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MIGRATION BEHAVIOR OF PRONGHORN IN SOUTHEASTERN IDAHO

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Abstract: Fifty-four pronghorn (*Antilocapra americana*) were radio-collared out of 232 captured on 3 winter ranges in southeastern Idaho. Radioed pronghorn were followed for up to 21 months each, from December 1975 through August 1977. Winter home ranges showed a difference ($P < 0.005$) in size among valleys the 1st winter and were different in size and location within valleys between years. Snow covered the ground 1 week earlier and lasted 3 weeks longer in 1975-76 than in 1976-77. Spring migration began more than 1 month earlier in 1977 than 1976, and appeared related to loss of snow cover on the winter ranges in both years. Distances that pronghorn migrated in spring 1976 were different among valleys ($P < 0.05$) but directions were, in general, upward to areas near the heads of the valleys. Summer home ranges of all radioed pronghorn averaged $2,033 \pm 322$ (SE) ha. Yearlings wandered during summer and their home ranges were 2 to 5 times as large as ranges of adults. Fall migration in 1976 began after 1 October and was not prompted by snowfall. Percent moisture in vegetation is suggested as a stimulus for onset of fall migration, and snowfall is suggested as a factor influencing distance migrated and location of winter home ranges.

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The few published reports on seasonal migrations of pronghorn were based on observations of recognizable individuals or tag returns. Migrations of more than 160 km have been reported (Martinka 1966) but most seasonal shifts were 15 to 50 km (McLean 1944, Cole and Wilkins 1958, Martinka 1966) or much less (Baker 1953, Hoover et al. 1959). Nielson (1962) reported that pronghorn marked in southeastern Idaho were later observed in Montana and suggested that interstate migration occurred regularly. This interstate movement increases the need for better understanding of seasonal movements so that proper management decisions can be made (Einarsen 1947).

Using telemetry, we studied pronghorn migrations in southeastern Idaho to determine the routes used and factors influencing selection of winter and summer ranges. The hypothesis that migratory behavior was in response to storms (McLean 1944) and snow (Mace 1954, Ackery and Regier 1956, Cole and Wilkins 1958, Martinka 1966) was tested, and pronghorn mortality was evaluated.

Fieldwork was conducted from October 1975 through August 1977.

Pronghorn in the study areas wintered at the mouths of 3 valleys just north of and on the U.S. Department of Energy's (DOE) Idaho National Engineering Laboratory (INEL) (Fig. 1). Because of the possibility of radionuclide intake by the pronghorn (Markham et al. 1976), detailed information on movements was required to aid in interpretation of radionuclide data.

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STUDY AREA

The 12,630 km² study area (Fig. 1) is located in southeastern Idaho and south-

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western Montana. Three winter ranges near the center of the study area, where pronghorn were captured, are located 84 km northwest of Idaho Falls, Idaho (112°W, 43°30'N). The Snake River Plain in the southern part of the study area is essentially flat with an average elevation of about 1,490 m above sea level. The mountain ranges to the north rise as high as 3,350 m. Valleys reaching northwestward between these high mountain ranges rise from 1,500 m at the winter ranges to 2,130 m at their heads. The plain and valley floors are in the sagebrush-grass vegetation zone of Idaho, mostly covered by dense stands of big sagebrush (*Artemisia tridentata*) (Dauenmire 1952).

The climate of the Snake River Plain is semiarid with generally low precipitation and humidity, and rapid evaporation when moisture is present (Nace et al. 1972). Daily, monthly, and annual temperatures vary greatly. Average annual temperature is 5.4 C, ranging from the January mean of -10.3 C to 20.6 C in July (Nace et al. 1972).

During the study, a drought began as a result of a minimal snowpack accumulation during winter 1976-77. Near the head of Birch Creek valley (Fig. 1) water content of the 104-cm snowpack on 1 May 1976 was 128% of the 1958-72 average, and the Little Lost River stream flow was forecast for May 1976 through September 1976 at 93% of average (Davis 1976). But on 1 May 1977, no snowpack was present near the head of Birch Creek valley, and the Little Lost River stream flow was forecast at 28% of average (Davis 1977).

