ALASKA DEPARTMENT OF FISH AND GAME

JUNEAU, ALASKA

STATE OF ALASKA
Jay S. Hammond, Governor

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Winter Habitat Use by Mountain Goats

BY
John W. Schoen,
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and
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Volume III
Project Progress Report
Federal Aid in Wildlife Restoration
Project W-21-1, Job 12.4R

(Printed January 1980)

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JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperators: J. W. Schoen, O. C. Wallmo, R. D. Taber, J. L. Fox, M. D. Kirchhoff, K. Raedeke

Project No.: W-21-1 Project Title: Big Game Investigations

Job No.: 12.4R Job Title: Winter Habitat Use by Mountain Goats

Period Covered: July 1, 1979 through June 30, 1980

SUMMARY

During this report period no additional goat captures were attempted. Telemetry effort was concentrated from December through April. From May through October goats were located only once every 4 to 6 weeks. From November 1979 through October 1980, 10 goats were relocated 175 times, 70 percent between December and May. To date we have a total of 645 observations of 22 marked goats.

Movements and home range patterns were similar to those described previously. One goat's home range presented here, however, shows a small winter range in old-growth forest below 457 m (1500 ft) and a larger summer range in the higher alpine and subalpine habitats. This goat was captured the previous year on the summer range. Most of our sample population was captured in the alpine during the winter, thus introducing a sample bias toward goats wintering in higher open habitats.

Results of seasonal habitat use from November 1979 through October 1980 are presented here. In general, winter habitat use was similar to that reported previously. During winter, 70 percent of goat relocations occurred above 914 m (300 ft) while in spring a downward movement occurred. Sixty-six percent of winter goat relocations occurred in rock-cliff habitat with the remaining use divided nearly evenly between alpine, subalpine and old-growth forest. During spring, use of rock-cliff habitats decreased as use of the other three habitats increased, especially subalpine.

We believe that some portions of the total goat population winter exclusively and, in part, in old-growth forest habitat. Additional work on these relationships is currently being undertaken.

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BACKGROUND

Background and justification for this investigation were outlined previously (Schoen 1978).

OBJECTIVES

To develop capture and telemetry procedures suitable for monitoring mountain goat movements and determine habitat use by mountain goats in Southeast Alaska.

STUDY AREA

The two study sites were described previously (Schoen 1978, 1979).

PROCEDURES

Procedures for this work were outlined previously (Schoen 1978, 1979).

RESULTS

Capture and Immobilization

No additional mountain goats were captured and no captures were attempted during this report period.

Location Telemetry

From December 1977 through October 1980, 645 observations were recorded for 22 marked goats. A decision was made at the beginning of the last report period to intensify the telemetry effort from December through April. From May through October animals were relocated only once every 4 to 6 weeks. During the winter period, however, locations of

instrumented goats were attempted once a week although this was often hampered by marginal flying weather. During this report period 10 goats were relocated 175 times, 70 percent between December and May. Sixty-two percent of all relocations resulted in visual observations of the marked animals. Ninety-eight percent of the relocations were estimated to be accurate to within 10 ha (25 acres) and were used in one analysis of habitat use.

The current status of instrumented goats from their date of capture to the present is summarized in Table 1. Of all goats instrumented, there have been 3 radio failures, 4 mortalities of undetermined causes, 4 hunter kills, and 2 have not been located recently. Currently, seven goats still have operable radios and they will continue to be monitored, with emphasis on the winter period, until their transmitters fail. Thus, the monitoring program in the Juneau area is in a phase-down period. Telemetry work will continue, however, in the Ketchikan area.

Home Range and Habitat Utilization

Patterns of movements and home range varied substantially between individuals and were similar to the patterns described previously (Schoen 1979).

One particular case of interest is the home range pattern displayed by mountain goat number 86, an adult male (Fig. 1). During the period January through April, this individual was relocated seven times generally below 457 m (1500 ft) in steep old-growth forest. Number 86's movements during this period were restricted to a small area of about 50 hectares (124 acres). From 1 May through September this same individual traversed an area estimated to be about 3000 hectares (7400 acres). The first relocation during this period occurred in low elevation forested habitat while the bulk of relocations occurred in high elevation rock and alpine habitats. Mountain goat 86 was captured June 16, 1979 on its summer range. Most other goats, however, were captured in the alpine during winter, which may have introduced a sample bias into the habitat analysis.

