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WYOMING BEARTOOTH MOUNTAIN GOAT STUDY

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Abstract: A mountain goat (*Oreamnos americanus*) population in northwestern Wyoming was studied during May-November, 1989. This herd is located in the Beartooth Mountains east of Yellowstone National Park. Goats occur in four major drainages. A minimum population of 141 goats was determined. Kid production was higher than previously documented, with kid:nanny ratios of 121:100 in the spring to 80:100 in the fall. Several nannies with twins and one set of triplets were observed. Remains of 7 goats were found during the study. Bighorn sheep (*Ovis canadensis*) also occupy this area. Seventeen bighorn sheep were observed grazing with 58 mountain goats. No dominance hierarchy was evident from bighorn sheep and mountain goat interactions.

The mountain goat herd was established through immigration from a mountain goat transplant in 1942 into the Beartooth Mountains near Red Lodge, Montana. Eight hunting permits are currently allocated for this herd unit. During the past 5 years, there has been a noticeable expansion of mountain goats in northwestern Wyoming. Confirmed observations have increased within and outside the Beartooth herd's range (Wyoming Game and Fish Department). Mountain goats have been reported along the North and South Fork drainages of the Shoshone River, and one observation was confirmed in the Wood River drainage, 104 km (65 mi) from the herd's range. These areas include critical habitat for important bighorn sheep populations. Range expansion by goats also concerns Grand Teton and Yellowstone National Parks. An "exotic" like the mountain goat might compete with indigenous bighorns and would not be welcome in the parks (Ball 1988). Mountain goats may not be desirable in certain mountain ranges in Wyoming. Confirmed sightings of mountain goats outside of known range in recent years may be indicative of changes in herd population dynamics.

The proportion of females in the harvest has been increasing in the Beartooth herd. During 1982-1987, the proportion of nannies increased from 12.5% (n = 1) to 71.5% (n = 7). It is not known if this trend is due to changes in hunter assess or to a change in goat sex ratios, or both. Correct harvest may be crucial to prevent herd decline. Mountain goat herds are easily reduced by even moderate hunting (Kuck and Pehrson 1977, Adams and Bailey 1982, Swenson 1986).