METHODS

Pronghorn were driven into corral-type traps with a Hughes 500 turbo-jet helicopter, which was ideally suited for herd-

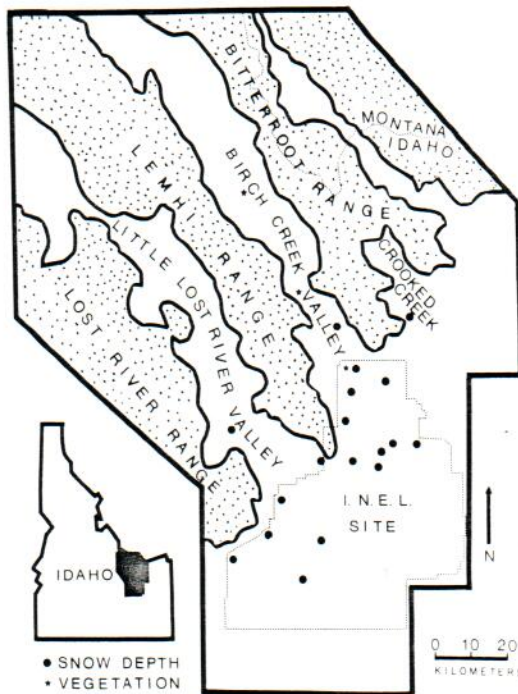


Fig. 1. The study area in southeastern Idaho showing points where environmental data were collected.

ing pronghorn and eliminated the need for a holding pasture enclosing the trap (Hoover et al. 1959, Spillett and Zobell 1967). Canvas panels (Spillett and Zobell 1967) were not placed on the sides of the corral for the 1st capture in the Little Lost River valley on 4 December 1975, but they were used to enclose half of the corral for the Birch Creek valley capture on 7 December 1975 and the Crooked Creek valley capture on 10 January 1976.

Pronghorn were handled immediately after capture, rather than waiting until the next day as reported by Mathisen (1962) and Hoover et al. (1959). Most animals were ear-tagged, sexed, and classified by age group on the basis of incisor replacement (Hoover et al. 1959). Some of each age and sex class also were radio-collared. Blood samples were taken and hematological and chemical analyses

Table 1. Pronghorn trapping data and percent trapping mortality, by valley, in southeastern Idaho.

	Little Lost River	Birch Creek	Crooked Creek
Total trapped	94	61	77
Radio-collared and ear-tagged	20	19	15
Ear-tagged	20	41	46
Released unmarked	47	0	13
Died in trap	7	1	3
Died shortly after release	1 ^a 2 ^b	1 ^b	1 ^b
Trapping mortality (%)	10.6	3.3	5.2

^a Ear-tagged.^b Radioed.

were done by the Idaho Department of Fish and Game (Trout 1976). Serological surveys for wildlife and domestic animal diseases were performed by the University of Idaho (Stauber 1976). Analyses of 24 parameters of blood chemistry, hematology, and endocrinology were made and interpreted by Seal and Hoskinson (1978).

Radioed pronghorn were tracked from a Piper Super Cub PA-18A-150 airplane with yagi antennas mounted on both wing-struts, and pointed to receive the maximum signal from the side of the plane. A 3-way selector allowed for listening through the left, right, or both antennas. Once a signal was homed in on and the pronghorn was seen, a low-level pass was made to observe the radioed pronghorn and count the number of individuals in the group. Ground-tracking was done from a 4-wheel drive vehicle equipped with 2 yagi antennas mounted on a rotatable mast extending through the roof, or with a hand-held portable antenna.

Seasonal home range sizes were determined (minimum area method, Mohr 1947) for all animals for which complete seasonal data were available. Pronghorn