To date there has been no indication that any instrumented animal has moved out of either of the two study sites. Based on these results and the abbreviated movements observed between winter and summer ranges, it appears that the sample populations can be characterized as relatively discrete.

Instrumented goat use of elevation, slope, aspect, terrain, habitat type and percent snow cover was evaluated by seasons for 10 goats during the period November 1979 through October 1980 (Tables 2 through 7). Winter and spring are the only seasons with adequate sample sizes.

Table 1. Age, sex, location, and current status of captured mountain goats through November 1980.

Goat #	Area	Capture Date	Age at Capture (years)	Sex	Current Status
1	Herbert	12-13-77	1	female	radio failure
2	Herbert	12-13-77	6	female	dead
3	Herbert	12-13-77	3	male	radio failure
4	Herbert	12-21-77	6	male	hunter kill
5	Herbert	12-22-77	5	female	dead
78	Herbert	12-26-78	6	female	transmitting
81	Herbert	12-26-78	1	female	radio failure
11	Herbert	12-26-78	5	male	hunter kill
26	Herbert	12-26-78	5	female	?
7	Berners	12-27-78	9+	female	hunter kill
79	Berners	12-27-78	7	male	dead
16	Herbert	3-27-79	7	female	hunter kill
65	Herbert	4-01-79	8	female	transmitting
83	Berners	4-10-79	8	male	transmitting
32	Berners	6-15-79	9	female	transmitting
86	Berners	6-16-79	7	male	transmitting
82	Herbert	6-22-79	2	female	transmitting
9	Berners	7-25-79	7	female	transmitting
31	Berners	7-25-79	11	female	dead
33	Berners	8-21-79	8	female	?

