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Natality and Early Calf Mortality of Northern Alaska
Peninsula Caribou, 1998

Final Report

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by

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Abstract: In 1998, 81% of caribou (*Rangifer tarandus*) cows ≥ 2 years old were pregnant. During the first month of life, 35% of radiocollared calves ($n = 37$) died. Predators, primarily brown bears (*Ursus arctos*), bald eagles (*Haliaeetus leucocephalus*) and wolves (*Canis lupus*), caused most of the mortality of calves < 2 weeks old, but disease apparently was an important mortality factor in calves > 3 weeks old.

Key words: Alaska, bald eagle, brown bear, *Canis lupus*, calf mortality, caribou, disease, natality, predation, *Rangifer tarandus*, survival, *Ursus arctos*, wolf.

INTRODUCTION

The Northern Alaska Peninsula Caribou Herd (NAP) ranges throughout Units 9C and 9E on the Alaska Peninsula. Historically, herd size has fluctuated widely, reaching peaks at the turn of the century, the early 1940s, and during the 1980s and early 1990s. During the late 1980s and early 1990s, liberal hunting regulations were maintained to reduce the herd to the lower limit of the population objective (15,000) because evidence suggested the traditional range could not sustain 20,000 caribou. During 1993–1994, the herd declined from about 15,000 to about 12,500 and then underwent a continued gradual decline to about 10,000 by 1997 (Sellers 1997). At its current size and productivity, the herd is only marginally able to meet the harvest demands of local hunters. There are indications that NAP caribou are chronically undernourished and may be more vulnerable to parasitism and predation than caribou in herds where nutrition is good. Since 1995 the Alaska Department of Fish and Game (ADF&G) and US Fish and Wildlife Service (FWS) have been cooperating on expanded survey work and assessment of nutritional condition in the herd. In October 1995, 10 calves were collected to assess nutritional condition; and lung lesions, later determined to be consistent with lungworm infection, were discovered in most of the calves. In June 1996, we examined 2 calves (approximately 1 month old) that were found dead south of Port Heiden. Both had lung abscesses, and lung tissue from 1 was submitted to a pathology lab and diagnosed as bacterial pneumonia. In October 1996, 10 calves were collected for further investigation of body condition and exposure to pathogens. No evidence of viral or bacterial pathogens was found, but there was evidence of lungworm in all 10 caribou calves. Lungworms can be a major source of mortality in bighorn sheep and other free-ranging species (Forrester 1971). In 1998, additional funds became available for work on the NAP, and ADF&G and FWS agreed to cooperate on a study to monitor pregnancy rate and determine causes of early calf mortality.

METHODS

Beginning 29 May 1998, we periodically observed radiocollared NAP females from a Bellanca Scout or Robinson R-44 helicopter to determine age-specific natality rates. Pregnant caribou found on the Bristol Bay side of the Alaska Peninsula were monitored daily to determine the timing of calving. From 30 May to 9 June we radiocollared and weighed 39 1–2 day old caribou calves. Calves were caught by hand after a close approach by helicopter. To reduce chances of abandonment, we generally only caught calves that were already dry (at least several hours old) and ones that were not in groups with other caribou. We monitored radiocollared calves from the air at least daily through 12 June to determine the timing and causes of mortality. We also recorded observations of predators on the calving area and surveyed caribou to determine the proportion of parturient females in the herd. We collected samples of lung and liver from dead calves to search for larval lungworm. In addition, 30 fresh fecal samples were collected to assess prevalence of lungworm in the herd. During 29 May–12 June, we flew about 55 hours in the Scout and about 40 hours in the R-44. Follow-up radiotelemetry flights were made on 19 June and in conjunction with the post-calving photo count during 25–28 June. On 30 June, a Robinson R22 helicopter was used to investigate late occurring deaths of

radiocollared calves and to collect 2 unmarked calves which were debilitated. The carcasses of these 2 calves and an intact collared calf were sent to the Washington Animal Disease Diagnostic Lab at Pullman, Washington for complete necropsy.