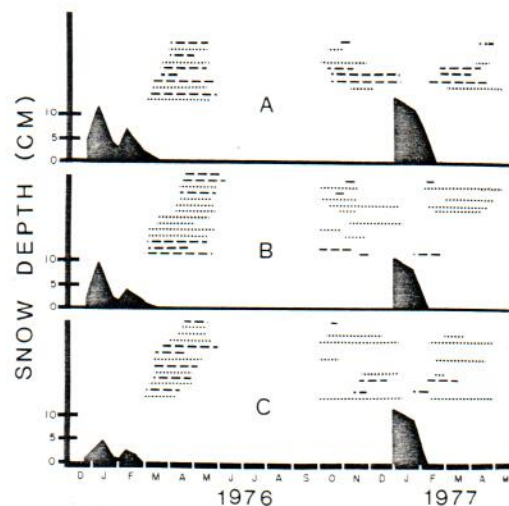


Fig. 2. Relation of time of pronghorn migration to snow depth. Black areas show snow depth and broken horizontal lines indicate periods of migration of individual animals. Dotted lines represent females and dashed lines represent males. (A—Crooked Creek valley, B—Birch Creek valley, C—Little Lost River valley).

that died or whose radios failed on a seasonal range were not included in that season's analyses. Winter 1975–76 home ranges for individuals were determined using 14 or more locations for each animal. Home ranges during summer 1976 were based on 11 or more locations per animal, and winter 1976–77 home ranges were determined using 9 or more locations.

Climatological data for the INEL site and nearby areas were obtained from the National Oceanic and Atmospheric Administration (NOAA) office on the INEL site. Temperature data were collected in Birch Creek valley using spring-wound thermographs. Snow depth was measured weekly at 5 points at each of 18 locations (Fig. 1), and averaged for each location.

Percent moisture in big sagebrush, rabbitbrush (*Chrysothamnus nauseosus*), and Idaho fescue (*Festuca idahoensis*) was determined from samples collected

Table 2. Mortality of radioed pronghorn during 1976 in southeastern Idaho.

Valley	Sex	Age at death	Date of death	Cause of death
Little Lost	F	Adult	1-5 Jan	Broke neck on pronghorn-proof fence
	F	0.6 yr	1-5 Jan	Probably poached
	F	Adult	20 Feb	Poached
	M	Adult	20 Sep	Unknown
	M	1.3 yr	25 Sep	Shot by hunter
	M	1.3 yr	26 Sep	Struck by truck
Birch Creek	M	Adult	30 Oct	Shot by hunter
	M	Adult	4-24 Mar	Probably poached
	F	0.9 yr	1-5 May	Unknown
	F	0.9 yr	17-28 May	Unknown
	M	0.9 yr	17-28 May	Unknown
	M	1.4 yr	30 Oct	Shot by hunter
	M	2.4 yr	30 Oct	Shot by hunter
Crooked Creek	F	Adult	30 Oct	Shot by hunter
	M	1.3 yr	19 Sep	Shot by bow hunter
	M	Adult	10 Oct	Shot in Montana by hunter

in Birch Creek valley from July 1976 through June 1977. Four samples of each species were collected about every 2 weeks from 3 locations: 1 on the winter range, 1 on the summer range, and 1 along the migration route (Fig. 1). No samples were collected within 24 hours after rainfall at the sampling sites. Samples were weighed before and after drying in a 60 C drying oven for 4-10 days.

RESULTS

A total of 232 pronghorn was captured, 54 were ear-tagged and radio-collared, 107 were ear-tagged, 60 were released unmarked, and 11 died immediately (Table 1). Sixteen pronghorn died as a result of capture, giving a trap mortality rate of 6.9%.

Mortality of Radioed Pronghorn.—Of the 54 radioed, 4 died just after release and were considered part of the trap mortality. Sixteen other radioed pronghorn died during the 1st year (Table 2) and 1 died during the 2nd year. Four disappeared during the 1st year and were nev-

er seen nor were their signals heard again.

One radioed adult female was poached in February 1976 and 3 others probably were poached during the study. Two of these last 3 were adult males and had been observed displaying territorial behavior during spring. Radio-collars of both bucks were found unopened without any sign of the animals. The unopened collars could not have slipped over the bucks' heads and fallen off.

Seven adult pronghorn were legally shot by hunters, 2 adults died from accidents, and 3 fawns apparently died from natural causes. Six of the 7 shot by hunters were males and half of the mortalities during the 1st year were fawns and yearlings.

Winter Range.—Snow cover during winter 1975-76 lasted from 25 December to 1 March and reached a maximum depth of 11.4 cm on 9 January (Fig. 2). Monthly mean temperatures from December through February averaged 1.9 C above normal and precipitation was 68% of normal (NOAA, pers. comm.).