① GOAT 86 MAY 1 80-SEP 30 80 3178.7 HECTARES

② GOAT 86 JAN 1 80-APR 30 80 50.4 HECTARES

1 KILOMETER

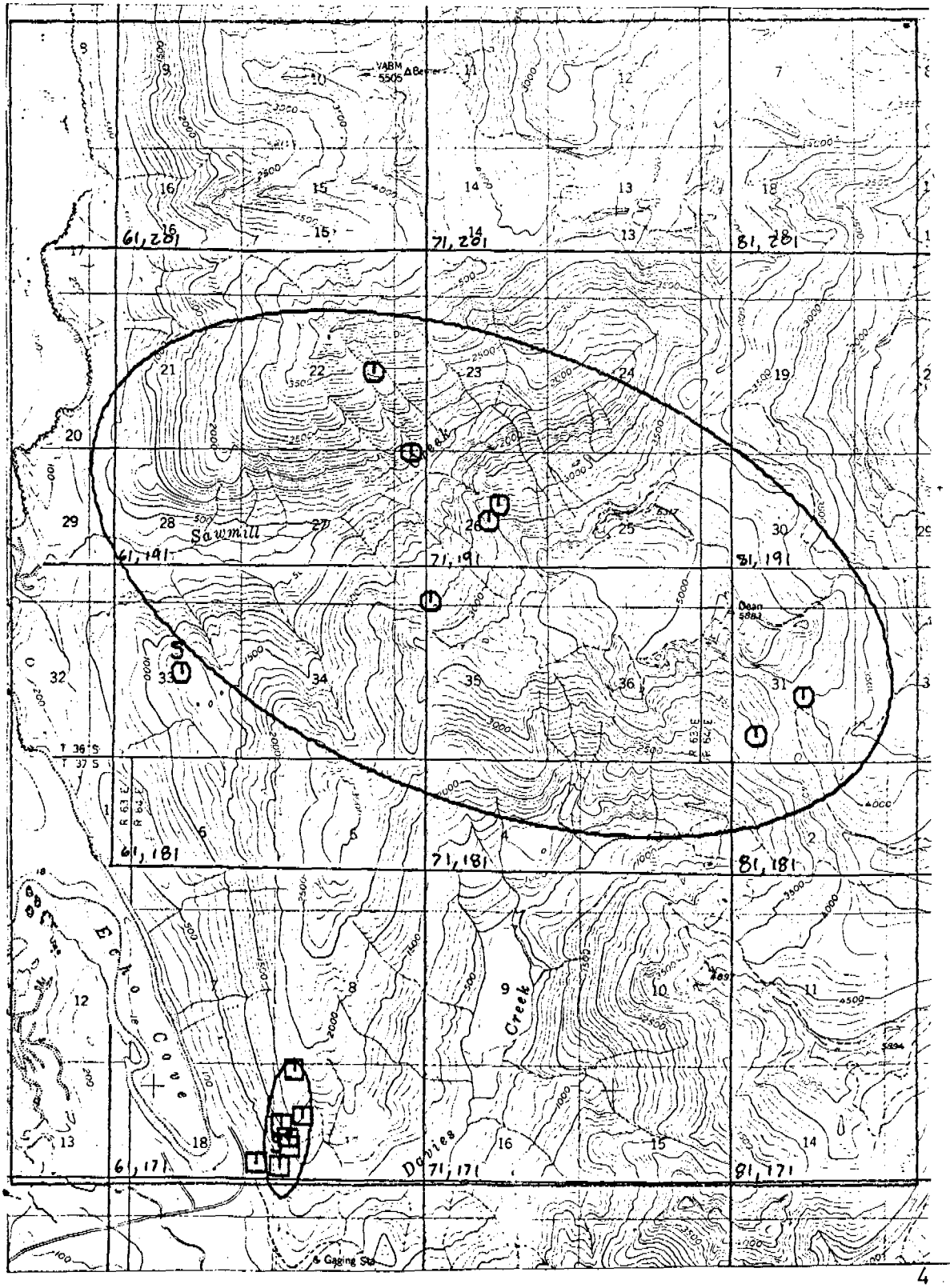

Fig. 1

Table 2. Seasonal use of elevation by instrumented mountain goats.

* CROSSTABULATION OF * * * * * *
ELEVATION FT. BY SEASON
* *

ELEV	COUNT / ROW PCT / COL PCT / TOT PCT	SEASON SPRING 1.1	SUMMER 2.1	FALL 3.1	WINTER 4.1	ROW TOTAL
1. 0-500		1	0	0	0	1
		100.0	0.	0.	0.	0.6
		1.4	0.	0.	0.	
		0.6	0.	0.	0.	
3. 1001-1500		7	2	2	5	16
		43.8	12.5	12.5	31.3	9.4
		9.6	5.3	20.0	10.0	
		4.1	1.2	1.2	2.9	
4. 1501-2000		7	1	1	3	12
		58.3	8.3	8.3	25.0	7.0
		9.6	2.6	10.0	6.0	
		4.1	0.6	0.6	1.8	
5. 2001-2500		14	10	0	3	27
		51.9	37.0	0.	11.1	15.8
		19.2	26.3	0.	6.0	
		8.2	5.8	0.	1.8	
6. 2501-3000		11	6	3	4	24
		45.8	25.0	12.5	16.7	14.0
		15.1	15.8	30.0	8.0	
		6.4	3.5	1.8	2.3	
7. 3001-3500		15	6	3	15	39
		38.5	15.4	7.7	38.5	22.8
		20.5	15.8	30.0	30.0	
		8.8	3.5	1.8	8.8	
8. 3501-4000		15	6	1	16	38
		39.5	15.8	2.6	42.1	22.2
		20.5	15.8	10.0	32.0	
		8.8	3.5	0.6	9.4	
9. 4001-4500		3	7	0	3	13
		23.1	53.8	0.	23.1	7.6
		4.1	18.4	0.	6.0	
		1.8	4.1	0.	1.8	
10. 4501-5500		0	0	0	1	1
		0.	0.	0.	100.0	0.6
		0.	0.	0.	2.0	
		0.	0.	0.	0.6	
COLUMN TOTAL		73	38	10	50	171
		42.7	22.2	5.8	29.2	100.0

Table 3. Seasonal use of slope by instrumented mountain goats.

