stomachs and large intestines came primarily from 2 sources: (1) bobcats trapped on the study areas specifically for the food habits phase of the investigation, and

(2) bobcats trapped on or near the study areas during the regulated trapping season. A few additional bobcats were collected by shooting.

The trapped bobcats were captured with Number Two coil spring traps (Woodstream Corp.[a], Lititz, PA), which were attached to wooden drags. Dirt hole sets, scent posts, and trail sets were all used in the trapping efforts. Bobcat urine, commercial lure (Southeastern Outdoor Supplies, Inc.[a], Basset, VA), fox urine, and various meat baits were used as attractants. Standard physical measurements were taken on each bobcat, and the stomach and intestines were removed and frozen for later analysis.

Scats were collected along roads and trails that were frequently traveled within the study areas. The presence of bobcat tracks and the characteristic appearance and odor of bobcat scats were used to distinguish bobcat scats from those of other carnivorous species. Scats were placed in labeled paper bags and air dried for later analysis.

Examination of Food Habits Materials

For analysis, the stomachs were separated from the intestines. Stomachs were cut open and the contents emptied into 3 nested sieves: 10, 18 and 34 mesh/inch respectively. The contents were washed with hot water to degrease the material and to facilitate separation via the sieves (Korschgen 1969). After washing, the material was emptied into a white enamel tray and examined under the 7X, 15X, and 20X objectives of a dissecting microscope to aid in the location of diagnostic material. After segregation of material was completed, the contents were identified from hair, teeth, bone, and other recognizable features. Sample hairs were washed in xylene and temporarily mounted on glass slides for examination under the 100X and 430X magnification of a compound microscope. These hairs were identified by comparison to a reference hair slide collection and hair keys (Adorjan and Kolenosky 1969, Spiers 1973, and Moore et al. 1974). Bones, skulls, and teeth were identified with the aid of a reference collection and keys (Schwartz and Schwartz 1959, Burt and Grossenheider 1964, and Lowery 1974). Following identification of contents, a volumetric determination of each component was made using the water-displacement technique (Latham 1951). The contents of each stomach were recorded by item and volume. Latham (1951) reported that this information would enable calculation of the frequency of occurrence and the percent volume of food habits material. Our data were presented in this form for comparison with other work on bobcat food habits.

Large intestines were treated in the same manner as the stomachs, except that a visual estimate of volume was used instead of the water-displacement method. The thorough mixing of food items in the large intestine made it impractical to completely separate each item for an accurate volumetric determination.

Scats were placed in quart jars containing hot, soapy water and left approximately 6 hours. This procedure greatly facilitated separation of scat contents. The material was then washed through a 34 mesh/inch sieve and emptied into an aluminum tray, and identified by the same procedure used for the stomachs and large intestines. No attempt was made to estimate percentage volume; and food items were recorded by occurrence.

Estimation of Relative Densities of Prey Species

Because of the large number of potential prey species it was not possible to obtain relative estimates of each. However, attempts were made to obtain relative density information on the more important prey species.

Small mammals were surveyed during each of the 4 seasons in each of the 4 previously described vegetational habitats. Initially the transect procedure of Bole and Moulthroup (1942) was used, however this procedure was abandoned because of the small number of animals captured. A modified procedure that involved systematically

[a]Use of name does not constitute an endorsement by the U. S. Fish & Wildlife Service.

placing a 4.5 x 15.5 m quadrat in each of the 4 described vegetational habitats was then used. One hundred snap-traps were set at approximately 1 m intervals throughout each quadrat. Traps were baited with a mixture of peanut butter and oatmeal and each quadrat was checked for 3 nights.

Estiamtes of relative densities of large mammals such as opossums (*Didelphis virginiana*) and raccoons (*Procyon lotor*) were made on the basis of catch per trap-night in Number Two steel traps that had been set for bobcats. Additional observations of deer, turkey, and rabbits were recorded in field notes.

Bobwhite quail densities were based on estimates by the plantation managers and on previous work conducted on 1 of the study areas (Gilbert 1975). Similarly, estimates of nongame birds were obtained from Gilbert (1975) as well as from observations in the field.

