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SOCIAL ORGANIZATION IN A BOBCAT POPULATION¹

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Abstract: This report describes the social organization of bobcats (*Lynx rufus*) during a 3-year study of their ecology in southeastern Idaho. Most information was based on 103 captures of 66 bobcats and 531 daily radiolocations of 17 bobcats wearing radio collars. Size of home ranges varied from 6.5 to 107.9 km². Females appeared to use their smaller ranges more intensively than did males. The movements of all bobcats were more restricted during the autumn–winter than spring–summer periods. Resident females had almost exclusive ranges, but male ranges overlapped each other as well as female ranges. Only a small proportion of range overlap areas were mutually shared, and then primarily during periods of environmental hardship. Land tenure was apparently based on prior rights as few adult social interactions were observed. Various scent marks were made by bobcats to advertise their presence.

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Although bobcat food habits and some aspects of their reproductive biology have been extensively studied (Rollings 1945; Pollack 1951; Progulske 1955; Erickson 1955; Davis 1955; Gashwiler et al. 1960, 1961; Kight 1962) little is known about bobcat social organization. Rollings (1945), Erickson (1955), and Robinson and Grand (1958) conducted limited studies of bobcat movements, and Provost et al. (1973) were one of the first to use radiotelemetry to monitor bobcat movements. This report, based on a 3-year study of bobcat ecology (Bailey 1972), describes the social organization of bobcats in southeastern Idaho from 1969 to 1972.

I am especially grateful to M. G. Hornocker for obtaining the financial support, helping to design, and obtaining the interagency cooperation for the study. I thank W. L. Ginkel, Manager, Idaho Operations Office, for permitting me to use the National Reactor Testing Station as my study area. I also thank R. Sherwood, W. Davidson, D. von Steen, and K. Neilson of the Idaho Fish and Game Department, W.

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STUDY AREA

The Atomic Energy Commission's vast National Reactor Testing Station was selected for a study area because its ideal bobcat habitat was off limits to public hunting and trapping. Situated in southeastern Idaho's rugged Snake River Plain, the Station is characterized by numerous lava flows, volcanic craters, and caves. For convenience and sake of discussion, I divided the 648 km²-study area in the southern region of the Station into six subregions (Fig. 1).

The weather in this region is typically dry, cool, and windy. During the study, the annual precipitation, mainly snow, averaged 24.4 cm per year. The average daily temperature was 5 C with average daily extremes of 31.7 and –18.7 C. The lowest temperature recorded during the study was –31.7 C. Winds in excess of 14.5 km per hour blew almost daily. Meteorological information was obtained from a Weather Bureau Station located at Central Facilities on the Station.

¹ Contribution of the Idaho Cooperative Wildlife Research Unit; University of Idaho, Idaho Fish and Game Department, U. S. Fish and Wildlife Service, and the Wildlife Management Institute, cooperating.

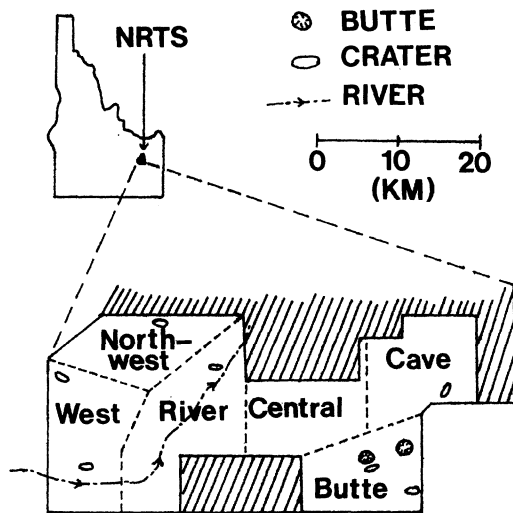


Fig. 1. Bobcat study area subregions within National Reactor Testing Station. Inset shows location of study area in Idaho.

Climax vegetation on the study area is sagebrush-grass (Tisdale et al. 1969). Big sagebrush (*Artemisia tridentata*) dominated the vegetation, but other shrubs such as rabbitbrush (*Chrysothamnus viscidiflorus*) and three-tip sagebrush (*A. tripartita*) were common. Dominant grasses included bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa sandbergii*), and needle-and-thread (*Stipa comata*). Cactus (*Opuntia* sp.) was widespread on sandy soils, and junipers (*Juniperus osteosperma*) were common on the rocky soils in the butte subregion.