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * *
SLOPE DEG. BY SEASON
* *

SLOPE		COUNT / ROW PCT / COL PCT / TOT PCT	SEASON SPRING 1.	SUMMER 2.	FALL 3.	WINTER 4.	ROW TOTAL
1-10	2.	COUNT	1	0	0	0	1
		ROW PCT	100.0	0.	0.	0.	0.6
		COL PCT	1.4	0.	0.	0.	
		TOT PCT	0.6	0.	0.	0.	
11-20	3.	COUNT	4	5	1	4	14
		ROW PCT	28.6	35.7	7.1	28.6	8.2
		COL PCT	5.5	13.2	10.0	8.0	
		TOT PCT	2.3	2.9	0.6	2.3	
21-30	4.	COUNT	18	7	1	9	35
		ROW PCT	51.4	20.0	2.9	25.7	20.5
		COL PCT	24.7	18.4	10.0	18.0	
		TOT PCT	10.5	4.1	0.6	5.3	
31-40	5.	COUNT	33	11	5	17	66
		ROW PCT	50.0	16.7	7.6	25.8	38.6
		COL PCT	45.2	28.9	50.0	34.0	
		TOT PCT	19.3	6.4	2.9	9.9	
41-50	6.	COUNT	14	7	3	19	43
		ROW PCT	32.6	16.3	7.0	44.2	25.1
		COL PCT	19.2	18.4	30.0	38.0	
		TOT PCT	8.2	4.1	1.8	11.1	
51-60	7.	COUNT	3	8	0	1	12
		ROW PCT	25.0	66.7	0.	8.3	7.0
		COL PCT	4.1	21.1	0.	2.0	
		TOT PCT	1.8	4.7	0.	0.6	
		COLUMN TOTAL	73	38	10	50	171
			42.7	22.2	5.8	29.2	100.0

Table 4. Seasonal use of aspect by instrumented mountain goats.

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
ASPECT BY SEASON
* *

ASPECT	COUNT / ROW PCT / COL PCT / TOT PCT	SEASON 1. SPRING	2. SUMMER	3. FALL	4. WINTER	ROW TOTAL
2. N		4	4	0	1	9
		44.4	44.4	0.	11.1	5.3
		5.5	10.5	0.	2.0	
		2.3	2.3	0.	0.6	
3. NE		2	10	2	1	15
		13.3	66.7	13.3	6.7	8.8
		2.7	26.3	20.0	2.0	
		1.2	5.8	1.2	0.6	
4. E		8	2	1	0	11
		72.7	18.2	9.1	0.	6.4
		11.0	5.3	10.0	0.	
		4.7	1.2	0.6	0.	
5. SE		4	2	3	1	10
		40.0	20.0	30.0	10.0	5.8
		5.5	5.3	30.0	2.0	
		2.3	1.2	1.8	0.6	
6. S		7	3	0	11	21
		33.3	14.3	0.	52.4	12.3
		9.6	7.9	0.	22.0	
		4.1	1.8	0.	6.4	
7. SW		33	9	0	22	64
		51.6	14.1	0.	34.4	37.4
		45.2	23.7	0.	44.0	
		19.3	5.3	0.	12.9	
8. W		10	6	3	8	27
		37.0	22.2	11.1	29.6	15.8
		13.7	15.8	30.0	16.0	
		5.8	3.5	1.8	4.7	
9. NW		5	2	1	6	14
		35.7	14.3	7.1	42.9	8.2
		6.8	5.3	10.0	12.0	
		2.9	1.2	0.6	3.5	
COLUMN TOTAL		73	38	10	50	171
		42.7	22.2	5.8	29.2	100.0

Table 5. Seasonal use of terrain by instrumented mountain goats.

CROSSTABULATION OF TERRAIN BY SEASON

TERRAIN		SEASON 1. SPRING	2. SUMMER	3. FALL	4. WINTER	ROW TOTAL
	0.	0	1	0	0	1
		0.	100.0	0.	0.	0.6
		0.	2.6	0.	0.	
		0.	0.6	0.	0.	
SMOOTH	1.	37	20	4	10	71
		52.1	28.2	5.6	14.1	41.5
		50.7	52.6	40.0	20.0	
		21.6	11.7	2.3	5.8	
BROKEN	2.	36	17	6	40	99
		36.4	17.2	6.1	40.4	57.9
		49.3	44.7	60.0	80.0	
		21.1	9.9	3.5	23.4	
	COLUMN TOTAL	73	38	10	50	171
		42.7	22.2	5.8	29.2	100.0

Table 6. Seasonal use of habitat type by instrumented mountain goats.