RESULTS

Of 29 radiocollared caribou >1 year of age that were alive in October 1997, we found 21 alive during calving surveys. Three more were found dead on the Pacific side of the Aleutian Range. One additional cow (151.661) was located on 25 June north of Ugashik River. Of the 4 missing caribou, one had a radio that was >4 years old and the battery may have been exhausted. The status of the other 3 collared cows is unknown. Of the 21 collared caribou that were located, 17 were found were on traditional calving range from Cinder River south to Port Moller, and 4 were found on the Pacific side of the Aleutian Mountains (Table 1). None of the 2-year-olds was pregnant, 1 of 4 three-year-olds was pregnant, and 80% of cows \geq 4 years old were pregnant (Tables 1 and 2). These results are similar to those of the previous 2 years (Table 2).

Of the 696 caribou counted during parturition surveys, 30 were bulls and 49 were judged to be yearling cows. Eighty-one percent of cows \geq 2 years old were parturient (Table 3). The northern portion of the calving area had more nonparturient females than the main calving area between the Ilnik and Bear Rivers (Table 3).

Newborn male calves were similar in size to calves of most other Interior Alaska caribou herds. However, female calves were probably somewhat smaller than female calves in most herds except the Porcupine (Table 4). NAP calves were much larger ($p < 0.001$) than those from the Southern Alaska Peninsula Herd in 1989 (Pitcher 1991).

Of the 39 calves collared, 2 did not reunite with their mothers and consequently were censored from the study, and 13 others died (Table 5) by 28 June. Mortality of collared calves during the first 2 weeks was 19%, and all of this appeared to be caused by predators. Only 1 mortality occurred during 12–19 June, but over the next week 5 more collared calves died, for a total mortality rate of 35%. The condition of 3 of these 5 carcasses suggest predation was not involved. While recovering radiocollars on 30 June, several debilitated uncollared calves were seen in the Ilnik-Black Lake area; and 2 calves were collected. Both these calves showed evidence of respiratory disease. One calf had copious amounts of greenish-yellow puss coming out of the nostrils and the other had an ulcerous lesion and abscesses on the lungs. These 2 carcasses and that of 1 collared calf (151.600) were sent to the Washington Animal Disease Diagnostic Lab for testing.

For unknown reasons, calves born in the Cinder-Meshik Rivers area had lower mortality (9%, $n = 11$) than did calves born in the Ilnik-Bear Rivers area (46%, $n = 26$) ($\chi^2 = 5.38$, $P = 0.02$).

Sample size was too small to determine the relative importance of individual predators, but brown bears were probably the most significant predator. During 29 May–12 June, we observed 88 brown bears on the calving grounds. Brown bear predation rates (number of calves killed per unit of time) were not calculated because it quickly became apparent that a concerted effort, including random selection of observation times and subjects would be

required. We watched 2 individual brown bears that were in the vicinity of nursery bands for over 2 hours. Neither bear seemed to be deliberately hunting caribou. One bear killed a ptarmigan (*Lagopus lagopus*) and scavenged a caribou calf during about 1.5 hours of observation, and the other bear killed 1 ground squirrel (*Citellus parryi*) during 0.5 hours. However, on the morning of 12 June, 3 bears killed at least 6 caribou calves (including 2 collared ones) in the main nursery band near the Sandy River airstrip. Several of these calves were not eaten, including one that was a relatively old calf weighing 15.9 kg. The only instance of wolf predation was discovered on 6 June in the vicinity of Three Hills. A wolf or wolves killed at least 6 caribou calves (none were collared) in a small area, and eagles were scavenging them. However, wolf sign was noticeably absent from the majority of the calving area, and only 2 wolves in the Wildman Lake-Three Hills area (possibly the same individual) and a few old tracks and old scats were found. A dead coyote (*Canis latrans*), later confirmed to be the first rabid coyote from Alaska, was found near Cinder River on 30 May. It is possible that rabies reduced wolf numbers on the northern Alaska Peninsula during 1997–1998 because there were several reports of a large pack of wolves in the vicinity of Sandy and Bear Rivers during winter 1997–1998 but wolves were virtually absent from the area during this study.

Analysis of specimens collected to investigate the prevalence of lungworm and other potential pathogens is in progress.

DISCUSSION

The chronic, relatively low pregnancy rate of NAP caribou suggests that females have had suboptimal nutrition over summer during at least the past 3 years. This finding is corroborated by the relatively small size of calves in October (Valkenburg 1997), and the fact that caribou from the NAP increased in size when transplanted to ungrazed range on the Nushagak Peninsula (Hinkes and Van Daele 1996). In addition, the fact that newborn calves weighed slightly less than calves from other herds also indicates suboptimal nutrition (Reimers 1997). Newborn calf weights in the NAP were not as low as in the Southern Alaska Peninsula Herd or the Denali Herd during periods of rapid decline (Table 4; Adams, pers commun).