Estimation of Bobcat Density

It is essential to have some estimation of predator density to properly evaluate predator impact on prey species. Unfortunately, no widely accepted procedures are currently available to census bobcats. To obtain this information we used a combination of catch per trap night, telemetry data from 20 instrumented bobcats, and a mark and recapture estimate.

RESULTS

Food Habits Analysis

Of the 156 stomachs collected, 20 (13%) were either empty or contained insufficient material for analysis. The majority of the stomachs (69%) were collected on the principal study areas or on adjacent managed plantations. The remaining stomachs came from adjacent areas under a wide range of land uses. A summary of the analyses of the remaining 136 stomachs is given in Table 2. Table 3 presents the results of analyses of 137 large intestines. An additional 19 (12%) of the large intestines were either empty or contained insufficient material for analysis. Table 4 presents a summary of the analyses of 218 bobcat scats collected on quail plantations. Occurrence of the 4 most important food items is summarized by month in Fig. 1.

Relative Abundance of Prey Species

Small mammals were censused during December (1975), April, June, and September (1976). A total of 4800 trap-nights of effort indicated tht the cotton rat was the most abundant small mammal at all seasons of the year. Mice (*Peromyscus* spp.) were next in abundance, followed by the eastern harvest mouse (*Reithrodontomys humulis*), and the shorttailed shrew (*Blarina brevicauda*) (Table 5).

Larger mammals were censused from April through September 1975, and from January through August 1976. A total of 2997 trap-nights of effort indicated that the opossum was the most abundant furbearer on the areas followed by the raccoon and the skunk (*Mephitis mephitis*), (Table 5).

No quantitative estimates for white-tailed deer or eastern wild turkey were obtained. However, large populations, affording excellent hunting opportunities were present on both study areas and numerous sightings were made throughout the year.

Nongame birds were abundant throughout both study areas, but no attempt was made to estimate their densities during the present study. Gilbert (1975) surveyed songbirds on one of the study areas, using Emlen's (1971) transect technique. He found that Rufus-sided towhee (*Pipilo erythrophthalmus*), cardinal (*Richmondena cardinalis*), bluejay (*Cyanocitta cristata*), and brown thrasher (*Toxostoma rufum*) were the most common resident species on the area. White-throated sparrow (*Zonotrichia albicollis*), song sparrow (*Melospiza melodia*), and dark-eyed junco (*Junco hyemalis*) were the most common migrant species on the area.

Table 2. Contents of 136 bobcat stomachs collected from 1975-1977 in the Upper Coastal Plain of Alabama.

Item	*Occurrence*		*Volume*
	Frequency	*Percent*	*Percent*
Mammals			
Cottonrat	51	37.5	29
Cottontail rabbit	41	30.1	26
Bobcat	30	22.1	0.7
White-tailed deer	12	8.8	9
Beaver	9	6.6	9
Opossum	8	5.9	5
Gray squirrel	6	4.4	2
Marsh rice rat	4	2.9	0.3
Mice	3	2.2	0.2
Least shrew (*Cryptotis parva*)	3	2.2	0.1
E. wood rat	2	1.5	
Golden mouse (*Peromyscus nuttalli*)	1	0.7	0.1
Raccoon	1	0.7	0.5
Long tailed weasel	1	0.7	0.3
Chipmunk	1	0.7	T
Unidentified mammal	13	9.6	8
Total Mammal	124	91.2	93
Birds			
Unknown birds	13	9.6	0.9
Chicken	1	0.7	1
Coot	1	0.7	3
Cardinal	1	0.7	0.1
Total Bird	16	11.8	6
Insects			
Ants (*Formica* sp.)	1	0.7	T
Stinkbug (*Pentatomidae*)	1	0.7	T
Total Insects	2	1	T

Both study areas and much of the surrounding land was under intensive management for bobwhite quail. Management practices included annual burning during the early spring, planting of food crops, and maintenance of food plots. During the 1977-78 quail season, the density of bobwhite quail on Bermingham Plantation was approximately 1 bird per 0.91 ha (M. Easley 1978, personal communication). This estimate was further supported by Gilber's (1975) findings. During his work on the same study area he instrumented 14 quail with radio transmitters. These quail were found to represent 4 coveys that contained a minimum of 40 birds. By examining the minimum ranges of these coveys, we obtained an estimate of 1 quail per 0.41 to 0.91 ha. Both of these estimates indicates a large population of bobwhite quail.