Table 3. Average sizes (ha) of home ranges of radio-monitored pronghorn, by season and area in southeastern Idaho, 1975-77.

	Little Lost River valley		Birch Creek valley		Crooked Creek valley	
	N	Ha	N	Ha	N	Ha
Winter 1975-76						
Total	13	1,344	16	7,137	11	2,183
Adults	9	1,275	11	5,496	8	2,146
Males	4	1,048	4	5,534	4	1,568
Females	5	1,456	7	5,475	4	2,723
Fawns	4	1,501	5	10,746	3	2,281
Summer 1976						
Total	12	1,873	12	2,452	10	1,723
Adults	9	1,527	8	975	8	1,565
Males	4	1,616	2	955	5	1,321
Females	5	1,456	6	981	3	1,972
Yearlings ^a	3	2,911	4	5,406	2	2,358
Winter 1976-77						
Total	8	3,314	10	2,514	8	2,392
Adults	7	3,456	9	2,365	7	2,615
Males	3	1,503	3	1,104	2	1,929
Females	4	4,921	6	2,995	5	2,889
Yearlings ^a	1	2,320	1	3,857	1	827

^a These yearlings are the same animals referred to as fawns in the winter 1975-76 season.

Total snowfall in winter 1976-77 was much less than in the previous winter, with no snow cover until 1 January (Fig. 2). That 13.3-cm snowfall produced the maximum depth recorded for the winter, and by 9 February only patches of snow remained. December through February temperatures were near normal and precipitation was 39% of normal (NOAA, pers. comm.).

Analysis of variance of the sizes of individual winter home ranges (Table 3) among valleys showed a difference in the 1st winter ($F = 15.92$, 2 and 34 df, $P < 0.005$). Home ranges in the 2nd winter were not different among valleys ($P > 0.25$).

The 1975-76 winter ranges were at the lower end of the valleys on the edge of the Snake River Plain. During the 2nd winter, 13 pronghorn stayed an average of 11.7 km up the valley from their pre-

vious winter's ranges; the maximum distance was 28.1 km.

Crooked Creek pronghorn had winter home ranges averaging about 2,300 ha in both winters (Table 3), although in different locations. In the 2nd winter the Little Lost valley pronghorn had larger home ranges than in the 1st winter ($P < 0.05$). Birch Creek valley pronghorn had smaller home ranges in the 2nd winter compared to the 1st ($P < 0.005$).

Intervalley Movements.—Four radio-collared pronghorn did not return in the 2nd winter to the same valleys they used the 1st winter. An adult female that stayed in the Little Lost River valley during winter 1975-76 spent the following winter 19 km southeast, in Birch Creek valley. An adult female that wintered in Birch Creek valley in 1975-76 spent the next winter 35 km northeast in Crooked Creek valley. A Crooked Creek valley

adult male spent the 2nd winter 20 km southwest, in Birch Creek valley, and an adult female that wintered in Crooked Creek valley during 1975-76 remained 18 km southeast, on her 1976 summer range during winter 1976-77.

Two Crooked Creek pronghorn traveled to Birch Creek valley and returned during the 1st winter. An adult female made the trip once and an adult male traveled the round trip 3 times.

Spring Migration.—Not all radioed pronghorn migrated upward from their winter ranges in spring 1976 (Fig. 3). In the Little Lost River valley an adult male and adult female did not migrate, an adult male and adult female migrated around the southern end of the Lemhi Range and up Birch Creek valley, and an adult female migrated southeast onto the Snake River Plain. One Birch Creek adult female migrated northeast into Medicine Lodge Creek valley, and an adult female from Crooked Creek valley migrated southeast onto the Snake River Plain.

In spring 1977 the adult female from the Little Lost River valley again migrated southeast onto the Snake River Plain. A Crooked Creek adult male that wintered in Birch Creek valley during 1976-77 traveled back through Crooked Creek valley and migrated into Medicine Lodge Creek valley.