MATERIALS AND METHODS

Capturing Bobcats

The 1st year of study was primarily devoted to capturing and tagging bobcats. Although trapping continued throughout the study period, as the study progressed, more time was necessarily allocated to radiotracking, snowtracking, censusing prey, and observing bobcats. Each sub-

region of the study area was trapped as thoroughly as conditions permitted with the greatest trapping effort each autumn and winter.

Victor No. 2, double-coilspring, steel traps and Tomahawk double-door livetraps, $38 \times 38 \times 100$ cm in size, were used to capture bobcats. Each captured bobcat was immobilized with phencyclidine hydrochloride (Bailey 1971), tagged with colored, numbered ear tags, ear tattooed, and released near the capture site.

All captured adult bobcats were classified as residents. Bobcats reared on the area, or immatures captured there before the peak dispersal period in the spring, were classified as kittens. Other bobcats which apparently did not remain on the study area, as determined by recaptures and radiotracking, were classified as transients.

Radio Equipment and Radiotracking Techniques

Bobcats in selected localities of the study area were fitted with radio collars after the 1st study year. Two different-sized collars were used, a 255-gram, 2-battery (Mallory RM12R) model for smaller bobcats, and a 340-gram, 3-battery model for larger bobcats. Transmitter life varied with pulse rate and power supply to about 3.5 months. Transmitters, receiver, and antennas are described by Seidensticker et al. (1970).

A single receiver was used with an interchangeable truck-mounted whip antenna, receiver-mounted loop antenna, and aircraft-mounted loop antenna. Average range of reception on the ground varied from 30 m when bobcats were inside caves, to about 1.6 km when they were in rocky terrain. Aerial reception averaged about 3.2 km from 305 m above ground surface.

Most radiotracking was from the ground, but if bobcats went into inaccessible areas, or if the snow became too

Table 1. Bobcat captures and trap days per capture.

Trapping period (July–June)	Number of captures				Number of trap days	Trap days/ capture
	Adults	Transients	Kittens	Total		
1969–70	25	1	27	53	8191	155
1970–71	10	2	27	39	4140	106
1971–72	7	1	3	11	2981	271
Total	42	4	57	103	15312	149

deep, an aircraft was used. On the ground, after a signal was detected with the whip antenna, the bobcat was approached until an accurate bearing could be obtained using the loop antenna. Several bearings from different places were obtained to determine the bobcat's location. Occasionally when only one bearing was obtained because of the bobcat's location and topography, the distance between the investigator and the bobcat was estimated. When aerial radiotracking, the signal source was approached from different compass directions until we passed directly over the bobcat at low altitude.

It was often impractical to obtain more than one radiolocation per bobcat per day because of trapping demands and the time required to locate bobcats in the rugged terrain. Each daily radiolocation represents the first location for a bobcat on a particular day. Observation time, bobcat activity, terrain, cover, and various meteorological parameters were recorded with each daily radiolocation. Locations were plotted on a map divided into 0.093 km² quadrants and identified by X,Y-coordinates. To facilitate analysis of bobcat movements, radiotracking data were coded and punched onto cards for use by a digital computer.

RESULTS

Capture Success

Sixty-six bobcats were captured 103 times during the study period with an average effort of 149 trap days per capture (Table

1). Not included were 7 captures of previously tagged bobcats off the study area by fur trappers. Bobcat kittens were more easily initially captured and recaptured than adults. Only three kittens were captured during the 1971–72 period, probably because few kittens survived after the local rabbit population crashed (Bailey 1972:47).

Decreasing trapping success suggested that the majority of adult bobcats on the area had been tagged. Seventy percent (19) of the 27 captured adults were trapped during the 1st year of study. The average number of trap days to initially capture adults increased during the three successive trapping periods from 431 to 690 to 1490, respectively. Simultaneously, the average number of trap days to recapture adults decreased from 1365 to 1035 to 596, respectively, even though adults were more difficult to recapture once they had been tagged. The number of trap days to initially capture an adult averaged 567 compared to 1020 to recapture one. Despite the trapping effort, some adults were not captured in the more inaccessible localities and along the study area boundary.

