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Interim Report

THE ECOLOGY OF THE BOBCAT (Felis rufus) IN THE  
RIVER OF NO RETURN WILDERNESS

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This report lists the objectives, procedures, and findings of all current research being conducted under the supervision of the Idaho Cooperative Wildlife Research Unit. The data reported herein are preliminary and may be inconclusive. Permission to publish any of the contents of this report in any form is therefore withheld pending specific authorization from the Unit.

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ABSTRACT: We have captured and radio-instrumented 29 bobcats, 10 coyotes and 4 mountain lions during the first 3 years of a 4 year study of bobcat ecology in a wilderness ecosystem. We have made over 900 daily locations of these bobcats, 190 locations of coyotes and 100 locations of lions. Bobcat population density is low and productivity is low when compared to other populations reported in the literature. Natural mortality is high accounting for the death of 28% of our marked bobcats. Predation by lions appears to be a major mortality factor. Little competition occurs between coyotes and bobcats despite overlap in territories and habitat and prey preference.

The bobcat has been both maligned as a predator and revered for its fur. For this reason the bobcat has been hunted and trapped for predator control and more recently for its fur which is valued as high as \$400 a pelt. It has been exploited over its entire range from southern Canada, throughout the United States and into northern Mexico.

Information is lacking on the bobcat's role as a predator in a natural ecosystem despite the number of studies that have been done on harvested bobcat populations and in areas where man's influence is predominant (see McCord and Cordoza 1982 for review). To wisely manage this species and ensure its survival over its entire range, we need to understand the ecology of an unexploited population of bobcats and what natural factors regulate their numbers.

In 1981 we began studies of a bobcat population in the middle of the 891,000 HA Frank Church River of No Return Wilderness of central Idaho. The objectives of our study are (1) to determine basic biology and ecology of an unharvested bobcat population inhabiting a mountainous ecosystem and (2) to determine the natural factors regulating bobcat populations.

Our study area is located in the middle of a vast wilderness area characterized by deep canyons and high mountains ranging from 1100 m to over 3000 m. Predominant wildlife species are elk (Cervus elaphus), mule deer (Odocoileus hemionus), white-tailed deer (Odocoileus virginianus), moose (Alces alces), mountain sheep (Ovis canadensis), and mountain goat (Oreamnos americanus). Major carnivore species in the area include black bear (Ursus americanus),

mountain lion (Felis concolor), bobcat (Felis rufus), lynx (Felis lynx), coyote (Canis latrans), and marten (Martes americana). Wolves (Canis lupus) have been reported in the region.

Field work began in October of 1981 with setting up field camps and distributing livetraps for capturing bobcats. Approximately 30 km of trail along the Middle Fork of the Salmon River and the lower Big Creek drainage were trapped. We have trapped from January through April of 1982, December 1982 through April 1983 and December 1983 through May 1984. Trail hounds were used in selected situations. We have traveled over 6400 km of wilderness trail during these 3 years.

We have captured 29 bobcats: 11 adult males, 9 adult females, 1 subadult male, 4 subadult females (estimated to be 1 to 2 years old), 2 male kittens and 2 female kittens (less than 1 year old). One of the adult males was captured and marked previously as a subadult, and one was captured and marked previously as a kitten. In addition to these bobcat captures, we have captured 3 adult male coyotes and 7 adult female coyotes. We have also captured 2 adult female mountain lions and 1 subadult female and 1 subadult male mountain lion. All of the captured animals were instrumented with radio transmitter collars except for 3 bobcat kittens.

Instrumented animals are monitored from ground and from fixed-wing aircraft. We have made over 900 daily radio telemetry and/or visual locations of the marked bobcats. We have made 190 daily locations of marked coyotes and 100 daily locations of the radio instrumented mountain lions.

The study area supports a relatively low density bobcat population: approximately 0.02 bobcat per km<sup>2</sup>. We obtained density estimates from data on captured bobcat, home range size of radio instrumented animals and numbers of tracks observed during the winter. This density is lower than densities reported elsewhere by McCord and Cardoza (1982). They recorded densities ranging from 0.09 to 2.74 bobcat per km<sup>2</sup>.