The start of migration in spring 1976 averaged 21 March (Fig. 2) and was not different among valleys ($F = 0.36$, 2 and 34 df, $P > 0.25$). There was no difference by sex in the start or the end of migration ($P > 0.50$). Average start of spring migration in 1977 was 22 February but was different among valleys ($F = 5.32$, 2 and 17 df, $P < 0.05$). The duration of spring migration in 1976 averaged 55.6 days, compared to 42.6 days in 1977.

Snow cover on all winter ranges

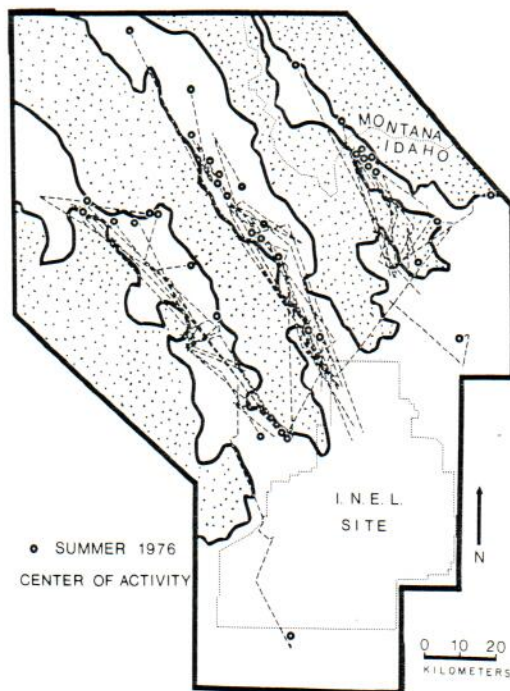


Fig. 3. Pronghorn migration routes in spring 1976 and centers of activity during summer 1976 in southeastern Idaho.

reached its maximum depth for winter 1975-76 early in January (Fig. 2). Following a 3.1-cm snowfall on 3 February, the snow began to melt. By 1 March the snow had completely melted from the wintering areas, but scattered patches remained in the upper parts of the valleys, and the areas near the summits were still snow covered. Snow on the summer ranges was not gone completely until 27 April.

In contrast, snow cover on the winter ranges in spring 1977 melted 3 weeks earlier than in 1976. Snow cover in the upper parts of the valleys had been minimal during winter and disappeared at the same time as on the winter ranges.

As the pronghorn migrated in spring 1976, they stayed in areas where scattered patches of snow were present, and moved upward as snow cover disap-

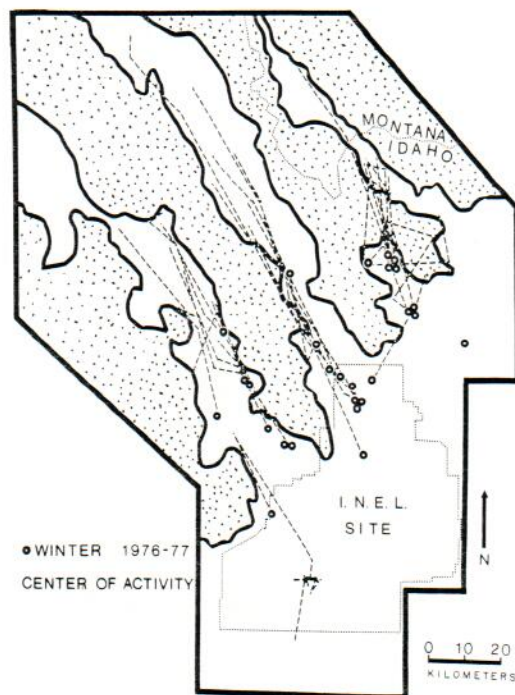


Fig. 4. Pronghorn migration routes in fall 1976 and centers of activity during winter 1976-77 in southeastern Idaho.

peared. In 1977 snow melted throughout the valleys at the same time. The end of spring migration was different among valleys in 1976 ($F = 4.55$, 2 and 34 df, $P < 0.05$), but not in 1977 ($P > 0.10$).

In Birch Creek valley the temperatures on the winter range were warmer in the latter part of February 1976 just before the migration than in the 1st part of March when migration began. During the 1976 migration upvalley, temperatures on the winter range averaged about 6 C warmer than on the summer range. Even along the migration route the temperatures were warmer in the lower end of the valley than upvalley ($P < 0.005$).

