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# DIETS OF SYMPATRIC RED FOXES AND COYOTES IN SOUTHEASTERN IDAHO<sup>1</sup>

Jeffrey S. Green<sup>2,3</sup> and Jerran T. Flinders<sup>2</sup>

**ABSTRACT.**— Scats of sympatric red foxes and coyotes from the upper Snake River Plain of southeastern Idaho were analyzed for composition. Rodent remains in general and those of cricetid mice in particular occurred more frequently in scats of red foxes during all seasons of the year than any other food items identified. Scats of coyotes differed significantly in content from scats of red foxes during winter and contained primarily pygmy rabbit remains. In summer, remains of pygmy rabbits, sheep, ground squirrels, yellow-bellied marmots, arthropods, and vegetation were found more frequently in scats of coyotes and remains of cricetid mice occurred more frequently in scats of red foxes. Red foxes and coyotes generally consumed similar food items but in different proportions. Based on the location of scats that were collected, red foxes and coyotes largely used different portions of the study area. Reasons for the preferential usage of habitat are discussed.

Although over 100 studies of food habits of red foxes (*Vulpes vulpes*) (Ables 1975) and numerous studies of diets of coyotes (*Canis latrans*) (Gier 1975) have been published, there is a lack of information on the food habits of these two canids in sympatry. Both species are versatile in their eating habits and readily consume animal and plant matter depending on season and availability. Both species readily feed on livestock and poultry when available and thus have come into conflict with human interests. Here we report the diets of red foxes and coyotes on the U.S. Sheep Experiment Station (USSES), where up to 10,000 sheep graze at various times of the year.

## STUDY AREA AND METHODS

The USSES occupies approximately 11,000 ha of the upper Snake River Plain in Clark County, Idaho. The vegetation, described by Blaisdell (1958), is dominated by big sagebrush (*Artemisia tridentata*), with the primary understory species being thick spike wheatgrass (*Agropyron dasystachym*), bluegrass (*Poa* spp.), and mixed forbs. The area is grazed by sheep primarily in the spring and fall.

Scats from red foxes and coyotes were collected monthly from January 1976 to March

1978, primarily along dirt roads except when snow cover allowed cross-country snowmobile travel. Scat identification was made by observation of associated tracks, prey kills, and proximity to known dens and areas of preferred use. Scats were oven dried prior to storage and were later washed, separated, and prepared for analysis in a manner similar to that described by Johnson and Hansen (1979). The hair component of each scat was hand separated from the large (> 1mm) insoluble component.

Using a point frame method, 20 hair fragments from each scat were selected and identified by comparison to a reference collection of hair from prey species on the USSES. Hair was identified by medullary characters (Brunner and Coman 1974). Teeth were also used to verify the animal species consumed.

Relative abundance of small rodents on the USSES was estimated (Leslie 1952) with two parallel lines of 50 snap traps at 10 m intervals set for four consecutive nights. At least six sites per season were trapped during July 1976 and July 1977 in areas of varying sagebrush and bitterbrush cover. Fecal pellets of pygmy rabbits (*Brachylagus idahoensis*) were collected from seven permanent sites during 1977 and 1978 to monitor relative abundance of rabbits (Green and Flinders, 1980a). Rock chucks (*Marmota flaviventris*) and sage

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grouse (*Centrocercus urophasianus*) were censused with spatial counts during summer 1976 and 1977.

A chi-square test was used to compare red fox and coyote diets and significance is reported at the 0.05 level.

### RESULTS AND DISCUSSION

One hundred twenty-five scats from red foxes and 129 scats from coyotes were analyzed. They were grouped, according to date of collection, into one of two seasonal periods: winter (comprising inclusively the months September through February) and summer (comprising inclusively the months March through August). Small sample size precluded meaningful analyses of red fox and coyote scats between years. Therefore, the results reported reflect a biseasonal comparison of scat composition through a 27-month period (Table 1).

Sheep and yellow-bellied marmot remains occurred more frequently in red fox scats during the winter period, and Great Basin pocket mice (*Perognathus parvus*) occurred

more frequently in the summer period. Rodents in general and cricetid mice in particular (primarily *Peromyscus maniculatus*), occurred more frequently in scats of red foxes in both seasonal periods than any other food items identified.

Remains of pygmy rabbits were found most frequently in the scats of coyotes during the winter period and remains of Uinta ground squirrels (*Spermophilus armatus*), yellow-bellied marmots, arthropods, and vegetation were found more frequently in scats during the summer period. This was not unexpected, since yellow-bellied marmots and ground squirrels were in hibernation from approximately August until March and the likelihood of coyotes consuming arthropods and vegetation was higher in summer than in winter.

There were significant differences in the composition of scats of red foxes and coyotes during the winter and summer periods. During winter, pygmy rabbit remains were found more frequently in scats of coyotes, and remains of cricetid mice, birds, and vegetation were found more frequently in scats of red

TABLE 1. Bi-seasonal comparisons of contents of scats from sympatric red foxes and coyotes in southeastern Idaho.

	Winter (September-February)				Summer (March-August)			
	Red fox (n = 38)		Coyote (n = 64)		Red fox (n = 87)		Coyote (n = 65)	
	% occur. <sup>1</sup>	% vol.	% occur.	% vol.	% occur.	% vol.	% occur.	% vol.
Rabbits (total)	(32)	(22)	(67)	(70)	(32)	(14)	(38)	(22)
Pygmy rabbit ( <i>Brachylagus idahoensis</i> )	29	22	64	69	22		38	22
Jackrabbit ( <i>Lepus townsendii</i> )	3	t	3	1				
Rodents (total)	(71)	(51)	(39)	(16)	(82)	(69)	(74)	(65)
Yellow-bellied marmot ( <i>Marmota flaviventris</i> )	5						31	
Uinta ground squirrel ( <i>Spermophilus armatus</i> )			2		1		17	
Great Basin pocket mouse ( <i>Perognathus parvus</i> )	3		3		17		12	
Cricetid mice <sup>2</sup>	68		39		75		43	
Other rodents	5		6		16	5		
Domestic sheep	34	23	25	13	17	14	32	12
Birds	13	t	3	t	10	t	12	t
Arthropods	18	t	6	t	21	t	49	t
Plant matter <sup>3</sup>	34		17		34		66	

<sup>1</sup>Percent of scats that contained particular food items.