Productivity of this bobcat population is also low. Only 1 litter was observed during 3 years of study. The number of kittens in this litter was 3. Two adult females which were monitored for 2 consecutive years did not have litters either year. However, one of these females when initially captured was accompanied by a single kitten, indicating that it had a litter the year before its capture. Another female captured the first year of the study was also accompanied by a single kitten. Reproductive tracts from females that have died during the study have yet to be examined for evidence of pregnancies.

Comparing capture rates of juvenile bobcats (subadults and kittens combined) to adults would indicate a relatively high ratio of 45 juveniles per 100 adults. This implies a good reproductive rate. However, each juvenile was captured an average of 6.4 times compared to 3.3 times for each adult. This indicated that juveniles are almost twice as susceptible to trapping as are adults. The greater likelihood of juveniles to be trapped does not support the hypothesis that a high ratio of captured juveniles to adults represents a high reproductive rate in the population.

Natural mortality is high in this study area, accounting for 28% of the 29 marked bobcats. One bobcat died from drowning, 1 from unknown natural causes and 6 were killed by predators. Three, possibly 5, of these 6 were killed by mountain lions and 1 possibly by a bobcat. In addition, 2 bobcats were killed by hunters the first year of the study. Bobcat hunting and trapping is now officially closed in the area.

During the winter when deep snow covers the higher elevations, bobcats are forced to congregate in the lower elevations along the canyons and south exposed slopes of the major drainages. At this time, bobcat ranges overlap completely with each other. But as the snow begins to leave in late spring, bobcats begin to disperse to higher elevations and away from the major drainages. Some adults disperse up to 20 km to the summer range. At these times, bobcats occupy territories which appear to exclude other bobcats of the same sex but which overlap territories of the opposite sex. Home range sizes of 2 female bobcats monitored for 2 consecutive years are 57 km<sup>2</sup> and 36 km<sup>2</sup>. Home range sizes of 2 males monitored during the same period are 31 km<sup>2</sup> and 145 km<sup>2</sup>. Their territorial boundaries were maintained for the 2 years. An adult male monitored for 1 year had a territory of 62 km<sup>2</sup>. Juveniles have dispersed from 10 to 35 km from their initial capture sites.

Territories are probably maintained by "scent marking," by "visual marking," or both. This is accomplished by either defecating, urinating or scraping duff into piles with their feet. This behavior has been reported in southeastern Idaho by Bailey (1974), as well as in other areas (McCord and Cardoza 1982).

Marking has been observed along travel routes during both winter and summer in our study area. Bobcats mark with scrapes and scats at sites where they are feeding on deer or sheep carcasses. A female with a litter of kittens was observed to mark on three separate occasions at a single site along its travel route.

Habitats favored by bobcat during the winter are generally south exposures and xeric habitats where snow depth is less. During the winter 97% of 165 bobcat locations occurred at elevations between 1100 m to 2000 m. During snow-free summer and fall seasons bobcats use the more mesic habitats at higher elevations. At this time 68% of 126 locations occurred at elevations between 2000 m to 2700 m.

We have sampled these various habitats for small rodents and have captured an average of 5.4 deer mice (Peromyscus maniculatus) and 0.7 voles (Microtus sp.) per plot on 80 sample plots. However, we have found voles to be more abundant on mesic habitats and deer mice to be more abundant on xeric sites. Ground squirrels (Spermophilus columbianus) are abundant at the higher elevation mesic sites.

Voles are an important part of the bobcat diet in our study area. Of 147 bobcat scats analyzed, 59% contained voles and only 3% contained deer mice. Other items found in the bobcat diet included mule deer 19%, bighorn sheep 14%, woodrat 7%, bird 3%, and cottontail rabbit 7%. The greater occurrence of voles rather than deer mice in the diet indicated that bobcats selectively hunt for voles. Observations of our captive bobcat indicate that voles are more readily preyed on than are deer mice. Bobcats were observed to



prey on bighorn sheep and mule deer periodically during the winter. Of 69 ungulate carcasses examined during the study, we were able to determine that bobcats killed 5 deer and 2 sheep. Food remains at a natal den site indicate that bobcats prey on cottontail rabbit and ground squirrel during the summer.

