ALASKA DEPARTMENT OF FISH AND GAME

JUNEAU, ALASKA

STATE OF ALASKA
Steve Cowper, Governor

DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

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DEVELOPMENT AND ALTERATION OF CARIBOU MOVEMENT PATTERNS

by

Raymond D. Cameron
Walter T. Smith
and
Kenneth R. Whitten

Progress Report
Federal Aid in Wildlife Restoration
Projects W-22-5, W-22-6, Job 3.29R

(Printed January 1987)

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PROGRESS REPORT (RESEARCH)

State: Alaska

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Project No.: W-22-5 / W-22-6   Project Title: Big Game Investigations

Job No.: 3.29R   Job Title: Development and Alteration of Caribou Movement Patterns

Period Covered: 1 July 1985-30 June 1986
(Includes data collected through 31 August 1986)

SUMMARY

This study was designed to determine the mechanisms by which caribou (*Rangifer tarandus granti*) movement patterns are established and subsequently sustained or altered. During spring, 1982-84, we radio-collared 17 short yearlings of cows that had been relocated periodically during each of the preceding years. Thirteen of these yearlings were radio-tracked during the 12-41 months following collaring; an aggregate total of >200 relocations was obtained. All geographic point locations have been digitized and filed on computer discs, and 1 base map has been prepared.

Unfortunately, all radio collars deployed in 1984 failed within 16 months, rendering the sample size insufficient to meet the primary objectives of the study. Some comparative analyses are possible, however. We recommend that satellite telemetry be used in subsequent studies of this nature.

Key Words: caribou, movement patterns, radio-collaring, range use.

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BACKGROUND

Caribou (Rangifer tarandus granti) surveys conducted along the Trans-Alaska Pipeline (TAP) Corridor and within the Prudhoe Bay Complex (PBC) between 1975 and 1982 yielded overall calf percentages that were generally lower than corresponding regional estimates, particularly during summer (Cameron and Whitten 1980; Cameron et al. 1979, 1985; Smith and Cameron 1983). We interpret these results as avoidance of disturbed areas by cows and calves.

Given that female caribou and their calves respond negatively to certain combinations of development and human activity, one might predict that increasing disturbance would further deter cows and calves. Conversely, a decrease in adverse stimuli might result in reoccupancy of areas previously avoided. In addition, repeated exposure to disturbance might result in some degree of accommodation or habituation by some cow/calf bands.

The above premises are not supported by available data. Despite a net decrease in disturbance within the TAP Corridor/PBC after 1976 (Cameron and Whitten 1980, Cameron et al. 1983), local calf representation remained lower than in adjacent areas (Cameron et al. 1983, 1985). Thus, cow/calf occupancy did not increase in response to a seemingly more favorable local environment. Similarly, there was apparently no accommodation to the relatively stable disturbance conditions within the corridor after 1976, although the fact that cows and calves did not totally abandon the area suggests that some individuals can tolerate--or readily accommodate to--certain adverse stimuli.

The central point is that an increase in local calf representation did not accompany the decline in development activity between 1976 and 1982. Possibly even the lowest of disturbance levels characterizing the corridor in recent years is above the avoidance threshold of maternal cows. It is also conceivable that, once displaced, caribou modify their seasonal movement patterns, which tend to persist as new traditions. The latter possibility forms the basis of this study. We will attempt to test the hypothesis that the distribution and movements of caribou are maintained along matriarchial lines. If not disproved, the applicable corollary is that changes in range use, be they natural or human-induced, are initiated by adult cows and sustained by subsequent generations of female offspring. Hence, components of range, once abandoned by adult females, may not be reoccupied for many years, and perhaps then only by chance.

Through an examination of these mechanisms, we hope to gain some insights into the dynamics of range use. An improved understanding of these processes will assist in predicting the effects of industrial development in terms of the probable extent and minimum duration of habitat loss. This report contains a brief update of progress made through mid-1986, an overview of analyses intended for the Final Report, and a discussion of the limitations of the data collected to date.

OBJECTIVES

1. To evaluate the degree to which the seasonal movements of individual adult caribou are influenced by their 1st-year movements as calves.

2. To identify and describe any disturbance-related alteration of seasonal distribution and movements of such caribou.

3. To determine sexual differences in the development of caribou movement and dispersal patterns, social relationships, habitat preferences, and range fidelity.

PROCEDURES

During spring 1982, 1983, and 1984, we radio-collared (Whitten and Cameron 1983) 2, 8, and 7 short yearlings, respectively, of radio-collared cows that had been relocated periodically by fixed-wing aircraft (Whitten and Cameron 1983) during the previous 9-11 months. Of these 17 yearlings, 5 either died or lost their collars within 8 months. The remaining 12 were radio-tracked for 12-41 months after collaring (Tables 1 and 2).

