Alaska Department of Fish and Game
Division of Wildlife Conservation

Federal Aid in Wildlife Restoration
Research Progress Report
1 July 1997- 30 June 1998

Investigation of Regulating and Limiting Factors in the Delta Caribou Herd

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Grant W-27-1
Study 3.42
March 1999

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RESEARCH PROGRESS REPORT

STATE: Alaska **STUDY:** 3.42

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GRANTS: W-27-1

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SUMMARY

Since 1992 the study of limiting and regulating factors in Alaskan caribou (*Rangifer tarandus*) has extended to herds other than the Delta herd because of pressing research and management questions. Area management biologists in Regions II and III have become actively involved in the study, and the work has grown more statewide in scope. Besides the Delta herd, the Nelchina, Northern Peninsula, Southern Peninsula, Kenai Mountains, Killey River, White Mountains, Ray Mountains, and Nushagak herds have yielded particularly valuable information in the study of limiting and regulating factors and determination of optimum herd sizes. In addition, parallel studies in the Delta and Denali herds have become invaluable.

From July 1997 through June 1998, in addition to routine collection of population data (i.e., fall composition counts and annual census), we weighed and measured newborn, 4-month-old, and 10-month-old female caribou calves in the Delta and Nelchina herds and collected a sample of 10 female calves in fall in the Northern Alaska Peninsula herd. We also report results of the 1997 calf mortality study in the Delta herd, preliminary results of a similar study in the Northern Alaska Peninsula herd in 1998, and the diversionary feeding study from the Delta herd in 1997. Data from fecal pellets collected during 1994–1996 are also presented.

The Delta herd remained stable at just over 3500 from 1997 to 1998, and condition parameters were similar between years but perhaps somewhat better in 1998. Natality in the Delta herd was higher in 1998 than in 1997. Nelchina 4-month-old calves were heavier in 1997 than in 1998. In general, herds with large calves in October and April had a high proportion of lichens

in the winter diet. Four-month-old and 10-month-old calves continue to be relatively small in the Nelchina and Northern Alaska Peninsula herds, moderate in the Delta, Fortymile, and Kenai Mountains herd, and large in the White Mountains and Killey River herds. Newborn calves in the Delta, Fortymile, and Mentasta herds were generally similar in size in 1997 and 1998. Denali and Nelchina herd calves were larger in 1998, and Northern Alaska Peninsula females were smaller. Lungworm has been identified as a possibly significant source of mortality in Northern Alaska Peninsula caribou. The study of weather patterns in relation to caribou condition is continuing. The study of diversionary feeding is also continuing in the Delta herd.

Key words: body condition, calf mortality, caribou, Delta herd, diversionary feeding, Nelchina herd, natality, Northern Alaska Peninsula herd.

CONTENTS

BACKGROUND

A continuing long-term population dynamics study of the Delta caribou herd (DCH) began in 1979. Results of the first 17 years of research were presented in 8 progress reports, 3 final reports (each covering 5 years) (Davis and Valkenburg 1985; Davis et al. 1991; Valkenburg 1997), and numerous scientific papers (Davis et al. 1991; Boertje et al. 1996; Valkenburg et al. 1996). Predator/prey relationships and human harvest of moose (*Alces alces*), caribou, sheep (*Ovis dalli*), grizzly bears (*Ursus arctos*), and wolves (*Canis lupus*) within the range of the DCH were reviewed by Gasaway et al. (1983) and Boertje et al. (1996).

Since 1979 the DCH has gone through 4 growth phases. Herd size rapidly grew from 1979 to 1982 ($r = 0.18$) with high recruitment and low mortality from hunting and natural causes. The herd grew slowly ($r = 0.05$) from 1982 to 1985 with moderate to high recruitment, low to moderate natural mortality, and high hunting mortality. The herd also grew slowly ($r = 0.07$) from 1986 to 1988 with moderate recruitment, moderate to high natural mortality, and low

hunting mortality. Then the herd rapidly declined (r = -0.20) from 1989 to 1992 with low recruitment, high natural mortality, and low hunting mortality.