Prey species are abundant in the study area. During the summer ground squirrels, voles, deer mice and snowshoe hares are available sources of food. In the winter mule deer and bighorn sheep as well as voles occur on the open southern exposed slopes and lower elevations favored by bobcats. But these areas are also occupied by potentially competing predators; the mountain lion and coyote. Mountain lions feed on both deer and elk (Hornocker 1970). Our studies show that coyotes feed on many prey species used by bobcats. Of 171 coyote scats analyzed, 36% contained voles, 45% mule deer, 22% bighorn sheep, 13% elk, 4% cottontail rabbit and 5% deer mice. Voles are an important part of both the coyote and bobcat diet in our study area.

What effect does competition from mountain lions and coyotes have on bobcats? Mountain lions have killed 3 of our marked bobcats and may have killed 2 others. These bobcats were killed but not fed on by the lions. During the winter both lions and bobcats are forced into the narrow Big Creek canyon where snow depth is less and where both predators may prey on deer and sheep. For these reasons conflicts between the two predators may occur. Four of the bobcats that were suspected to be killed by lions were at or near deer, elk or sheep carcasses. We believe that lions killed these bobcats because they either were usurping the carcass from a bobcat or were

protecting their kill from an intruding bobcat. On 2 occasions we have observed where lions usurped a bobcat kill. The opportunity for a hunting lion to encounter a bobcat at a bobcat kill is great because bobcats may spend 10 to 14 days feeding on a kill. On one occasion we found a bobcat carcass near a lion killed elk. At this site the lion marked with scrapes and scats around the dead bobcat.

During the winter, because both predators are confined to the narrow snow-free region of the lower drainages, opportunities for conflict between lions and bobcats are increased. One of the radio-instrumented lions shared a winter range with 12 instrumented bobcats. This lion may have killed 1 of these marked bobcat because the lion was in the vicinity at the time the bobcat was killed. Hornocker observed lions to kill bobcats during his studies of lions in the areas from 1962 to 1975 (Hornocker 1970). Ackerman et al. (1984) found lions to feed on bobcats in Utah. McCord and Cordoza (1982) noted records of lions preying on bobcats in California.

It has also been hypothesized that coyotes may compete against bobcats because both use the same habitat and prey. Nunley (1978) speculated that coyotes may even kill bobcats. Coyotes and bobcats use similar habitat and prey in our study area. Both predators feed on voles, mule deer, bighorn sheep, woodrat, cottontail rabbit and deer mice. Although food habits are similar, the manner in which these two predators procure their food is dissimilar. Even though territories of the two predators overlap, coyotes hunt the entire territory extensively during a relatively short period of time, whereas bobcats hunt more intensively smaller portions of its territory. The anatomy of the two predators also suggests a

different hunting behavior; the coyote has evolved for running and traveling greater distances, while the bobcat has evolved for stalking. Although both predators feed on deer and bighorn sheep, we have found that most of the deer and sheep fed on by bobcats are killed by bobcats, while most deer and sheep fed on by coyotes are scavenged and not killed by coyotes.

We have observed too that coyotes will attempt to avoid encounters with bobcats. Coyotes will not approach a feeding site when bobcats are present. However, both predators may feed on the same carcass if the bobcat is only occasionally visiting the feeding site. Because of the different hunting and scavenging strategies and because of the apparent avoidance of bobcats by coyotes, little competition exists between the two species in our study area.

We are conducting a fourth year of studies to better assess the effects of competition between mountain lions, coyotes and bobcats. With an adequate understanding of the factors regulating bobcat populations in this wilderness ecosystem, we can apply the knowledge to managing and understanding bobcats in non-wilderness areas throughout its range.

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