Mortality of newborn calves during the first 3 weeks of life was relatively low. In other herds early mortality during the first 3 weeks to 1 month of age have ranged from 20–85% (Whitten et al. 1992; Adams et al. 1995; Jenkins 1996; Valkenburg 1997; Boertje and Gardner 1998). Given the relatively high density of brown bears on the calving area (Miller and Sellers 1992), it was somewhat surprising that bears did not kill more newborn calves. In addition, wolves were scarce on the calving area despite observations of a large pack in the area earlier in the winter. However, in coastal areas, rabies is known to periodically devastate canid populations (Ballard et al. 1997; Brand et al. 1995), and the fact that we found a dead rabid coyote near Cinder River confirms that rabies was present in the area.

Among the most intriguing findings of this study was the substantial mortality, apparently disease related, that occurred in late June. Of 29 collared calves alive on 19 June, 5 (17%) died during the next week. In most other calf mortality studies, survival improves after calves reach 2 weeks of age as they become less vulnerable to predators. Adams et al.

(1995) found that 98% of all mortality was caused by predation and that 85% of all deaths occurred within 8 days of birth. We found that 46% of deaths occurred after 2 weeks from birth and that perhaps as high as 31% of all deaths that occurred within 1 month of birth was not caused by predators.

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Table 1 Age, pregnancy status, date of calving, and location of female radiocollared caribou in the Northern Alaska Peninsula Herd in late May and early June 1998

Collar	Age (yr)	Pregnant	Date of calving	Latitude/Longitude	Location
R31	2	No		5634/15936	Sandy River
R39	2	No		5711/15803	Cinder River
R16	2	No		5709/15813	Cinder River
R42	2	No		5621/16000	Sandy River
R44	2?	No		5725/15647	Lower Ugashik Lake
R67	2	No		5643/15828	Port Heiden
R93	2	No		5717/15712	Mother Goose Lake
R57	3	No		5724/15724	Ugashik River
R70	3	No		5641/15743	Lower Aniakchak River
R82	3	No		5712/15802	Cinder River
R27	3	Yes	Unknown ^a	5712/15746	Pumice Creek
O70	4	Yes	4 Jun	5609/16020	Sandy River
O44	4	Yes	Unknown		Kujulik Bay
O71	4	Yes	6–9 Jun	5624/15957	Muddy River
O75	4	No		5643/15828	Ugashik Bay
O47	4	Yes	before 1 Jun	5659/15655	Nakalilak Bay
O77	4	Yes	Unknown	5648/15713	Amber Bay
O74	4	Yes	28 May	5611/16022	Sandy River
B4	>4	Yes	5 Jun	5718/15749	Cinder River
B14	>4	Yes	2 Jun	5610/16021	Sandy River
B15	>4	No		5630/15949	Three Hills

^a Distended uterus, no calf.

Table 2. Pregnancy rate of known aged cows in the Northern Alaska Peninsula caribou herd.

Year	2-year-olds		3-year-olds		4-year-olds	
	Available	Pregnant (%)	Available	Pregnant (%)	Available	Pregnant (%)
1996	15	0 (0)				
1997	4	0 (0)	8	2 (25)		
1998	6	0 (0)	4	1 (25)	7	6 (86)
Total	25	0 (0)	12	3 (25)	7	6 (86)

Table 3. Parturition survey of the Northern Alaska Peninsula caribou herd, 5/31/98 and 6/1/98.