In June 1993 the Board of Game approved a 3-year ground-based wolf predation control program for a portion of Unit 20A. One of the objectives of the program, which began in October 1993, was "to reverse the decline of the DCH and increase the midsummer population to 6000–8000 caribou, with a sustainable annual harvest of 300–500 caribou." To better evaluate the effectiveness of intensive management (i.e., control of wolf numbers) of the DCH, we extended the project with state funds to include annual calf mortality studies. Results of these studies will be reported in this and future Pittman–Robertson documents.

Population decline in the DCH was reversed in 1994, coincident with the wolf control program, and the herd increased to over 4000. However, after 1995 the herd once again stabilized, and the research project in the DCH focused on monitoring population parameters in the caribou herd as moose and wolf numbers approached very high levels. In recent years, the study of limiting and regulating factors in caribou has extended to other herds with pressing research and management questions, and the study has become statewide in scope. This new approach has only been possible because of the active interest taken by cooperating area biologists in establishing a coordinated research and management program. Besides the DCH, the Nelchina, Northern Peninsula, Southern Peninsula, Kenai Mountains, Killey River, White Mountains, Ray Mountains, and Nushagak herds have yielded particularly valuable information in the study of limiting and regulating factors and determination of optimum herd sizes.

STUDY OBJECTIVES

Evaluate the influence of weather, density, food limitation, hunting, and predation on the population dynamics of the DCH and other Interior herds.

JOB OBJECTIVES

- Census the DCH annually
- Determine annual natality rate and timing of calving in the DCH
- Determine recruitment from annual fall and spring composition counts
- Monitor harvest annually
- Determine weight and size of calves in April to determine influence of summer versus winter weather on body condition and test a model that predicts recruitment (i.e., fall calf:cow ratio) from April calf weights in the Delta, Fortymile, and Nelchina herds
- Radiocollar female calves in fall to maintain known-aged cohorts in the DCH
- Determine if weather is a factor that limits growth of the DCH
- Assess and analyze food habits of the DCH and other Interior herds

- Monitor movements, dispersal, and mortality in the DCH
- Recollar adult females to maintain cohorts of collared, known-aged females

METHODS

DELTA HERD

During summer 1997 we continued to monitor caribou calves collared as newborns about every 7–10 days to determine timing and causes of calf mortality. Between 27 September and 3 October, we collared, weighed, and measured 7 female calves at random and replaced collars on the 12 female calves still surviving from the mortality study. By comparing weights of these calves as newborns and subsequently as 4-month-olds, we were able to estimate weight gain over summer 1996 and 1997. We conducted a fall composition count on the DCH on 27 September using an R-22 helicopter for caribou classification and a Bellanca Scout for radiotracking. The sample was distributed in proportion to the distribution of radiocollared caribou. On 19 October, after rutting activities were over, we changed collars on 3 adults whose collars were 5 years old or older. During winter we monitored distribution and mortality of radiocollared caribou by tracking caribou on 16 December and 1 March. The 4 snow stations were read on 16 December, 1 February, and 1 March. On 9 April 1998 we immobilized, weighed, and measured 12 female calves to evaluate their size and condition at the end of winter. In early May we collared the alpha male wolf of the Wells Creek pack to monitor its movements during the caribou calving season. From 17–25 May we observed all collared caribou in the DCH 1–3 times to determine if they were pregnant. No calf mortality study was done in 1998. On 29 June we conducted the DCH census, using a DeHavilland Beaver, 3 Bellanca Scouts, and 1 Piper Supercub. All but 2 radiocollared caribou were located. The 2 missing caribou were not found during calving surveys, and their collars may no longer be functioning.

NELCHINA HERD

In addition to the standard fall composition survey and annual census that will be reported in the biennial management report, we weighed samples of calves as newborns, at 4 months of age, and again at 10 months to determine trends in body condition in relation to weather and changing herd size. Sixty newborn calves (30 males and 30 females) were weighed on 25 May 1997 and 1998. The peak of calving was 24–26 May in both years. On 27 September 1997 we collected 10 female calves on the Little Nelchina River and evaluated condition, weight, and fat indices. On 1 May 1998, we collared, weighed, and measured 15 10-month-old female calves, 3 yearling females, and 4 adult females in the Lake Louise area.