Population Characteristics

The sex ratio of the 31 captured males (10 residents, 3 transients, 18 kittens) and 35 captured females (17 residents, 1 transient, 17 kittens) was 0.9 males per female. Other reported bobcat sex ratios vary from 1.5 to 0.4 males per female (Erickson 1955:112 and Foote 1945:326, respectively). The sex

Table 2. Number of resident female bobcats in three subregions of study area.

Year	Subregion			Total
	River	Cave	Butte	
1969	4	2	4	10
1970	4	3	4	11
1971	4	3	4	11

ratio of 896 lynx (*Lynx canadensis*) was 1.3 males per female (Berrie 1973:28).

Twenty-seven bobcat litters with at least 58 kittens, 35 of which were captured, were recorded on the area during the study period. The average litter size for 16 litters, complete at time of observation, was 2.8. Some mortality may have occurred among these litters since kittens were seldom observed before they were 3 months old. One 3-week-old litter contained 4 females and 1 male. Erickson (1955:108) and Gashwiler et al. (1961:79) reported average bobcat litter sizes of 2.6 and 3.5, respectively.

Eighty percent (16) of 20 bobcat deaths recorded during the study period were caused by man. Seven tagged bobcats were killed by fur trappers off the study area, three deaths were study related, and six kittens were electrocuted while climbing powerline poles. Three resident females died during the study, the causes of their deaths uncertain, and one kitten apparently died of a skull fracture when it fell from a rock ledge.

The number of resident bobcats on the

study area each year was estimated to be 35, or one resident per 18.4 km². This estimate was based on captures of 27 adults, observations of five untagged adults, and tracks of adults repeatedly observed in three distinct localities. The number of residents was assumed to be relatively stable throughout the study period. On three of the most intensively investigated regions of the study area the number of resident females was relatively stable (Table 2). It was impractical to estimate total bobcat numbers each year because of the undetermined numbers of transients passing through the study area and fluctuations in kitten productivity and survival.

Home Range Use

A total of 531 daily radiolocations of eight male and nine female bobcats provided information on home range sizes, movements, and spatial dispersion (Table 3). Bobcat home ranges were based on irregular polygons formed by connecting the outermost radio locations. Female ranges varied from 9.1 to 45.3 km² and male ranges from 6.5 to 107.9 km² in size. The average size for four male ranges (42.1 km²) was 2.2 times larger than the average for eight female ranges (19.3 km²). In some southeastern regions of their geographic range, bobcat home ranges may be as little as 2.5 km² in size (Provost et al. 1973:49), and in some northeastern regions as large as 105 km² (Marston 1942:329). Regional differences

Table 3. Bobcats radiotracked and daily radiolocations.

Sex	Number of animals	Spring-summer (Apr.-Sept.)		Autumn-winter (Oct.-Mar.)		Total	
		Number of daily radiolocations	(%)	Number of daily radiolocations	(%)	Number of daily radiolocations	(%)
M	8	63	12	82	15	145	27
F	9	219	41	167	32	386	73
Total	17	282	53	249	47	531	100

Table 4. Distribution of 310 distances between consecutive daily radiolocations of radio-equipped bobcats according to sex.

Sex	Number of locations					Total
	0–1.6 (km)	1.6–3.2 (km)	3.2–4.8 (km)	4.8–6.4 (km)	6.4–8.0 (km)	
Males	40	27	14	1	1	83
Females	154	45	23	5	0	227
Total	194	72	37	6	1	310

in bobcat home range sizes probably reflect differences in the abundance of bobcat prey.

In comparing bobcat movements, only movements between consecutive days were considered. The linear distance between consecutive daily radiolocations was used to measure the net distance between the daily resting places of bobcats. Average net distances include those days when bobcats remained in, or returned to, previously-used resting places. The actual distances bobcats moved between daily resting places was usually much greater than the net distance. I once snowtracked a bobcat 3.2 km from a rockpile to which it returned. Erickson (1955:34) snowtracked bobcats up to 11.7 km between daily resting places, and Rollings (1945:137) reported that bobcats traveled 4.8–11.2 km per night.

The distribution of distances (Table 4) between the daily radiolocations of males differed significantly from that of female bobcats ($\chi^2 = 13.3$, $df = 4$, $P < 0.05$). Female bobcats were located more often 0–1.6 km from their previous location than were

males, and males were located more often over 1.6 km from their previous location than were females. There was no significant difference between the distribution of distances of females with kittens and females without kittens. The average net distance of 1.8 km between the daily radio locations of male bobcats did not differ significantly from the 1.2 km between female locations.