Estimates of Predator Density

Bobcats were numerous on both study areas and were occasionally observed during the daylight hours. Thirty-two bobcats were captured as a result of 2997 trap-nights of effort. This is equivalent to 1 bobcat per 93.7 trap-nights. During the 1976-77 trapping

Table 3. Contents of 137 bobcat large intestines collected from 1975-77 in the Upper Coastal Plain of Alabama.

Item	*Occurrence*	
	Frequency	*Percent*
Mammals		
Cottonrat	56	40.9
Cottontail rabbit	40	29.2
White-tailed deer	14	10.3
Bobcat	13	9.5
Opossum	7	5.1
Gray squirrel	5	3.6
Marsh rice rat	5	3.6
Beaver	4	2.9
Pine vole (*Microtus pinetorum*)	3	2.2
Mice (*Peromyscus* spp.)	2	1.5
Least shrew	2	1.5
Short-tailed shrew	1	0.7
Pocket gopher (*Gromys pinetis*)	1	0.7
E. wood rat	1	0.7
Housemouse (*Mus musculus*)	1	0.7
Longtailed weasel	1	0.7
Chipmunk	1	0.7
Unknown mammal	9	6.6
Total mammal	131	95.6
Bird		
Unknown bird	11	8.0
Total Bird	11	8.0
Insect		
Ant (*Formica* sp.)	1	0.7
Total Insect	1	0.7
Total Insect		
Reptile		
Unknown reptile	2	1.5
Total Reptile	2	1.5

season, there were 13 instrumented bobcats on the Bermingham area. The manager on this area caught 11 bobcats in steel traps. Although he was trapping in the area of the instrumented bobcats, he caught only 3 of them. Using the ratio of mrked to unmarked bobcats we obtained an estimate of 48 bobcats. Applying this number to the area involved, 2025 ha yields an estimate of more than 1 bobcat per 43 ha. Admittedly, this estimate may be inaccurate because of an insufficient number of marked animals and the uncertain fate of some of the instrumented bobcats. However, 20 bobcats have been removed from the Bermingham area in each of the last 2 trapping seasons with no noticeable decrease in tracks or scats. This was equivalent to the removal of approximately 1 bobcat per 130 ha. From these data and from unpublished telemetry data collected during the study, the authors conclude that the minimum bobcat density was 1 bobcat per 86 to 130 ha.

Table 4. Contents of 218 bobcat scats collected from 1975-1976 on quail plantations in south Alabama.

Item	*Occurrence*	
	Frequency	*Percent*
Mammals		
Cotton rat	141	64.6
Cottontail rabbit	82	37.6
E. wood rat	23	10.5
Pine vole	15	6.8
Opossum	12	5.5
Peromyscus	8	3.7
Bobcat	6	2.8
Chipmunk	5	2.3
Gray squirrel	4	1.8
White-tailed deer	3	1.4
E. Harvest mouse	2	0.9
Shorttailed shrew	1	0.4
Unknown mammal	29	13.3
Total Mammal	218	100.0
Birds		
Bobwhite quail	2	0.9
Chicken	1	0.4
Cardinal	1	0.4
Unknown bird	30	13.7
Total Bird	33	15.1
Insects		
Botfly larvae (*Cuterebra* sp.)	2	0.9
Ant (*Formica* sp.)	1	0.4
Unknown insects	18	8.3
Total Insects		
Reptiles		
Unknown snake	6	2.8
Ticks		
Ticks	12	5.5

DISCUSSION AND CONCLUSIONS

Rodents as a group, and the cotton rat in particular, occurred with greatest frequency and volume in the stomachs, large intestines, and scats analyzed (Tables 2, 3, and 4). The higher frequency of occurrence of cotton rats in the scat analyses (Table 4) compared to the stomach and large intestine analyses (Tables 2 and 3) may be explained by the fact that all scats were collected on areas intensively managed for bobwhite quail, while some of the samples in Tables 2 and 3 were collected on adjacent woodlands. Cotton rats were also the most important prey in the combined analysis for each of the 12 months (Fig. 1). Trapping efforts during the study indicated that the cotton rat was the most abundant rodent on the study areas (Table 5). This conclusion is also supported by data collected by Gilbert (1975) on the Bermingham area.