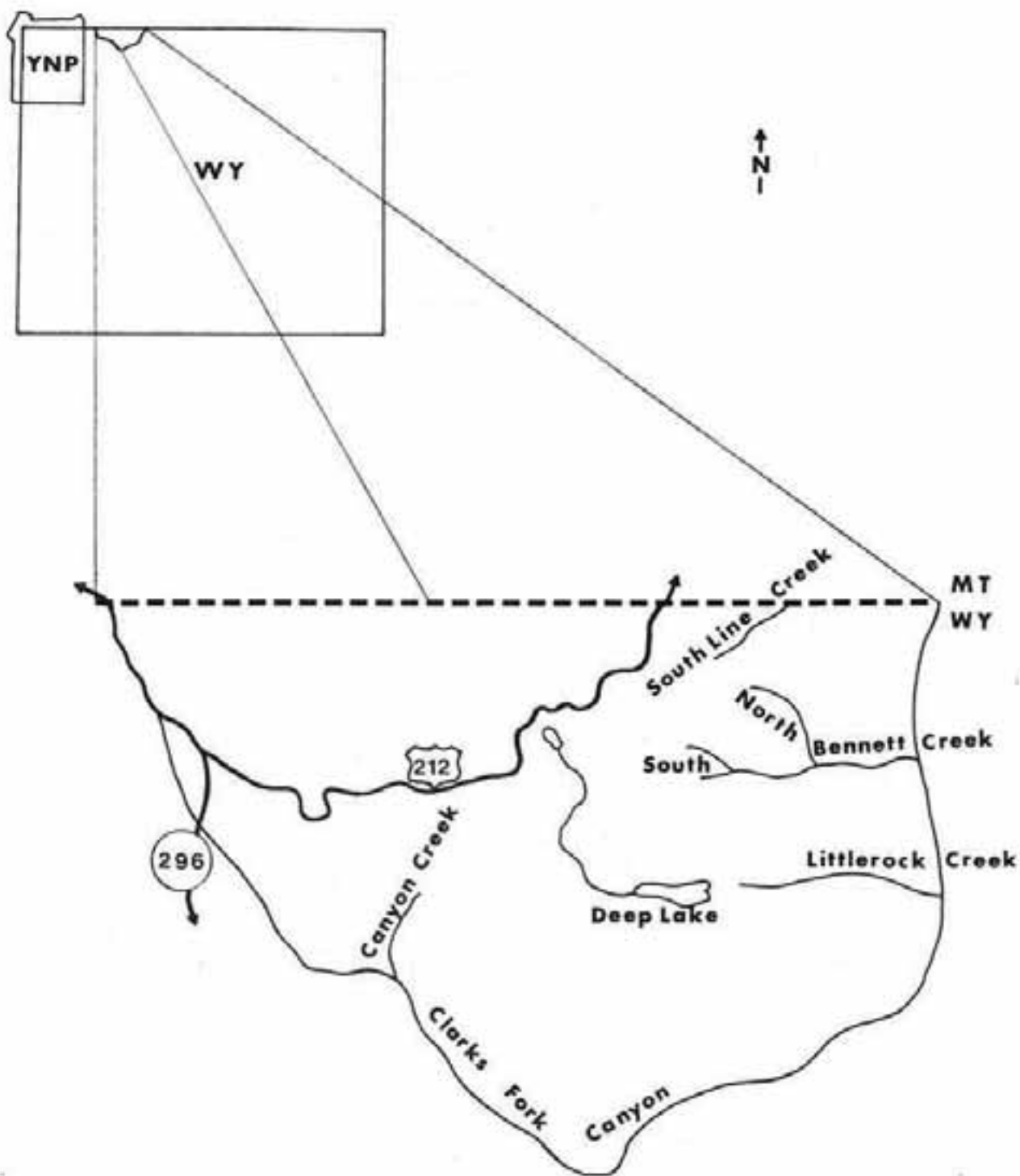


Fig. 1. Location of the Beartooth Mountain Goat Study area in northwestern Wyoming.

No population model exists for the Beartooth herd. Trend counts are often incomplete or unsuccessful because of the difficulty in locating the animals. The range map for this herd does not delineate winter range, parturition areas, yearlong range or crucial areas. Better data are needed for management decisions.

The objectives of this study were (1) to determine the distribution of mountain goats in the Beartooth herd range; (2) to determine the sex-age composition of the mountain goat population; and (3) to obtain a minimum population estimate of mountain goats in the Beartooth herd range.

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STUDY AREA

The study area is located in the Beartooth Mountain Range of northwestern Wyoming, east of Yellowstone National Park and west of Clark, Wyoming. The southern boundary is the Clarks Fork of the Yellowstone River and the northern boundary is the Montana state line. Because of limited funding, efforts were confined to that part of the study area south of the Beartooth Highway (HWY 212, Fig. 1). Elevations within the area range from 3,413 m (11,200 ft) on the Beartooth Plateau to 1,341 m (4,400 ft) in the Clarks Fork Canyon.

METHODS

Each drainage of the study area was observed systematically from the ground during consecutive days from daylight to dusk. This reduced the probability of duplicate observations of goats that might move along a canyon. During spring, snow prevented movement of goats between drainages. During the summer when goats could move between drainages, adjacent drainages were observed in the morning and evening, respectively, to avoid duplication.

Mountain goats were classified as males, females, and unknown in the adult, 2 1/2, and yearling age classes, or as kids (Smith 1988). Females older than 2 1/2 were classified as nannies. Nanny:kid ratios were based on classified females only. Unclassified mountain goats that may have been nannies were included in (nanny + unclassified):kid ratios and compared to observed nanny:kid ratios. An aerial survey was conducted on July 7, 1989 to obtain an initial estimate of population size and to locate areas of concentration.

Marked Mountain Goats

Radio collars were attached to 2 mature females captured by darting using carfentanyl and xylazine. Eight mature females and yearlings were marked with orange or blue paint using a CO₂ pistol and paint balls. Visually marking goats provided a basis for determining movement

patterns, but should also assist hunters to avoid harvesting females. Goats were approached to within 18 m for marking. In addition, 2 goats were individually identifiable due to a missing horn and an injured eye.