Female bobcats appeared to use their smaller home ranges more intensively than males. Females were frequently located within one of several distinct localities within their home ranges. These localities were usually within 1.6 km of a protected resting place such as a cave. After staying in one locality for a number of days, females would then move to another locality. The same localities were thus used repeatedly. In contrast, male bobcats moved from one part of their range to another without any apparent pattern and seldom, except during some winter periods, returned to previously-used resting places.

The distribution of distances (Table 5)

Table 5. Distribution of 310 distances between consecutive daily radiolocations of radio-equipped bobcats according to season.

Season	Number of locations					Total
	0–1.6 (km)	1.6–3.2 (km)	3.2–4.8 (km)	4.8–6.4 (km)	6.4–8.0 (km)	
Spring–summer (Apr.–Sept.)	80	43	22	3	1	149
Autumn–winter (Oct.–Mar.)	114	29	15	3	0	161
Total	194	72	37	6	1	310

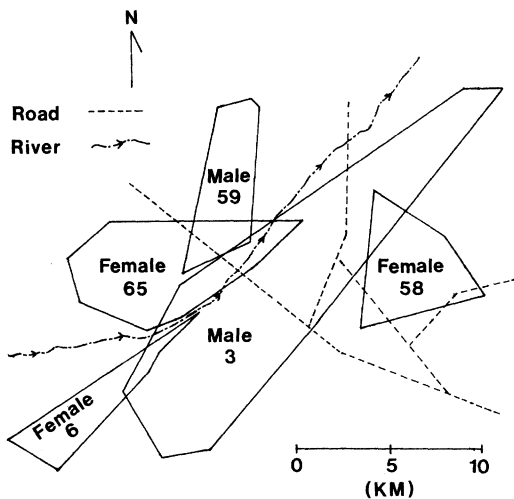


Fig. 2. Home ranges of resident male and female bobcats in river subregion of study area.

between radiolocations of all bobcats in the spring–summer differed significantly from those in the autumn–winter periods ($\chi^2 = 10.6$, $df = 4$, $P < 0.05$). Bobcats were located more often 0–1.6 km from their previous location in the autumn–winter than in spring–summer, and more often over 1.6 km from their previous location in the spring–summer than the autumn–winter periods. The greater proportion of shorter distances in the autumn–winter was probably related to the difficulty bobcats had in traveling through deep snow. The number of suitable resting places was also more limited during the autumn–winter periods. During periods of severe winter weather, bobcats often remained in, or daily returned to, previously-used resting places.

Home Range Overlap

Radiotracking data indicated that female–female home ranges had the least and female–male home ranges the most overlap. Male ranges overlapped the ranges of one or more females (Fig. 2). Based on the irregular polygon method of delimiting

home range boundaries, 0.1 percent of the combined areas of eight female ranges overlapped each other, and 23 percent overlapped four adjacent male ranges. Two percent of the combined areas of four male ranges overlapped each other, and 15 percent overlapped five adjacent female ranges.

Quadrant occupancy analysis revealed that bobcats in adjacent ranges were radio-located in only a small proportion of the quadrants within the overlapping areas. There was no overlap among the ranges of six adjacent females. Of two female ranges that overlapped 1 quadrant, both females were located at different times in that quadrant. Of 36 quadrants comprising the overlap areas among four ranges of males, adjacent males were located in only 1 quadrant. Adjacent males and females were located in 4 of 271 quadrants comprising the overlap areas among the ranges of four males and five females. Five of the six mutually-used quadrants encompassed a cave or rockpile that bobcats rested in or used to avoid inclement weather.

Adult Interactions

Although females and their kittens sometimes associated with each other for nearly a year, adult bobcats were solitary and seldom observed together. Adult males were observed with females and kittens on two occasions. Once during the breeding season in March, a large male was observed with a radio-collared female and her two nearly year-old kittens. Although the kittens investigated the male, the female appeared to ignore his presence. Once in November, tracks in the snow indicated that a captured male had just visited a cave where a female and her large kittens were staying. Only females with kittens at least 6 months old or females without kittens were observed with adult males. Older females or females with kittens were never observed together.