The following data were recorded for each observation of a radio-collared caribou:

Date of relocation (or collaring, as appropriate)

Method - aerial tracking or observation only

Status - alive with collar in place and transmitter operational, dead or collar shed, inoperative transmitter, or unknown

Visual contact - yes or no

Map location (1:250,000 USGS) with accuracy rating

Group size with accuracy rating

Group type - predominantly cow/calf, predominantly bulls, mixed, or unknown

Cow accompanied by calf - yes or no

Hard antlers (cows only) - yes or no

Direction of movement - none, north, south, east, west, or unknown

Point locations were transferred to a permanent map file, and geographic coordinates were generated using an Altek digitizing table connected to an IBM XT; the appropriate software was developed by Game Division. All of the above information was coded numerically and entered on computer discs compatible with IBM PC hardware. Base maps were prepared using a variant of the digitizing software and an HP plotter.

FINDINGS AND DISCUSSION

All relocation data collected by fixed-wing aircraft through August 1986 have been coded and entered in a computer file, and the first of several base maps has been prepared (Fig. 1). The tasks remaining for data management include: (1) proofing all entries; (2) digitizing detailed base maps, principally for the northern half of the study area; (3) writing new programs for the retrieval of selected data, calculation of distances, determination of home range sizes, etc.; and (4) adding opportunistic observations of radio-collared caribou made during various systematic aerial and road surveys.

The number of relocations of caribou radio-collared as yearlings is disappointingly few. Only 2 of the 17 radio collars were confirmed to be operational for the projected life of the transmitters. Nine of the 10 collars deployed in 1982 and 1983 functioned for at least 2 years, but none of the 7 collars deployed in 1984 were known to be operational for more than 8 months (Table 1). Structural failure of the expandable neck band is probable. Three of the 6 radio collars that had been shed were recovered; the collar material had shredded in all 3 instances. Thus, it appears likely that the remaining 3 radio collars deployed in 1984 were also lost.

With complete data on only 2 radio-collared caribou (1M, 1F), it will not be possible to meet the primary objectives of this study (see above). However, 3 years' data (i.e., through spring of year 3) are available on a total of 9 caribou (3M, 6F), and 3 others (1M, 2F) were tracked through 2 years (Table 2). Thus, there will be some opportunity for chronological analyses of range use by individuals, and the possibility of a limited assessment of sexual differences in annual distribution. Unfortunately, these data apply only to subadults and will not permit an examination of the development of movement patterns and range fidelity from birth to full sexual maturity at 3+ years of age.

Perhaps the data management aspects of this study will be the most important contribution. The locations of all radio-collared caribou tracked by aircraft since 1980 have been digitized and computer-filed (Appendix A). We are now in a position to examine long-term patterns of range use by a number of adult females, many of which have been recollared; 1 manuscript on summer range fidelity (Cameron et al. 1986), prepared under the auspices of this Job, has been accepted for publication. In addition, our digitizing capabilities will soon permit graphic illustrations of seasonal/annual changes in distribution of the Central Arctic Herd and trends in the relative use of developed areas.

Despite the technical difficulties encountered during the course of this study and, consequently, the likelihood that the stated hypothesis cannot be tested satisfactorily using the available data, we remain convinced that questions regarding range fidelity merit further investigation. Although problems with collar integrity can be overcome, the field technique itself has serious limitations. The logistics requirements and costs of conventional radio-tracking in the Arctic preclude the frequent relocations necessary to precisely characterize range use. We therefore recommend that the study be reinstated at some future time using satellite telemetry.

