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NATURAL MORTALITY OF WESTERN ARCTIC CARIBOU

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Project Progress Report
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PROGRESS REPORT (RESEARCH)

State: Alaska

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Project No.: W-17-11 Project Title: Big Game Investigations

Job No.: 3.24R Job Title: Qualitative and Quantitative
Aspects of Natural Mortality
of the Western Arctic Caribou
Herd

Period Covered: July 1, 1978 through June 30, 1979
(limited data through October 1979 included)

SUMMARY

We field tested standard production radio transmitters on Delta Herd caribou and concluded that improved transmitters were essential for attaining the study objectives. Subsequent testing of custom-designed prototypes identified one that consistently transmitted signals from 150-260 km (60-100 mi) under field conditions and that should last for 3 years. Both criteria were essential to attain the objective of this job. We radio-collared nine Western Arctic Herd (WAH) caribou in April and May 1979 using Cap-Chur equipment and a helicopter. We collared three males on Kevuk Creek, one male in the Selawik Hills, one male and one female at the mouth of the Hunt River, and three females near Driftwood airstrip on the Utukok River. Between 28 September and 2 October 1979 we used a boat to collar 22 WAH caribou while they were swimming across the Kobuk River. Twenty-one of these were radio-collared and one was visual-collared only; 15 were males and seven were females. Few relocations were made during the study period. Plans to determine sex, age, condition, and cause of death of adult caribou dying from natural causes were delayed one field season because of the delayed receipt of our radio collars. Carcasses will be located and examined during flights to relocate radio-collared caribou.

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BACKGROUND

The Western Arctic Herd (WAH) was one of several major Alaskan caribou (*Rangifer tarandus granti*) herds that declined during the early 1970's (Davis 1978). Because the WAH was the largest herd in North America, and its decline was numerically most dramatic, its population dynamics and management have been a focus of public and scientific attention since the decline was documented in 1975 (Davis and Valkenburg 1978).

Recent population modeling of the WAH (Davis et al. in press; Doerr 1979, in press) and an intensified management program have demonstrated the need for better biological data. Several studies addressing many facets of the WAH were initiated in recent years and are providing some of the required data. However, rates of natural mortality and the causes of this mortality have not been adequately determined. Caribou biologists familiar with population demography acknowledge that such data are essential to understanding the population dynamics of any caribou herd (Klein and White 1978). Also, Davis et al. (in press) concluded that natural mortality (particularly predation) contributed greatly to the recent decline of the WAH.

Because empirical data were not available for ongoing modeling and planning, information about natural mortality has been extracted, or extrapolated, from the literature. Rates of natural mortality published in the literature are few, and of limited value, consisting primarily of generalities from studies conducted a decade or more ago under different conditions than now exist in the WAH. Skoog (1968) and Kelsall (1968) suggested annual natural mortality rates of 5-6 percent for animals older than yearlings when few natural predators were present. Bergerud (1971) found that males had a higher mortality rate (9%) than females (4%) in Newfoundland. In a recent review of population dynamics of North American caribou, Bergerud (1978) stated, "The natural mortality rate of adults when there are normal densities of predators has not been determined yet, but it probably will average 7-13 percent, depending upon predator densities." Determining actual mortality rates, and whether there are any compensatory mechanisms involved (e.g. is all wolf-induced mortality additive or would some of this mortality occur regardless), is important for management considerations and is requisite to understanding herd population dynamics.

This study is complementary to a concurrent study (National Park Service [NPS] Proposal No. 9100-78-05) designed to determine the seasonal home range use, social structure, and habitat selection of the WAH. The Alaska Department of Fish and Game is conducting the study through a 3-year contract from NPS. Caribou radio-collared for both jobs, will increase the total sample size without detracting from the major objective of either job.

OBJECTIVE

To determine the age, sex, condition, and cause of death of adult caribou dying from natural causes (all factors other than human-induced mortality), and to monitor 50 radio-collared caribou to help quantify mortality factors.