RESULTS

Paint Marking

Goats marked with paint could be identified by color and placement. After nanny goats were hit with a paint ball, they ran a few feet or to nearby goats. Most goats were marked in summer. Longer guard hairs of the winter coat's covered paint markings by fall.

Mountain Goat Distribution

Mountain goats or evidence such as shed winter hair was found in each of the 4 major drainages in the study area. These drainages are the Clarks Fork of the Yellowstone River, the southern boundary of the herd unit; Littlerock Creek, which includes Deep Lake; South and North Bennett Creek; and South Line Creek which flows into Montana (Fig. 1).

In the Clarks Fork Canyon goats extend as far west as Canyon Creek and as far east as 4.4 km east of the canyon mouth during the winter (Fig. 1). No goats were observed south of the Clarks Fork Canyon during the spring or summer. However, during fall a nanny and yearling were seen on the south side of the Canyon. Recent reports indicate that some mountain goats use the south side of the Canyon.

Mountain goats were seen along the Littlerock Creek drainage, with concentrations in the Deep Lake area during the summer. Although they are occasionally reported upstream from Deep Lake, I did not see goats in this area. No goats have been reported downstream (east) of Deep Lake in Littlerock Creek; however, I found goat hair in this area in spring. No goats were observed in this drainage during the fall trend count, although the Deep Lake area was not surveyed.

I observed mountain goats in the North and South Forks of Bennett Creek at the higher elevations during the spring, summer, and fall. Mountain goats have been observed by landowners at lower elevations (1,120 m) during the winter. Mountain goats have been observed during the spring, summer, and fall in the South Line Creek drainage and along this drainage into Montana during the winter.

Spring range of mountain goats ranged from 3,048 m (10,000 ft) in the Line Creek drainage to 1,603 m (5,260 ft) in the Clarks Fork Canyon. During the summer, goats were found up to 3,127 m (10,260 ft) in the Deep Lake area, while other goats were located as low as 1,165 m (5,300 ft) in the Clarks Fork Canyon. During the fall, goats ranged between 3,024 m (9,920 ft) in the Line Creek and 1,463 m (4,800 ft) in the Clarks Fork Canyon.

Seven marked or recognizable mountain goats were located between 2 and 6 times during 12 July - 18 November. The longest observed movement was by a radio collared female #0, who traveled from Line Creek about 13

km to south of Deep Lake. The greatest distance between observations of radio collared female #3 was 2.7 km.

Concentrations of mountain goats ranged from a lone individual to 58 goats along the rim of Fall's Creek, a tributary of the Clarks Fork Canyon. A concentration of 42 goats was observed in the Deep Lake area during the summer. The largest group of mountain goats observed during the fall was 19 goats in the Clarks Fork Canyon. One hundred five goats were counted in the Clarks Fork Canyon during the fall.

Population Composition

One hundred and forty goats were classified (Table 1). A minimum of 5 sets of twins was observed during the spring. On October 6, 1989 a set of triplets was observed in the Clarks Fork Canyon. The spring nanny to kid ratio was 121:100, but 87:100 if the unclassified adults were included as adult females. This ratio does not include the 30+ goats observed in North Bennett Creek because a number of kids were observed but could not be accurately counted. Nanny to kid ratios during the summer were 134:100 or 84:100 including unclassified adults. Nanny to kid ratios during the fall were 80:100 or 73:100.

Table 1. Seasonal composition of mountain goats in the Beartooth mountain goat herd range south of the Beartooth Highway (212), 1989.

	Adult			2 1/2 year old			Yearling			Kid	Unk
	Male	Female	Unk	Male	Female	Unk	Male	Female	Unk		
Spring	13	23	9	1	1				15	28	32 ^a
Summer	7	29	17	2	3		2		22	39	
Fall	26	45	4	7	4		2	6	10	36	

^aGroup of goats spooked and counted from photo.

Minimum Population Estimate

A minimum population of 121 goats was calculated during the spring while goats were still on their winter range. During the summer, at least 125 different goats were observed. During the fall when most goats were presumed to be on winter range, a minimum population of 141 was observed. This estimate does not include goats north of the Beartooth Highway and 31 goats north of the highway along the Montana state line.