* CROSSTABULATION OF * * * * *
HABITAT BY SEASON
* *

HABITAT	COUNT / ROW PCT / COL PCT / TOT PCT	SEASON SPRING 1.	SUMMER 2.	FALL 3.	WINTER 4.	ROW TOTAL
3. OLDGROWTH FOREST		10	2	1	5	18
		55.6	11.1	5.6	27.8	10.5
		13.7	5.3	10.0	10.0	
		5.8	1.2	0.6	2.9	
11. SUBALPINE		21	10	5	5	41
		51.2	24.4	12.2	12.2	24.0
		28.8	26.3	50.0	10.0	
		12.3	5.8	2.9	2.9	
12. ALPINE		11	11	1	7	30
		36.7	36.7	3.3	23.3	17.5
		15.1	28.9	10.0	14.0	
		6.4	6.4	0.6	4.1	
13. ROCK-CLIFF		29	15	3	33	80
		36.3	18.8	3.8	41.3	46.8
		39.7	39.5	30.0	66.0	
		17.0	8.8	1.8	19.3	
14. ICE-SNOW		2	0	0	0	2
		100.0	0.	0.	0.	1.2
		2.7	0.	0.	0.	
		1.2	0.	0.	0.	
COLUMN TOTAL		73	38	10	50	171
		42.7	22.2	5.8	29.2	100.0

Table 7. Seasonal use of snow cover by instrumented mountain goats.

* CROSSTABULATION OF * * *
PERCENT SNOWCOVER BY SEASON
* *

	SEASON				
COUNT / ROW PCT / COL PCT / TOT PCT	SPRING 1.	SUMMER 2.	FALL 3.	WINTER 4.	ROW TOTAL
SNOCOV					
0	28	36	2	0	66
	42.4	54.5	3.0	0.	38.6
	38.4	94.7	20.0	0.	
	16.4	21.1	1.2	0.	
1-25	4	0	1	2	7
	57.1	0.	14.3	28.6	4.1
	5.5	0.	10.0	4.0	
	2.3	0.	0.6	1.2	
26-50	6	2	1	6	15
	40.0	13.3	6.7	40.0	8.8
	8.2	5.3	10.0	12.0	
	3.5	1.2	0.6	3.5	
51-75	6	0	0	4	10
	60.0	0.	0.	40.0	5.8
	8.2	0.	0.	8.0	
	3.5	0.	0.	2.3	
76-100	29	0	6	38	73
	39.7	0.	8.2	52.1	42.7
	39.7	0.	60.0	76.0	
	17.0	0.	3.5	22.2	
COLUMN TOTAL	73	38	10	50	171
	42.7	22.2	5.8	29.2	100.0

During winter, 70 percent of goat relocations occurred above 914 m (3000 ft) while during spring, only 45 percent occurred above this same level. As in previous years, there was a downward trend in goat movements in spring. Goat relocations relative to terrain varied substantially between winter and spring, with 80 and 49 percent of the relocations occurring in broken terrain during winter and spring, respectively. Throughout these periods, over 60 percent of goat use occurred on southerly exposures. About 70 percent of the relocations were on slopes steeper than 30 degrees.

Instrumented mountain goats spent the majority of their time (66 percent) during winter in rock-cliff habitat. Use of this habitat declined to 40 percent in spring with an increase of occurrence in subalpine habitats. Old-growth forest and alpine received lower but similar use during these two seasons.

DISCUSSION

Forest use by goats during winter has been of major interest throughout this investigation. Telemetry was originally considered the best approach for investigating these relationships. Unfortunately, however, sample bias resulting from capturing goats in the alpine during winter was considered an impediment to elucidating these relationships (Schoen 1979). From the example cited in this report, it is apparent that some goats winter exclusively in low elevation forested habitat. To more closely assess what proportion of the population displays this pattern of habitat use it would be necessary to capture a large sample of goats on their summer range, instead of the winter range where the only goats accessible are those inhabiting non-forested habitat.

We believe that some portion of the total goat population winters exclusively and in part in old-growth forest habitat. This is supported by the results presented here as well as by Schoen (1979), Fox (1979a,b,c, 1980) and reports by regional biologists. Presumably the amount of forest use varies between geographical area and winters. Additional and more intensive work on these relationships is currently being undertaken cooperatively by ADF&G and the USFS on the Cleveland Peninsula north of Ketchikan (Harrington 1979, Raedeke 1980).

The data presented here are a brief summary of work accomplished during the last report period. A final report for this investigation will be prepared within the next year.

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