A most unusual association of adult bobcats took place during a period of inclement weather and general rabbit scarcity in the winter of 1971–72. It occurred in the river subregion of the study area when high winds, deep snow, and subzero temperatures prevailed for over a month. Most of the places bobcats normally sought refuge in this subregion, such as small rock outcrops and dense stands of sagebrush, had been drifted over with blowing snow. At a large pile of boulders two adult males and two females, one about 1.5 years old and the other older, were captured and fitted with radio collars. These adults were never observed resting or traveling together. When resting inside the rockpile, they were separated 2–3 m from each other, and each had a particular section of the rockpile in which it stayed. The bobcats fed exclusively on a local concentration of jackrabbits (*Lepus californicus*) within a 0.8-km radius of the rockpile. No aggressive behavior was observed when the two males were once 3 m apart, sunning themselves on the rocks, and no sign of fighting was ever observed while snowtracking them. After about 2 weeks, one male and the younger female either removed their radio collars inside the rockpile or perished. The other two adults left the rockpile and resumed normal activity in their separate ranges after the weather moderated.

Provost et al. (1973:54–55) reported only one instance of aggressive behavior among the bobcats they radiotracked. An older male was once observed pursuing a younger male in a tree. Berrie (1973:23) once observed a male lynx give the right-of-way to a female lynx it met using the same route of travel.

Scent Marking

A significant mode of communication among bobcats on the study area was scent

marking. Adult bobcats scent marked with feces, urine, scrapes, and anal glands. Young bobcats did not scent mark, and observations at natal dens indicated that kittens always attempted to cover their feces. Later in the autumn, however, when the kittens were older, they occasionally abandoned this habit, a trait similarly observed in the lynx (Saunders 1963:398).

Although adult bobcats sometimes covered their feces, at other times they left exposed, conspicuous feces along their routes of travel and near caves and rockpiles. Of 60 single groups of feces discovered while snowtracking bobcats, 60 percent were covered and 40 percent exposed. Of these, females covered 57 percent and left 13 percent exposed. The sex of the other snowtracked bobcats was uncertain. Of 42 bobcat feces investigated by Erickson (1955:25), 52 percent were covered and 48 percent exposed.

Conspicuous groups of bobcat feces were also observed throughout their home ranges. These fecal marking locations sometimes had over 50 feces in an area 1 m in diameter. Kight (1962:9) once collected 254 feces from a single marking location in South Carolina. Ninety percent of 50 fecal marking locations I investigated were in rocky terrain, but 68 percent were on a soft substrate (Table 6). Fifty-two percent of the fecal marking locations were situated within female bobcat ranges, 32 percent in areas of overlap between male and female ranges, and 16 percent in unclassified bobcat ranges. Forty-two percent of the fecal marking locations were near natal or temporary dens of females with kittens, and 58 percent were near places bobcats frequently traveled such as rocky ridges and rims of volcanic craters.

Most of the fecal marking locations which had recently-deposited feces in them ap-

Table 6. Terrain and substrate at 50 bobcat fecal marking locations.

	Number	Percent
Terrain		
Broken (rocky)	45	90
Level (not rocky)	5	10
Substrate		
Soft		
Fine soil	14	28
Antmounds	10	20
Juniper needles	10	20
Hard		
Rocky soil	8	16
On rocks	8	16

peared to have been established by females with kittens. These were established in the late summer and early autumn after the kittens began following their mothers. One female established eight fecal marking locations around a temporary den soon after moving her kittens there. Each fecal marking location of this female was on conspicuous antmounds. It appeared that females demarcated special places within their home ranges rather than their home range boundary as reported for a female bobcat by Provost et al. (1973:76).

There was no apparent regularity to the rate bobcats defecated in fecal marking locations. New feces were found in one fecal marking location on the average of about once every 3 months. New feces were not evident in one female's fecal marking locations after September although she continued to visit the area until the following spring. Two bobcats defecated in their fecal marking locations only after all feces there were experimentally removed. A female defecated at her location within 12 hours after she returned to the area, but a male waited several days before defecating at his.

Bobcats also scent marked by squirting small amounts of urine on rocks, bushes,

Table 7. Objects urine-marked by bobcats.

Object	Observations	
	Number	Percent
Sagebrush	11	38
Rocks	10	35
Vertical snowbank	5	17
Horizontal snow surface	3	10
Total	29	100

and snow banks as they traveled about their home ranges (Table 7). One bobcat scent marked with urine three times in 1.6 km; another, three times in 0.4 km. Lynx sometimes squirt urine 17–20 times per 1.6 km (Saunders 1963:398), and a tiger (*Panthera tigris*) squirted urine 11 times in 30 minutes (Schaller 1967:255). Urine squirting was particularly noticeable when four adult bobcats traveled the same pathways and a frozen river to avoid walking in deep snow. Three adult females squirted urine with a musky odor at the entrances to caves they stayed in during the breeding season.