PROCEDURES

Quantitative Assessment of Natural Mortality

Natural mortality will be investigated by radio-collaring 20 caribou in conjunction with 30 caribou for the NPS Proposal No. 9100-78-05. These 50 animals will be relocated monthly, biweekly, or more frequently if necessary to determine mortality rate of radio-collared animals and to identify sources of mortality.

Considerable variations in radio transmitter reliability was experienced in recent years by investigators conducting radio-telemetry studies in Alaska. Because reliable transmitters are central to the success of this project, we field-tested transmitters by collaring caribou in the Delta Herd (Job 3.26R) near Fairbanks. Available standard production transmitters had insufficient signal range, unacceptably high failure rates, and probably an unacceptably short battery life to be practical for the proposed WAH work. Consequently, Telonics Inc.,* Mesa, Arizona developed and supplied a prototype transmitter designed to provide 3 years of battery life, transmit signals reliably over 155 km (60 mi), and contain a mortality pulse switch. The prototype met our specifications during field-tests (3-year life was not tested). However, this testing, coupled with the manufacturer not meeting original delivery dates, precluded instrumenting caribou in November 1978 as originally planned. We received our radio collars in mid-April 1979.

The radio collars were constructed of triple-layered, rubberized machine belting to which were attached either one or two hermetically sealed metal boxes containing the transmitter and batteries. The radios are activated by removing a magnet from the transmitter box. A highly visible yellow collar with black numbers about 10 cm high was pop-riveted to each radio collar. The entire unit weighs about 850 g. All collars have at least one external, cable whip antenna, and some of the collars have an external dipole antenna.

On 19 April 1979 we used a Bell Jet Ranger (206B) helicopter and immobilizing equipment (Cap-Chur, Palmer Co., Douglasville, Georgia) to

* Mention of trade names or manufacturers in no way implies our endorsement and they are given only as reference material.

collar three male caribou on Kevuk Creek in the central Brooks Range. We used the same procedure in early May to collar three caribou south of the Brooks Range (one in the Selawik Hills and two near the Kobuk River) and three north of the Brooks Range. The immobilizing drug consisted of 3 to 5 cc of etorphine (M-99, D-M Pharmaceuticals, Inc., Rockville, Maryland) and 20 mg xylazine (Rompun, Haver-Lockhart, Shawnee, Kansas). The antagonist diprenorphine (M-50-50, D-M Pharmaceuticals, Inc., Rockville, Maryland) was administered in equal volume to the etorphine.

From 27 September to 4 October 1979 we chartered a riverboat in Ambler and used it to capture and collar caribou as they crossed the Kobuk River. This technique was simple, effective, and relatively inexpensive. We waited on the south bank of the river at places where caribou traditionally cross. When a group started to cross we then promptly maneuvered to the swimming caribou and lassoed an adult by the antlers. The caribou was then dragged to the side of the boat and held while the boat was maneuvered to capture other caribou. We handled up to four at a time, and did not chemically immobilize or tranquilize them. We did not attempt to obtain body measurements or teeth for aging. After their release, we tried to herd all caribou to the same shore. Females accompanied by calves were herded to where the calf was last seen. Twenty-two caribou were collared, and we were pleased with the technique because it is probably less stressing to the animals and is also safer than using a helicopter.

Qualitative Assessment of Natural Mortality

The qualitative portion of this job will entail conducting periodic scheduled reconnaissance flights near known concentrations of caribou to locate and collect specimens from dead caribou. Contacts with pilots, guides, and local residents will help locate carcasses. Surveys for species such as wolves (*Canis lupus*), caribou, and moose (*Alces alces*), as well as radio-tracking surveys conducted under NPS Proposal No. 9100-78-05, will provide additional means of locating carcasses. Specimens will be collected from carcasses whenever possible using a helicopter or ski plane. Field necropsy will be conducted on all animals that cannot be brought into the lab for examination. Department lab personnel and research veterinarians at the University of Alaska will be available to examine specimens and retrieved carcasses. Nutritional condition will be evaluated via standard fat reserve measurements, including quantitative bone marrow fat determinations (Neiland 1970).