Simpson (1976) reported that certain quail management practices tend to increase roden populations and that at high densities, cotton rats in particular could have a

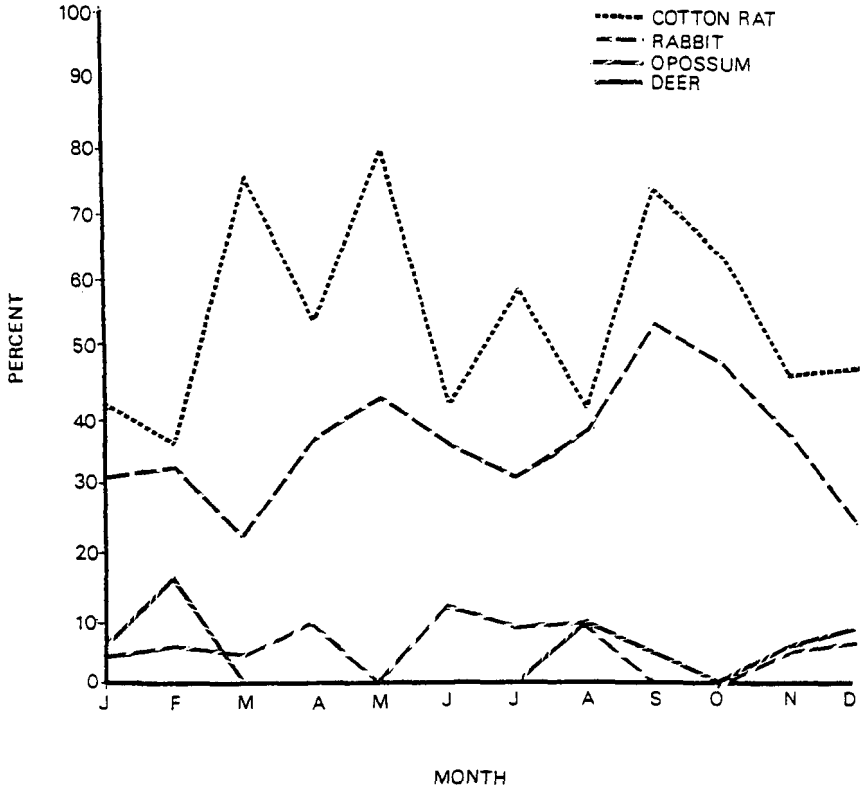

Fig. 1. Monthly summary of the four principal prey species of the bobcat plotted by percent frequency of occurrence. Based on 218 scats, 136 stomachs, and 137 large intestines collected on the upper coastal plain of Alabama, 1975 through 1977.

detrimental impact on quail populations. These impacts are manifested in several ways. Cotton rats can eat or otherwise damage roots of valuable quail food plants (Stoddard 1931). Direct competition for quail food can be serious, particularly since cotton rats can occur at densities 60 times greater than quail (Stoddard 1931, Komarek 1937, and Schnell 1968). Perhaps the most obvious impact of cotton rats is destruction of quail nests and eggs (Stoddard 1931, Simpson 1976). On one area in Georgia, nest destruction by rodents, of which cotton rats were the msot abundant species, accounted for destruction of 12 percent of the quail nests found; on the same area bobcats caused less than 0.4% of the total nest destruction (Simpson 1976).

The importance of cotton rats in the bobcat's diet in this study is apparent (Tables 2, 3, and 4), and the consequences of this high rate of cotton rat consumption to quail populations should not be overlooked. Schnell (1968) concluded that a highly mobile predator population could be more important than food, weather, or social interaction in regulating cotton rat density. The rate of predation applied to cotton rats by bobcats on these study areas may actually benefit bobwhite quail populations.