Distances migrated in spring 1976, measured as the straightline distance from winter to summer centers of activity (Hayne 1949), were different among val-

leys ($F = 3.42$, 2 and 33 df, $P < 0.05$). The Little Lost pronghorn migrated 47.1 ± 5.5 km ($\bar{x} \pm SE$), ranging from 4.8 km to 64.8 km. The Birch Creek pronghorn migrated 53.6 ± 6.6 km (11.5-97.7 km) and the Crooked Creek pronghorn migrated 32.9 ± 4.2 km (6.8-62.0 km).

In spring 1977, distances migrated were shorter than in 1976 as a result of the upper-valley winter home ranges during the 2nd winter. All 22 radioed pronghorn followed for 2 years returned to the same areas in summer 1977 that they had occupied during summer 1976.

Summer Ranges.—These were generally located near the heads of the valleys. Some pronghorn in each valley migrated a short distance beyond the heads of the valleys into the next drainage. As a result, 2 of the radio-marked Crooked Creek valley pronghorn summered in Montana.

In 1976, summer home ranges of all radioed pronghorn averaged $2,033 \pm 322$ ha and were not different among valleys ($F = 0.45$, 2 and 32 df, $P > 0.25$). However, summer home ranges of yearlings were 2 to 5 times as large as those of adults (Table 3). Monthly shifts of 10-20 km were not uncommon for the yearlings. All shifts during June and July were in a southeasterly direction, or downward. In August some of the yearlings moved back upward. Most of these movements were a slow wandering. However, a more rapid movement pattern was exhibited by a Little Lost valley male that had moved gradually downward during June and July, but then traveled 8.4 km down the valley on 7-8 August and returned 7.0 km upward on 8-9 August.

Fall Migration.—All but 1 of the 27 migratory pronghorn being followed in fall 1976 migrated from their summer ranges toward winter ranges (Fig. 4) between 1 October and 25 November (Fig. 2) Within a month of their departures



Fig. 5. Seasonal route in Birch

from summering, then back to the winter range. By 22 July established winter ranges were near the heads of the valleys. In 1977 did winter range spent the winter range during 1977.

During migration temperatures on the winter range were not different from summer range.