RESULTS

Radio-collared caribou were relocated only on an opportunistic basis and primarily during a census of cows on the calving ground in June 1979. Capture locations and subsequent relocations are depicted in Fig. 1. Tables 1 and 2 summarize data from the collaring work to date. As yet, we have no information on mortality, but all the females collared during early May 1979 had calves, and the calves survived for at least 10 days after birth.

Table 1. Data summary for Western Arctic Herd caribou collared in 1979.

Tagging Chronology	Collar Number ^a	Transmitter Freq. (MHz)	Age ^b /Sex	Date Collared	Location
1	69	150.020	young/male	4/19/79	Kevuk Cr., John R.
2	67	.195	young/male	4/19/79	Kevuk Cr., John R.
3	64	.025	adult/male	4/19/79	Kevuk Cr., John R.
4	68	.065	young/male	5/1/79	Selawik Hills
5	63	.048	young/male	5/2/79	Mouth Hunt R.
6	34	.045	adult/female	5/2/79	Mouth Hunt R.
7	9	.150	adult/female with calf	5/9/79	Driftwood, Utukok R.
8	1	.120	adult/female with calf	5/9/79	Driftwood, Utukok R.
9	33	.190	adult/female with calf	5/9/79	Driftwood, Utukok R.
10	76 (on backwards)	.105	young/male	9/28/79	Ambler, Kobuk R.
11	73	.085	young/male	9/28/79	Ambler, Kobuk R.
12	32	.030	young/male	9/28/79	Ambler, Kobuk R.
13	78	.060	young/male	9/28/79	Ambler, Kobuk R.
14	77	.090	young/male	9/28/79	Ambler, Kobuk R.
15	61	.055	adult/female	9/29/79	Ambler, Kobuk R.
16	74	.095	young/male	9/29/79	Ambler, Kobuk R.
17	36	.135	adult/female	9/29/79	Ambler, Kobuk R.
18	37	.100	adult/female	9/29/79	Ambler, Kobuk R.
19	75	.130	adult/male	9/29/79	Ambler, Kobuk R.
20	38	.210	adult/female	9/29/79	Ambler, Kobuk R.
21	72	.245	adult/male	9/30/79	Ambler, Kobuk R.
22	66	.125	adult/male	9/30/79	Ambler, Kobuk R.
23	65	.220	adult/male	9/30/79	Ambler, Kobuk R.
24	71	.155	adult/male	9/30/79	Ambler, Kobuk R.
25	6	.160	adult/female	10/1/79	Ambler, Kobuk R.
26	0	.200	adult/female	10/1/79	Ambler, Kobuk R.
27	2	.115	young/male	10/1/79	Ambler, Kobuk R.
28	4	.240	adult/female	10/2/79	Ambler, Kobuk R.
29	62	.015	young/male	10/2/79	Ambler, Kobuk R.
30	79 (on backwards)	.225	adult/male	10/2/79	Ambler, Kobuk R.
31	80	no radio	adult/male	10/2/79	Ambler, Kobuk R.

^a All collars are yellow with black numbers unless otherwise noted.

^b Young means an estimated age of less than 4 years. Adult means an estimated age of 4 years or older.

Table 2. Size and composition of groups from which caribou were radio collared.

Collar Number(s)	Group Size	Group Composition
67, 69	7	all males
64	3	all males
68	ca. 50	mostly young males and yearlings
34, 63	12	10 males, 2 females
9	6, 11, or 17(?)	mostly females
1	7	mostly females
33	6	includes 2 calves, 2 males
76	2	young males
32, 73	7	5 males, 1 cow, 1 calf
77, 78	less than 15	mixed
61, 74	8	mixed: 2 cows, 2 calves
36, 37, 38, 75	less than 10	females and calves
65, 66, 71, 72	6	adult males
6, 0, 2	15	1 adult male, females, calves
4, 62	9	1 male, 1 calf, 1 yearling, 1 cow + unk.
79, 80	5	adult males

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