Relative to cotton rats, the other rodents were of little importance in the bobcat's diet. Mice (*Peromyscus* spp.) and the eastern harvest mouse had the highest relative densities of any other rodents occurring on the areas (Table 5). In spite of their relative

Table 5. Relative abundance of mammaliam species on two quail plantation study areas in south Alabama, 1975-76.

Species	*Relative abundance*[a]
Opossum[b]	24.3
Raccoon[b]	12.0
Bobcat[b]	11.0
Striped skunk[b]	2.5
Cotton rat[c]	2.1
Peromyscus spp.[c]	1.7
Harvest mouse[c]	0.8
Longtailed weasel[b]	0.6
Shorttailed shrew[c]	0.4

[a]Based on animals caught per 1000 trap-nights.
[b]Based on 2997 trap-nights of steel traps.
[c]Based on 4800 trap-nights of snap-traps.

abundance, they were not important food items. The marsh rice rat (*Oryzomys palustris*), which was not trapped at all, occurred more frequently than either *Peromyscus* spp. or the eastern harvest mouse in both the stomachs and large intestines of bobcats (Tables 2 and 3). The eastern wood rat (*Neotoma floridana*) was trapped only once, but it was more important than either of the mice categories in the scat analysis. At first glance, this relation appears to represent the inverse of the direct relation believed to exist between prey availability and prey occurrence in the diet (Latham 1951). However, Rosenzweig (1966) found that predators, in general, tend to specialize in killing prey of a certain size and that bobcats usually took prey in the 150 g to 5.5 g x 10^4 range. This range would include rats, rabbits, and deer but would exclude most mice. In addition to availability, the size of a particular prey species is an important consideration in its value as a prey item. The presence of smaller rodents in the diet could be explained by predation due to change encounter (Leopold 1933). The presence of the marsh rice rat and the eastern wood rat in the diet, in spite of their relative scarcity, may be explained by the specialization of bobcat hunting techniques for a particular size range of prey. A predator would not be very successful if it expended more energy in the capture of a small prey item than was obtained by its assimilation.

Rabbits ranked second in both frequency and volume in the stomachs, large intestines, and scats (Tables 2, 3, and 4). They also ranked second in frequency in each month (Fig. 1). Most of the previous studies concerning the food habits of bobcats in the Southeast have found rabbits to be more important than rodents as food items (Table 1). The removal of some rabbits by bobcats on quail plantations is generally welcomed by managers, who consider rabbits a tempting distraction to working bird dogs.

Bobcat hair occurred in 30% of the somachs, 13% of the large intestines and 6% of the scats. In only one instance (in a scat collected in November 1976) was there any evidence of cannibalism. The presence in this scat of bobcat teeth (milkteeth), fur, and skull fragments indicated that a kitten had been eaten. In all the remaining food habits materials examined, the amount of bobcat fur involved was so small that it probably represented hair ingested by grooming or hair ingested while the animal was in the trap.

White-tailed deer occurred in 9% of the stomachs, 10% of the large intestines, and 2% of the scats. The utilization of deer was high during the hunting season (November through January), low during the summer, and increased in August and September (Fig. 1). The increased consumption in late summer to early fall may be related to

availability of fawns during those periods. The deer flesh found in the stomachs of bobcats appeared fresh but it was impossible to ascertain whether the bobcats had killed the deer or fed upon them as carrion. An unusually high frequency of occurrence of deer in the bobcats' diet may reflect a decline in some other preferred prey species. Beasom and Moore (1977) found that deer occurred in bobcat diets during periods of cotton rat and rabbit scarcity but that it was important when these species were abundant.

Beaver (*Castor canadensis*) occurred in about 7% of the stomachs and 3% of the large intestines. It is difficult to interpret the importance of beaver in the diet, since it was commonly used as trap bait. Two trappers reported that beavers they had trapped had been fed upon by bobcats. It is possible that bobcats catch an occasional beaver but on the whole beavers are probably unimportant as prey.