<sup>2</sup>Primarily *Peromyscus maniculatus*.

<sup>3</sup>Volume of plant matter was not estimated.

foxes. In the summer period, remains of pygmy rabbits, sheep, ground squirrels, yellow-bellied marmots, arthropods, and vegetation were found more frequently in scats of coyotes, and remains of cricetid mice occurred more frequently in scats of red foxes.

An index of similarity (SI) was calculated for scat composition of red foxes and coyotes for the winter and summer periods using the formula  $SI = (\Sigma \text{ minimum value} \div \Sigma \text{ maximum value}) (100)$ . The SI for composition of scats of red foxes and coyotes during the winter period was 48.5 percent and during the summer period was 44.5 percent. An SI of 100 percent would exist when scats were identical in composition.

The density of small mammals was estimated to be 44/ha in the summer 1976 and 74/ha in the summer 1977. Deer mice were the predominant rodent during both years (59 and 90 percent, respectively). The density of yellow-bellied marmots and sage grouse were 0.075 and 0.475/ha, respectively, in 1976 and 0.57 and 0.97/ha, respectively, in 1977. Fecal pellet counts of pygmy rabbits were not significantly different during the two years of the study.

Sheep remains were found in scats of red foxes and coyotes throughout the year. In winter, the sheep remains were obtained as carrion because the sheep were kept in pens where they were not vulnerable to predation. Sheep carcasses were not removed from the range, and in winter they may have provided an important source of food for both canids. One of us (Green) observed sheep carcasses uncovered from beneath several feet of snow by red foxes and coyotes. They were frequently fed upon by both predators. During the spring, lamb remains were observed at the entrance to several fox dens. Lambs die of exposure and/or disease in the spring and may be consumed by both red foxes and coyotes. Both predators may also kill and consume sheep.

Several studies have shown that, in certain areas, coyotes relied heavily upon rabbits (*Sylvilagus* spp.) and/or hares (*Lepus* spp.) (Bond 1937, Sperry 1941, Korschgen 1957, Clark 1972). In this study area, pygmy rabbits provided a major portion of the diet of coyotes. Scats from coyotes collected during January and February were often composed

entirely of remains from pygmy rabbits. During the period of this study, cottontail rabbits (*S. nuttallii*) and white-tailed jackrabbits (*L. townsendii*) were rarely observed. Although relatively small, pygmy rabbits were the largest prey species available on the USSES during the latter half of the winter period. [Adult pygmy rabbits weigh approximately 450 g (Green and Flinders 1980b); adult Nuttall's cottontail rabbits weigh approximately 800 g (Orr 1940); white-tailed jackrabbits weigh approximately 2.7 kg (Flinders and Hansen 1972).]

Scats from coyotes were collected throughout the 11,000 ha of the USSES although more (73 percent) were found in the northern half. Scats from red foxes were also found throughout the study area, but a majority (80 percent) was collected in the southern half. In addition, red foxes were rarely observed anywhere but in the southern portion of the USSES. The entire study area is sagebrush-grass type with no readily apparent differences in habitat between the northern and southern portions. Rodent trapping and other censusing of wildlife indicated that items of prey were generally found in similar concentrations in all areas sampled.

We propose that both canids in this study, and particularly red foxes, showed a preferential usage of habitat for the following reasons. For over 60 years the plan of sheep management at the USSES has been to graze the southern portion of the range with ewes and their new lambs beginning approximately May 1. The death of lambs from disease and starvation is often augmented by adverse weather conditions, thus providing carrion for carnivores. The availability of carrion corresponds closely to the time of whelping, raising, and rearing of red fox pups. Since adult red foxes are likely to remain in the same area for life (Ables 1975), it is conceivable that generations of red foxes have keyed on this area for food; both carrion and vulnerable prey (lambs). At least five active den sites of red foxes were located in the southern portion of the USSES during this study. Red foxes have not been actively hunted in this area.

Several factors have increased human killing of coyotes since the early 1970s. Fur prices escalated, causing increased sport



hunting, trapping, snowmobile chasing, and aerial gunning of coyotes. The latter two methods are extremely effective in eliminating coyotes in sagebrush-grass habitat. The use of poisons for coyote control was prohibited, perhaps intensifying the effort, particularly in sheep-producing areas, to remove coyotes at every opportunity.

Since the USSES headquarters is located in the southern portion of the range, human activity (moving sheep to and from headquarters for lambing and shearing, hauling water, and inhabiting sheep wagons) is more intense than in the northern area. Human pressure on coyotes, the concurrent relative disregard for red foxes, and the opportune pup-rearing circumstances for red foxes in the southern portion of the range may all have contributed to the differential use of habitat by red foxes and coyotes observed in this study.

Although little is known of the inter-specific relationships of red foxes and coyotes, there is some indication that red foxes may readily occupy a suitable niche vacated by coyotes as a result of predator control or other reasons (Gier 1975, U.S. Fish and Wildlife Service 1978). It is not known how long red foxes and coyotes have occupied this study area, but, because both these predators often utilize similar food items and occupy similar habitat, it is doubtful that their relationship is static.

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