Mountain Goats and Bighorn Sheep

Bighorn sheep were observed in the Clarks Fork Canyon during the spring, summer, and fall. During the summer, 2 ewes and 3 lambs were observed within 68 m (225 ft) of mountain goats. In late July, 17 bighorn sheep were grazing with 58 mountain goats in an alpine meadow. In August a young ram was observed near 4 mountain goats in South Bennett Creek.

DISCUSSION

Distribution

Several mountain goats have been located outside the currently estimated herd range. Individual goats have been reported 64 km south of the herd unit along the North and South Fork drainages of the Shoshone River near Cody; one goat was confirmed 104 km south of the herd unit in the Wood River drainage southwest of Meeteetse, Wyoming. Two mountain goats were observed on the south side of the Clarks Fork Canyon during fall. Habitat along the south side of the canyon is more forested with less herbaceous vegetation and more cliff faces and talus slopes. This terrain may not supply adequate forage during the winter and may also accumulate more snow due to its north aspect. The distribution and number of mountain goats south of the herd's known range are unknown at this time.

Mountain goats concentrate in the Deep Lake area of Littlerock Creek during the summer. The Deep Lake area is timbered along the rim, with interspersed grassy meadows providing abundant forage. During fall the Deep Lake area was not surveyed. It is assumed that mountain goats do not winter there. Future locations on radio collared goat #0 could verify whether Deep Lake is a wintering area.

No goats were observed east of Deep Lake during the summer, but past observations indicate that Littlerock Creek may be a migration corridor into the Beartooth Plateau during spring and fall.

Population Dynamics

During the spring while goats were still on winter range, group sizes were small and goats less active, simplifying counting and classifications. I could not accurately classify goats during summer because of large group sizes and greater activity of individuals. Mountain goats were best classified during fall because of smaller group sizes and characteristically stained hindquarters of rutting billies.

Kid:nanny ratios were higher than previously reported. Kid:adult ratios of 23:100 were reported for this herd unit and for the adjacent Montana goat herd. These ratios have been obtained from flights and may be biased due to movement of goats and to the tendency for kids to be hidden underneath nannies. The decrease in nanny to kid ratios over the summer from 121:100 to 80:100 may be due to natural mortality.

A set of triplets was observed in October below the Switchback Ranch of the Clarks Fork Canyon. This ranch has irrigated meadows which, if used by the goats, could contribute to high productivity.

Prior to this study, this population was estimated at 75 to 100 mountain goats (Wyoming Game and Fish Department). Observations for both the spring and summer demonstrate the population to be at least 140 goats. Most of the goats south of the Beartooth Highway were assumed to have been observed.

Mountain goats and Bighorn Sheep

Mountain goats and bighorn sheep were observed feeding and bedded in close proximity. Bighorn sheep and mountain goats were observed during the summer grazing as close as 27 m (90 ft). Yearling goats were seen playfully chasing protective ewes with lambs. Mountain goats displaced bedded ewes and lambs, after which these goats were displaced by 2 young rams.

During the fall, 7 mountain goats walked through an area where 5 bighorn sheep were grazing. Goats and bighorn sheep were within 4.5 m (15 ft). An adult billy that was pursuing an adult nanny charged about 3 steps towards a ewe that ran about 4.5 m (15 ft) and then began feeding. It appears that adult males of goats or sheep can displace females of goats or sheep. This displacement occurred only when goats and sheep were within 3 m (10 ft) but did not prevent access to feeding or resting areas.

Mortality

Remains of 7 mountain goats were found. Six were found in the Clarks Fork Canyon. These included 3 yearling or older carcasses from the spring, 2 partial skulls of adult goats from 1988 or older, and a kid that died in mid-November. Causes of death were not determined for any goats. A goat found this spring appeared to die from a fall. The kid discovered in November was determined to have died from an unspecified type of pneumonia according to analysis from the State Veterinary Lab. A goat (yearling or older) found in Line Creek may have died in a rock slide.

Domestic Livestock

Three hundred sixty cattle were grazed on summer range north of Littlerock Creek. Cattle grazed along canyon rims where mountain goats had been observed, but no interaction between the species was seen. Eight hundred domestic sheep were trailed into summer range north of the Beartooth Highway. Two feral, male goats were observed in the Clarks Fork Canyon during October and November. These feral goats approached mountain goats within 4.5 m (15 ft) before the mountain goats walked away and eventually left the area.

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