The opossum was the most abundant furbearer on the study areas (Table 5). In spite of its abundance and presumed vulnerability, it occurred in a relaively stable 5 to 6% of all the food habits materials (Tables 2, 3, and 4). This frequency indicates that the opossum is utilized as food, but that it is not a highly preferred item.

Chipmunks (*Tamias striatus*) occurred in 0.7% of the stomachs and intestines and in 2.3% of the scats. Gray squirrels (*Sciurus carolinensis*) occurred in about 4% of the scats. These species are apparently not as important food items on quail plantations as they are in river bottoms (Davis 1955, Progulske 1955).

The least shrew (*Cryptotis parva*) occurred in 2.2% of the stomachs and 1.5% of the large intestines. The shorttailed shrew (*Blarina brevicauda*) occurred in 0.7 percent of the large intestines and 0.4 percent of the scats. Although neither the frequency nor the volume of the shrews is appreciable, their presence is noteworthy. It has been reported that mammalian predators will kill shrews but not consumer them due to their disagreeable taste (Schwartz and Schwartz 1959, Lowery 1974).

The long-tailed weasel (*Mustela frenata*) and the raccoon also occurred in the bobcats' diet but because of their low frequency in the diet, they were relatively unimportant food items. The raccoon was the second most abundant furbearer on the study areas but, perhaps due to its ability to defend itself, it was seldom killed by bobcats.

Birds as a group occurred in about 10% of the stomachs, 8% of the large intestines, and 15% of the scats. In 7 of the stomachs only a trace of feathers was found. The amount of coot (*Fulica americana*) and chicken (*Gallus domesticus*) present in 2 of the stomachs represented approximately 80% of the total volume of birds in the sample. Cardinals were abundant on the study areas but were found only in 1 stomach and 1 scat (Tables 2 and 4).

In spite of their high density on the study areas, bobwhite quail were found only twice in all the material examined, 1 in May and the other in November. The low frequency of occurrence of quail in this study is in general agreement with other studies that have found quail in the bobcats' diet (Davis 1955, Kight 1962, and Fritts 1973). If the bobcat were a serious predator on bobwhite quail, it should have been obvious on the present study areas, which supported high densities of both bobwhites and bobcats. Those quail that do occur in the bobcats' diet might be explained by change encounter (Leopold 1933). It is particularly noteworthy that most of the food habits materials was collected on areas with high turkey populations, but no turkey occurred in the bobcats' diet. Unidentified birds are present in Tables 2, 3, and 4 and, although positive identification has not been made, none of this avian material resembles bobwhite quail. These findings agree with those of Beasom and Moore (1977), who found that when rodent populations were high, birds were relatively unimportant in the bobcats' diet.

Trace amounts of insects occurred in the stomachs and large intestines but it is unknown whether or not they are ingested intentionally. Insects occurred in approximately 10% of the scats, but it is thought that many of these entered the scat after it was deposited. Ticks were found in 6% of the scats and may have come from prey speies or have been incidentally ingested during grooming.

Unidentified reptiles occurred 7 times in all the material analyzed. It is not known whether bobcats killed these reptiles or consumed them as carrion.

There is no mention of vegetation in any of the tables, in spite of its occurrence in 121 (89%) of the stomachs, 110 (80%) of the large intestines, and 146 (66%) of the scats. The presence of its vegetation was interpreted as trap debris (i.e., material ingested while the animals were in the trap) rather than as an important part of the bobcats' diet. This interpretation is supported by both the type of vegetational matter (dead leaves, grass, bark, twigs, and briars) and by the appearance of the trap site. Additionally, the 8 bobcats that were shot contained no plant matter. Davis (1955) reported extraneous vegetation (i.e., trap debris) in bobcats collected by trapping and little vegetation in those that were shot. By choosing to label all plant material as trap debris we may have missed some important vegetational component in the bobcats' diet; however, the low nutritional quality of this material suggest that vegetable matter is relatively insignificant in their diet. The grass found in the scats may have been ingested accidentally, or perhaps it acts as a purgative (Fritts 1973). The appearance of the grass in the scats was essentially in an unaltered form, further suggesting its unimportance as a food item.

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