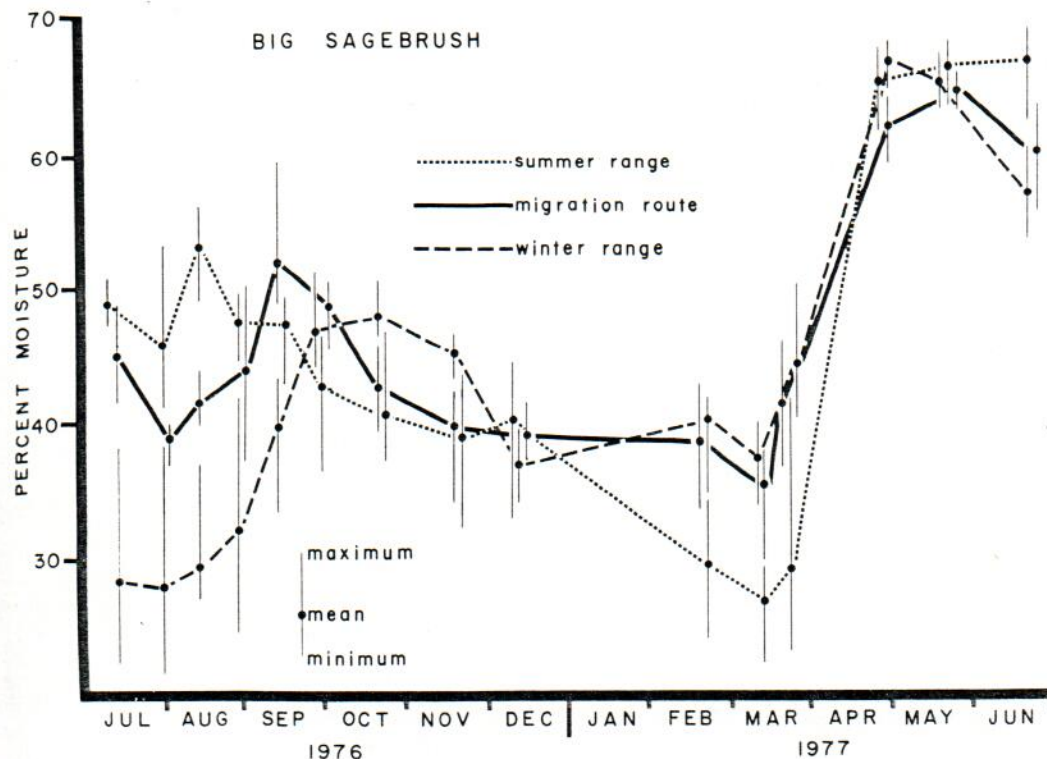


Fig. 5. Seasonal changes in percent moisture in big sagebrush on summer and winter ranges and along the migration route in Birch Creek valley in southeastern Idaho.

from summer ranges all had stopped migrating, though 13 were not all the way back to the ranges used the previous winter. By 22 December, 6 of the 13 had established winter ranges and the others were near what became their winter ranges. Not until the 1st week of January 1977 did the other 7 pronghorn move to winter ranges. One adult female that spent the 1975-76 winter in Crooked Creek valley remained on her summer range during fall 1976 and winter 1976-77.

During mid-October 1976, when most migrations began, average daily temperatures on the Birch Creek winter range were not different from those on the summer range ($P > 0.10$). Although the summer range temperatures dropped an av-

erage of 3.2 C in early November compared to late October, temperatures also dropped during the same period on the winter range and were slightly cooler then than on the summer range. No measurable snowfall occurred during fall 1976.

Simultaneous with the downward fall migration was a shift downwards in the location of the most moist sagebrush, rabbitbrush, and Idaho fescue, as measured in Birch Creek valley. All 3 species showed the same general pattern with respect to moisture content; therefore, sagebrush was selected as an illustration (Fig. 5). Percent moisture in sagebrush had averaged 49.2 during July and August on the summer range, which was more than on the winter range or along

the migration route ($P < 0.005$). During September and the 1st part of October, sagebrush along the migration route was most moist, averaging 50.8%, which was higher than on either the summer or winter range ($P < 0.01$). In early October the summer range sagebrush was drier than anywhere else in the valley and sagebrush along the migration route was drying. Winter range sagebrush continued to increase in moisture content and by mid-October had become most moist.

DISCUSSION

Total trapping mortality was about the same as reported in earlier studies (Hoover et al. 1959), and was reduced by over 50% in the 2nd and 3rd trappings by the use of canvas lining in the trap. Although usually more expensive, use of a helicopter to herd the pronghorns into the trap was more efficient and eliminated the difficulties of using fixed-wing aircraft (Thompson 1974).

Four of the 17 recorded mortalities probably involved poaching, which suggests the possibility of heavy poaching pressure in the study area. Conversations with area residents during the study supported this suspicion.

Hunter kills accounted for 7 of the 17 mortalities recorded. During the pronghorn hunting season in fall 1976, 7 of the 36 radioed animals being followed in the valleys were killed by hunters. In the Little Lost River valley 325 permits were issued to hunters, but only 1 of the 11 radioed pronghorn was shot. In Birch Creek valley 4 of the 14 radioed pronghorn were shot (135 permits), and in Crooked Creek valley (75 permits) 2 of the 11 radioed pronghorn were shot. A harvest of 25% was felt to stabilize the population in South Dakota (Anonymous 1965), and 20–35% of most Montana

herds are harvested each year (Martinka 1966).

In contrast to published reports of high mortality due to crippling, no radioed pronghorn died as a result of being crippled by hunters. In Wyoming 79.5% of the winter loss was believed to have been pronghorn crippled by hunters (Baker 1954). For every 100 pronghorn harvested in Wyoming, 9 were left dead or dying in the fields (Mobley 1960).

Sizes of winter ranges among valleys were different during the first winter. The 1975–76 winter ranges in the Little Lost River valley were 5 times smaller than those in Birch Creek valley and 1.5 times smaller than those in Crooked Creek valley. In winter 1976–77 the sizes of home ranges among valleys were not significantly different.