Bobcats sometimes scraped the substrate with their hind feet after scent marking with urine or feces. These scrapes, two parallel grooves, were 25–30 cm long and 10–15 cm wide. Scrapes were found near and inside caves, along trails, and in fecal marking locations. The odor of urine was detected in 3 of 7 fresh scrapes, but older scrapes may have had undetected odors.

The anal glands of adult bobcats contained a pastelike secretion that varied in color from light yellow in females to dark brown in males. In juvenile bobcats, the secretion was white to slightly yellow in color. I could not determine how bobcats scent marked with anal gland secretions. One bobcat expelled anal scent on snow it used to cover its feces, and another expelled anal scent when it sprang a trap but escaped. New feces in fecal marking locations sometimes had an odor resembling anal scent.

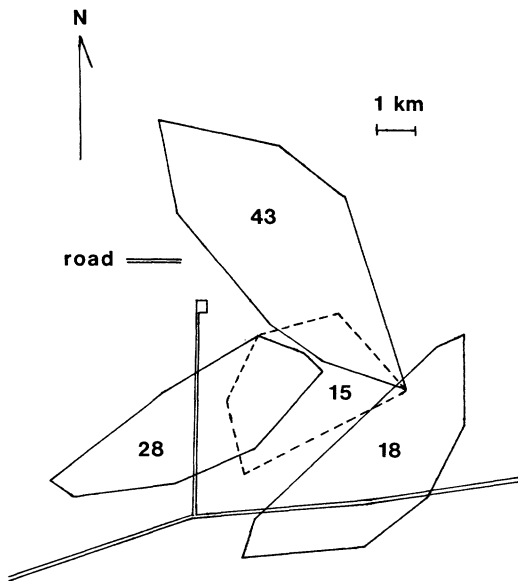


Fig. 3. Home ranges of resident female bobcats in cave subregion of study area. Portions of female No. 15's range (dashed outline) were assumed by females Nos. 28 and 43 after No. 15's death.

Land Tenure System

The land tenure system of bobcats was apparently based on prior rights. No neighboring resident or transient permanently settled in an area already occupied by a resident. Transient bobcats only passed through areas occupied by adults. Of two transient males fitted with radio collars, one apparently left the study area in 2 days, the other in 4 days. The latter male was subsequently located at different times about 24 km south of the study area and may have settled in an area where bobcats were repeatedly removed by fur trappers.

Dispersing young bobcats reared on the study area also appeared to avoid settling in areas already occupied by residents. No tagged kittens were recaptured on the study area a year after their birth. However, five tagged kittens were later captured as adults

1–2 years after their births off the study area by fur trappers.

All observed changes in resident bobcat home ranges and land occupancy by new residents were attributed to former residents' deaths. Parts of one female's range in the cave subregion of the study area were assumed by two other females after the former's death (Fig. 3). The ranges of two tagged females that died in the river subregion were also subsequently occupied by new females. Although similar occurrences were not documented among resident males, their continued presence in the same localities suggested that the males' land tenure system was similar to that of female bobcats.

DISCUSSION

A social organization or organizational system describes the conspecific relationships and interactions between individuals and their relationship to the land about them (Fisler 1969). The relative exclusiveness of bobcat home ranges, particularly among females, the failure of other bobcats to settle in occupied areas, and certain aspects of bobcat scent marking suggested that the social organization of bobcats was a form of territoriality. The most important point, in regards to territoriality, was that once an area was occupied by a bobcat, others were somehow prevented from settling there. The manner which residents advertised land occupancy and intruders responded was uncertain, but scent marking appeared to have been important. Overt defense of areas was not evident and was believed to be minimal or absent. In these respects, the social organization of bobcats was similar to that of other solitary carnivores such as the mountain lion (*Felis concolor*) (Hornocker 1969, Seidensticker et al. 1973), weasel (*Mustela nivalis*) and

stoat (*M. erminea*) (Lockie 1966), mink (*M. vison*) (Gerell 1970), and otter (*Lutra lutra*) (Erlinge 1968).