Area	Females ≥ 2 years old			Female				
	Parturient			Not parturient	% parturient	yearling	Bull	Total
	w/calf	hard antlers	distended uter					
Cinder River	49	34	12	42	69	20	28	185
Meshik - 3 Hills	20	16	17	41	56	18	2	114
Muddy - Bear River	196	107	46	37	90	11	0	397
Total	265	157	75	120	81	49	30	696

Table 4 Weights of newborn calves from selected Alaskan Herds

Herd and year	Males			Females		
	Weight (kg)	S \bar{x} ^a	N	Weight (kg)	S \bar{x}	N
DELTA 1995	8.72	0.29	26	8.31	0.24	19
Delta 1996	8.39	0.23	22	7.40	0.19	28
Delta 1997	8.33	0.21	40	7.99	0.20	35
Delta 1998	8.41	0.22	15	7.70	0.29	15
Denali 1986–1987 ^b	9.00	0.11	67	7.80	0.11	60
Denali 1998 ^c	9.4	0.30	15	8.4	0.32	14
Fortymile 1994	7.71	0.20	22	7.55	0.27	22
Fortymile 1995	8.65	0.16	24	7.94	0.19	25
Fortymile 1996	8.54	0.24	26	8.09	0.17	32
Fortymile 1997	8.52	0.25	24	7.97	0.21	32
Fortymile 1998	8.43	0.14	30	8.00	0.15	39
Mentasta 1993 ^d	8.90	0.23	15	7.91	0.20	23
Mentasta 1994 ^d	8.83	0.21	18	8.09	0.19	23
Mentasta 1998 ^e	8.66	0.27	15	7.98	0.32	12
Nelchina 1996	8.26	0.24	23	7.19	0.19	17
Nelchina 1997	8.43	0.18	30	7.91	0.21	30
Nelchina 1998	8.97	0.20	30	8.57	0.18	30
NAP 1998	8.44	0.24	19	7.17	0.30	20
SAP 1989^e	6.7	0.67	9	5.4	0.57	9
Porcupine 1983 ^f	7.40	0.19	24	6.60	0.16	28
Porcupine 1984 ^f	7.30	0.22	33	6.70	0.18	23
Porcupine 1985 ^f	7.70	0.23	27	7.30	0.20	26
Porcupine 1993 ^g	na	na	na	6.2	0.7	68

^a With standard errors of about 0.2 kgs, a difference in means of 0.6 kgs would be significant at the 0.05 level.

^b Denali data is corrected for calf age; uncorrected weights would be 0.3–0.5 kgs higher (Adams et al. 1995).

^c Unpublished data from L Adams.

^d Data from Jenkins (1996).

^e Data from Pitcher (1991).

^f Data from Whitten et al. (1992).

^g Data from Whitten (1995)

Table 5 Age, sex, and cause of death of radiocollared newborn caribou calves in the Northern Alaska Peninsula Herd, 1998^a

Mortality	Sex	Age at death (days)	Cause of death	Location
1	M	2	Abandoned	Bear River
2	F	3	Abandoned	Cinder River
3	F	2	Brown bear	Cinder River
4	F	3	Brown bear or wolf ^b	Three Hills
5	F	5	Probably bear or wolf ^c	Bear River
6	M	4	Bald eagle ^d	Bear River
7	F	7	Unknown ^e	Three Hills
8	M	7	Brown bear	Sandy River
9	M	14	Brown bear	Sandy River
10	F	6–12	Unknown ^f	Three Hills
11	F	20–25	Disease? ^g	Ilnik
12	M	22–25	Unknown ^h	Ilnik
13	F	22–26	Drowning ⁱ	Ilnik
14	M	26–28	Disease? ^j	Ilnik
15	M	18–25	Unknown ^k	Milky River

^a Thirty-nine caribou calves were collared.

^b Some large bones were crunched, but carcass was cleaned up by eagles.

^c Only the radiocollar was found, fresh tracks of a medium sized brown bear were about 150 m from the radiocollar.

^d Calf was whole with mother guarding it.

^e Only the collar was found.

^f Heard on mortality mode on 6/19/98, site visited on 6/30/98, only a few bones left and femur and vertebrae were crushed, probably by bear or wolf.

^g Site visited on 6/30/98. Carcass intact and estimated to be dead approximately 5 days. Carcass skinned and no evidence of trauma was found. No gross abnormalities noted for internal organs, but samples of lungs and liver taken.

^h Site visited on 6/30/98. Skeleton intact, but had been fed upon by eagles. No bones crushed and no other sign of mammalian involvement. Possible disease-related death and scavenging by eagles.

ⁱ Found 6/30/98. Collar lodged under “land bridge” over small deep creek with steep banks.

^j Site visited 6/30/98. Calf intact and estimated to be dead approximately 5 days. Carcass sent to diagnostic lab.

^k Site visited 6/30/98. Nothing but the collar was found.