Topography and man-made developments in the valleys may explain these differences. Crooked Creek valley has only minimal agricultural development and the topography in the upper part is similar to that at the valley mouth. The winter range in Birch Creek valley has no agricultural development because it is part of the INEL site. Birch Creek valley is narrower at the north end of the wintering area where mountains extend into the valley and a fenced highway passes up the valley. The mouth of Birch Creek valley is much wider and the highway, which is unfenced, passes along 1 side. In contrast, irrigated farms cover much of the mouth of the Little Lost River valley, leaving only narrow strips of undisturbed land along the foothills. But up the valley 10–15 km, most of the range is open and uncultivated.

Thus, during the 1st winter, the smaller Little Lost ranges, which were along the foothills, could have resulted from somewhat restricted movements between the mountains and the partially

fenced farmland. At the same time, the Birch Creek pronghorn wintered in an open, unrestricted expanse, with room to move widely.

Snow depths, although different between years, were at a minimum in the areas selected by the pronghorn during each winter. Depth of snow in both winters was greater at higher elevations, as would be expected. In addition, snow depths were greater at locations on the Snake River Plain away from the wintering areas. Snow depths on the winter ranges in 1975-76 and 1976-77 averaged 71% and 66%, respectively, of the snow depth on the Plain.

All winter ranges were generally larger than those reported by Bayless (1969). Their most striking feature was the great variation in size between years and among valleys. Size requirements for winter home ranges for pronghorn may be extremely variable and dependent on both biological and physical features. Food quality and quantity would seem to affect the area over which pronghorn would move in winter, as suggested by the Little Lost valley ranges during the 1st winter. They were the smallest winter ranges determined in this study and were located adjacent to partially fenced farmland, which provided an unlimited supply of high-protein food (Seal and Hoskinson 1978). In addition to influencing the range sizes, this food source probably contributed to the better physiological status of the Little Lost valley pronghorn when captured (Seal and Hoskinson 1978).

These data support the hypothesis (Bruns 1977) that winter ranges are not traditional locations to which pronghorn return annually, but rather that pronghorn migrate only as far as necessary to optimize the effects of environmental conditions.

Average temperature was slightly warmer in the 1st winter. However, the greatest difference in weather conditions between winters was the duration of snow cover, lasting over 1 month longer in the 1st winter.

The start of spring migration was different between years but coincided with breakup of snow cover in both years. Temperature did not appear to be a direct factor in stimulating spring migration, as indicated by upward migrations into areas colder than the winter ranges.

Percent moisture in sagebrush showed a rapid increase during late March and April 1977. However, spring migration had started in February, and appeared unrelated to development of vegetation.

In 1976 the duration of spring migration averaged about 8 weeks, but in 1977, spring migration began over 1 month earlier and lasted about 2 weeks less. The pronghorn did not compensate for an earlier start of the migration by extending its duration, as has been shown for white-tailed deer (*Odocoileus virginianus*) (Hoskinson and Mech 1976). During the 1st spring, snow remained in upper parts of the valleys after the start of migration and appeared to slow the migration. In the 2nd spring, snow cover in the upper valleys melted simultaneously with that on the winter ranges.

We hypothesize that by returning to summer ranges as soon as snow cover disappears, pronghorn can take advantage of additional resources. For example, they could disperse throughout their range to utilize more widespread food resources, as has been shown for pronghorn in Saskatchewan (Dirschl 1963), or to take advantage of an additional space resource. This space resource is used by the males as they establish their territories in spring (Kitchen 1974) and by females as they separate from the herds and become

the rate at which the pronghorn migrate to summer ranges. However, fall migration occurred without snow or storms and coincided with the shift down the valleys in the location of the most moist vegetation. In addition, it must be recognized that winter ranges located in areas of minimum snow depth would be advantageous to pronghorn not only because food would be most accessible, but also because the animals would have the least difficulty moving about and be best able to escape from predators by running.

This type of migratory behavior may have selective advantages to pronghorn. By migrating in spring as soon as snow cover breaks up, they are able to take advantage of additional forage and space resources. By responding to changes in vegetation in the fall, pronghorn may continue to have the best available food sources as they move downward to winter ranges.

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