The principle of range exclusiveness need not be a prerequisite for territoriality (Lockie 1966, Hornocker 1969). Some of the apparent overlap among bobcat home ranges was probably an artifact of the abstract manner home range boundaries were delimited by straight lines. Quadrant occupancy analysis suggested only small proportions of these areas were actually shared by bobcats having adjacent ranges. When overlap actually occurs between home ranges, it usually results from a restricted distribution of an essential resource (Altmann and Altmann 1970). Usually the bobcats' essential resources on the study area, prey and resting or denning places, were evenly distributed and bobcats well dispersed. During difficult times, when prey was scarce or the weather severe, these resources became limiting and the bobcats' social organization was modified as they adapted to the changing environment.

Territories need not be continuous areas. In environments where cover reduces visibility, a home range may consist of a number of places that are important to the animal, such as feeding or resting places, connected by a series of pathways (Ewer 1968). The home ranges of female bobcats, particularly those with small kittens, were essentially a number of temporary dens and hunting localities that the females periodically demarcated, but repeatedly used. When viewed from the animal's "outlook," noncontinuous areas may therefore interpenetrate and different individuals may move through the same area to reach a specific place that is important to them. When an observer, thinking in terms of continuous areas, sees an apparent violation of territorial boundaries, there may not in fact

have been any infringement of territorial rights (Ewer 1968).

Although scent marking by bobcats probably served a variety of functions, one function appeared to be related to the maintenance of territories. By demarcating special places within their home ranges, bobcats may have prevented others from settling there. No agonistic behavior need be involved; as Kleiman (1966) suggested, the efficiency of scent marking in maintaining territories probably derives from the avoidance responses shown by the intruder. Fecal marking could have been a form of territorial behavior as long as it was site-dependent and resulted in conspicuousness and avoidance by similarly behaving individuals (Fretwell 1972). Fecal marking appeared to be an action associated with a particular place, whereas urine marking appeared to depend on a bobcat's particular mood. Fecal marking locations could serve to demarcate special areas and urine marks to facilitate or prevent encounters. The gradual disappearance of a demarcating mark would advertise a vacancy in a locality and other bobcats could settle there.

Territoriality appeared to be more pronounced among female than male bobcats. If the primary function of a territory is to ensure that its holder has at its disposal an area sufficient to provide for its own or its family's needs (Ewer 1968), in bobcats where the female alone must raise the family, reproductive success is largely female dependent. Females with small kittens must utilize smaller areas than males because of their restricted mobility. Females must bring food to kittens which when small are left behind while the female hunts. Most of the female's time is thus spent protecting and providing food to her kittens. Soon after they become indepen-

dent she likely will breed again and start raising another litter.

Unlike females, male bobcats have no family-rearing responsibilities and thus greater mobility. A male's territory, besides providing food and shelter, probably encompasses as many females as he can successfully breed. Competition for territories instead of for females during their brief breeding periods would permit males to successfully consummate matings without being thwarted by other males. Selection should favor those males which leave the greatest number of offspring (Orians 1969).

Lynx appear to have an organizational system similar to that of bobcats. In Alaska, resident female lynx had mutually exclusive areas, but male ranges overlapped those of females and other males (Berrie 1973). In Sweden, Haglund (1966) reported that although the range of an old male lynx (*Lynx lynx*) overlapped that of a female with young, adjacent lynx made only short visits into their territories. A male and female lynx with young in Newfoundland shared the same area, but the male was seldom found in the immediate vicinity of the female (Saunders 1963). No other lynx shared their area although two juveniles, probably transients, passed through it. In Alberta, lynx appeared to be separated in time as well as space (Nellis et al. 1972). When lynx depend on local concentrations of prey for food, they apparently share such areas (Bergerud 1971).

The type of social organization bobcats display probably depends on the characteristics of their principal prey. If the prey is uniformly distributed and sedentary, competition for food could be reduced by having exclusive areas. If the prey becomes localized or is highly mobile, bobcats would have to follow their prey and exclusive areas would be of little survival value.

Similarly, after rabbit populations crash, small localized concentrations of jackrabbits could be found quickly and perhaps utilized more efficiently if bobcats wandered beyond their normal ranges in search of prey. In the process, their home ranges would gradually become larger and exhibit more overlap. Some ranges might eventually be abandoned. In such fluctuating environments, territoriality among bobcats may only occur during those periods when prey is widespread and abundant.

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