ACKNOWLEDGMENTS

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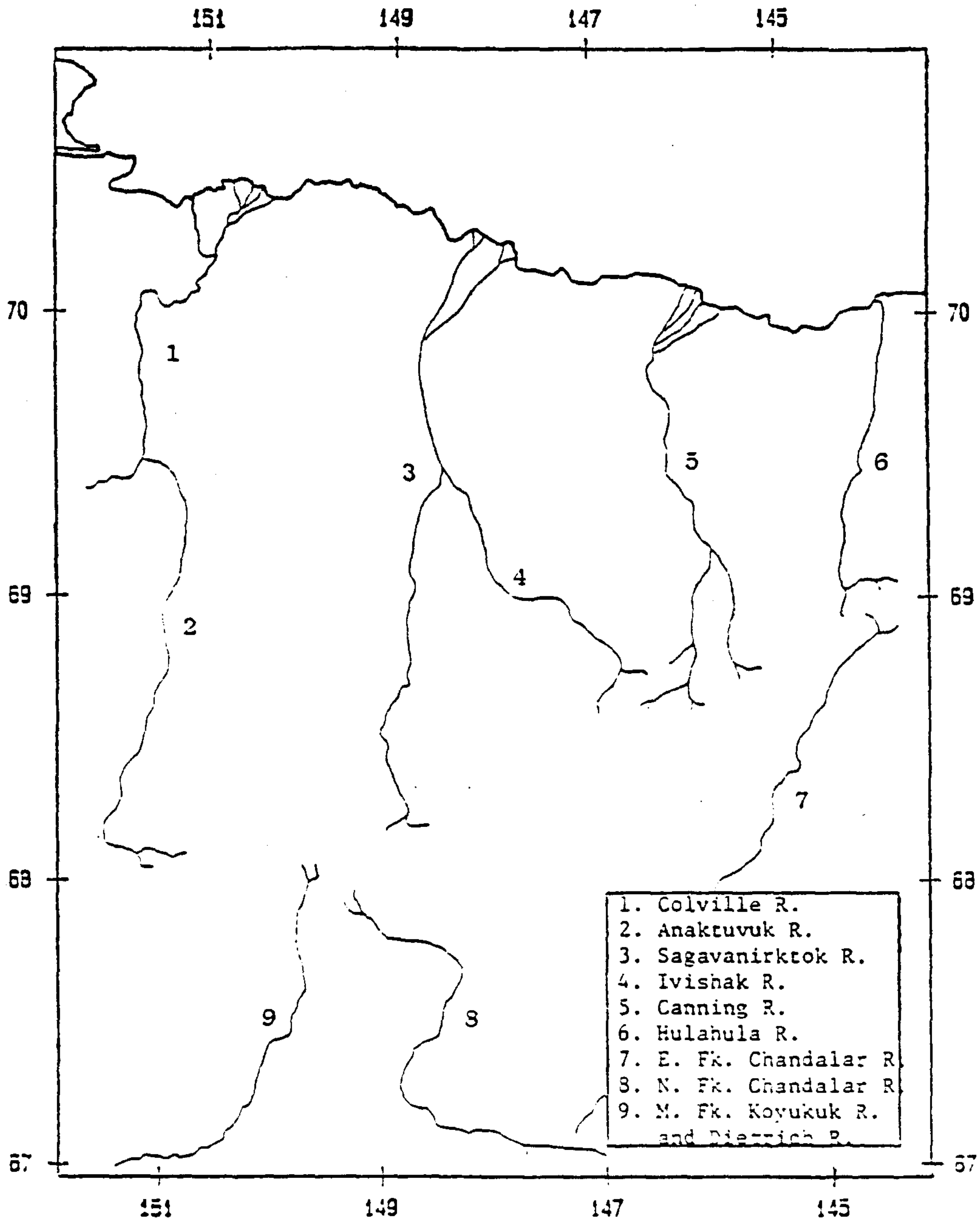

Fig. 1. Digitized base map of the greater range of the Central Arctic Herd.

Table 1. Disposition of radio-collared offspring of radio-collared female caribou, Central Arctic Herd, 1982-85.

Accession number	Month/year collared	No. months active[a]	Fate/remarks
8221	4/82	41	Normal transmitter life
8222	5/82	26	Dead or collar shed
8301	3/83	0	Dead
8302	3/83	28	Unknown
8303	3/83	25	Dead or collar shed
8304	3/83	28	Unknown
8305	3/83	28	Unknown
8306	3/83	28	Unknown
8307	3/83	32	Unknown
8308	3/83	40	Normal transmitter life
8413	3/84	4	Collar shed
8414	3/84	8	Collar shed
8415	3/84	16	Unknown
8416	3/84	0	Dead
8417	4/84	12	Unknown
8418	4/84	12	Unknown
8419	4/84	7	Collar shed

[a] Excluding terminal observations of mortality or shed collar.

Table 2. Relocation status of radio-collared offspring[a] of radio-collared female caribou, Central Arctic Herd, 1981-86.

Offspring accession no. (sex)	Year[b] and month: 1								2								3								4								5		
	J	J	A	S	N	M	A	M	J	J	A	S	N	M	A	M	J	J	A	S	N	M	A	M	J	J	A	S	N	M	A	M	J	J	A
8221 (F)	x	x		x			x[c]		x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x			x		x		x	x	x
8222 (M)					x		x	x[c]	x	x	x	x	x	x	x	x	x	x	x			x		x		x									
8302 (F)		x	x	x	x	x[c]	x	x	x	x	x	x	x		x		x	x	x							x									
8303 (F)	x	x	x		x	x[c]	x	x	x	x	x		x	x			x	x					x												
8304 (M)		x	x	x	x	x[c]	x	x	x	x	x	x	x	x			x	x			x		x		x	x									
8305 (F)		x		x	x	x[c]	x		x	x	x	x	x	x			x	x			x		x		x	x									
8306 (F)	x	x	x	x	x	x[c]	x	x	x	x	x	x	x	x			x	x	x							x									
8307 (F)	x	x	x	x		x[c]	x	x	x	x	x			x			x	x			x					x	x		x						
8308 (M)		x	x	x	x	x[c]	x	x	x	x		x	x	x	x		x	x			x		x			x			x			x	x	x	
8415 (F)	x	x	x	x	x	x[c]	x		x	x	x		x				x	x																	
8417 (F)	x	x	x	x	x	x	x[c]		x	x			x		x																				
8418 (M)	x	x	x	x	x	x	x[c]		x	x			x		x																				

[a] Only those individuals known to be alive, with functional transmitters, for at least 12 months.
[b] Year following birth.
[c] Collared when with dam.

Appendix A. Relocation status of caribou radio-collared in the Central Arctic region of Alaska,[a] 1980-86.

Accession No.		Number of relocations[b]							
Adult female	Offspring[c] (sex)	1980	1981	1982	1983	1984	1985	1986[d]	1980-86
8001		5	9	7					21
	8221(F)			7	43	6	4	3	63
8002		4	9	1					14
8003		3	10	5	36	1			55
	8307(F)				38	8	3		49
8004		3							3
8005		5	10	1					16
8006		2	1						3
8008		2							2
8009		8	9	1					18
8012		4	1						5
8101			10	1					11
8102			10	7	39				56
8103			8	1					9
8105			11	4	2	1			18
8108			10	5	37	8	5	4	69
	8418(M)					6	1		7
8109			10	11	39	7	5		72
8110			10	10					20
8111			11	5	43	6	6		71
	8304(M)				41	6	3		50
8112			11	6	42	6			65
	8306(F)				41	7	1		49
8113			6						6
8114			11	4	40	8	5	3	71
	8305(F)				37	6	3		46
8115			10	5	37	6	1		59
	8308(M)				39	8	5	3	55
8116			11	6	21		1		39
8117			9	6					15
8118			11						11
8119			1	4					5
	8222(M)			10	33	7			50
8201				4	18				22
8203				11	44	4			59
	8419(F)					8	1		9
8204				9	40	8	7	6	70
8205				5	47	8	6	4	70
	8303(F)				39	5	1	1	46
	8414(F)					7	1		8
8206				8	46	9	1		64
	8302(F)				40	5	1		46
8208				6	41	6	5	1	59
8209				3	2				5

Appendix A. Continued.

Accession No.		Number of relocations[b]							
Adult female	Offspring[c] (sex)	1980	1981	1982	1983	1984	1985	1986[d]	1980-86
8210				4	37	6	4	3	54
	8413(M)					6			6
8211				10	42	10			62
8212				2	1				3
8213				4	4	2			10
8214				6	40	5	4	1	56
8215				10	36	3	1		50
8216				5	42	7	5	4	63
	8415(F)					10	2		12
8217				5	43	7	5	5	65
	8417(F)					9	1		10
8218				9	43	11	7	1	71
8219				5	4	4	5	3	21
8220				5					5
8223				6	41	7	8	6	68
8224				1	28	7	7	1	44
8309					42	7	4	3	56
8401						9	4	6	19
8402						9	4		13
8403						7	4	3	14
8404						5			5
8405						8	6	2	16
8406						7	7		14
8407						10	1		11
8408						6	4	3	13
8409						5	6	3	14
8410						5			5
8411						5	3	2	10
8412						6	5	2	13
8420						7	4	4	15
8421						2	1		3
8501							6	3	9
8502							6	2	8
8503							7	5	12
8602								3	3
8604								5	5
8605								7	7
8606								2	2
8607								4	4
8608								5	5
8609								3	3
8610								5	5
8611								5	5
8612								2	2
8613								6	6

Appendix A. Continued.

Accession No.		Number of relocations[b]							
Adult female	Offspring[c] (sex)	1980	1981	1982	1983	1984	1985	1986[d]	1980-86
8614								5	5
8615								2	2
Totals		36	199	225	1328	349	187	141	2465

[a] Only those individuals observed alive at least once after collaring.

[b] Includes collaring, recollaring, and terminal locations.

[c] Offspring of the preceding adult female.

[d] As of 31 August 1986.