NORTHERN ALASKA PENINSULA HERD

Although we had no plans to collect caribou calves in the range of the Northern Alaska Peninsula herd (NAP) in fall 1997, we changed plans in September because of the unusually warm, dry summer in southwestern Alaska. On 31 October we collected 10 female calves about 5 miles south of King Salmon where most of the herd were located. Summer 1997 provided a good test of the hypothesis that warm summers result in poor weight gain and

reduced condition, especially in calves (Valkenburg et al. 1996; Lenart 1997; Morschel and Klein 1997). We were also interested in continuing to evaluate the importance and prevalence of lungworm in the population. Lesions on lungs of 5-month-old calves were first discovered in 1995 in a sample of 10 female calves collected for body condition assessment.

In addition, the US Fish and Wildlife Service (FWS) and the Alaska Department of Fish and Game (ADF&G) cooperated in a calf mortality study to determine the magnitude, timing, and causes of calf mortality in the herd and the importance of lungworm as a mortality factor. The NAP declined in recent years and is now only marginally able to support the demand for harvest by local residents. FWS provided $25,000 for helicopter time and bought 30 radiocollars for newborns, and ADF&G provided a field crew (including area biologist Sellers, wildlife disease specialist Zarnke, and research biologist Valkenburg) and a fixed-wing aircraft.

Winter Food Habits Analysis

We continued to collect fecal pellets from caribou in the DCH, Fortymile, Nelchina, Northern Alaska Peninsula, and Mulchatna caribou herds. Getting pellets analyzed has been taking up to 2 years. Results of analysis of fecal pellets collected in the DCH and other caribou herds during 1994–1996 are presented in this report.

RESULTS AND DISCUSSION

Population Size and Trend in the DCH

The DCH was stable from 1996 (3819 counted) to 1997 (3699 counted). The herd initially responded after wolf control but then declined slightly; now the herd has stabilized. The 1998 census was successfully completed on 29 June, but photos will not be processed until July.

Natality Rate in the DCH

Natality in the DCH was relatively low in 1997 and relatively high in 1998 (Table 1). Only 50% of the 3-year-olds produced calves in 1997, compared to 90% in 1998. We had predicted increased natality in 1998 compared to 1997, based on possibly larger calves in late September 1997 (Table 2).

1995 and 1996 Fall Composition Counts in the DCH

Recruitment of calves to fall has not changed appreciably for 4 years, and bull:cow ratios have remained relatively low (Valkenburg 1997:Appendix B). In 1997 there were 18 calves and 27 bulls:100 cows in a sample of 1598 caribou classified. Data on bull:cow ratios are variable from year to year, depending on timing of fall counts and behavior of bulls, which is affected by weather and timing of rutting activities. However, the bull:cow ratio appears stable, and the herd can apparently sustain the small bulls-only permit hunt.

Weight and Size of Calves from Interior and Southwestern Alaska Herds

Weight and size of newborn calves remained similar in the DCH over the 4 years for which data are available (Table 3). Although mean values were greater, weight of 4-month-old female

calves was not significantly higher in 1997 than in 1996 ($t = 0.93$, $P = 0.36$); nor was mean daily summer weight gain ($t = 1.09$, $P = 0.29$), although weights of 10-month-old calves in 1998 were probably higher than in 1997 ($P = 0.1$) (Table 2). Calves did not lose significant weight over winter 1997–1998. Weight and condition of calves have not returned to the levels of the early 1980s when herd size was low.

Newborn calves in the Nelchina Herd have been similar in size to calves of other Interior herds, except that Denali calves were larger in years when that herd was doing well (Adams, pers commun) (Table 3). However, Nelchina calves have been consistently smaller than calves from other herds at the end of summer. Summer nutrition therefore appears to be chronically suboptimal in the Nelchina Herd, although there was some improvement in 1997 that was also noticeable in the Denali, DCH, and Fortymile herds. In fall 1997 Nelchina calves were about 20 lb heavier than in previous years ($P<0.05$). We attributed this to favorable summer weather in 1997, and on that basis predicted improved natality in 1998 in the Interior herds. Some natality occurred in 2-year-olds in the DCH, Denali, and Fortymile herds but not in the Nelchina. In contrast, weights of Northern Alaska Peninsula calves continued to be low. After the record dry summer of 1998, we expected to find record low calf weights, but they were similar to 1995 and 1996 (Valkenburg 1997). Data are still being analyzed.

Weather

Data from 4 snow markers in the range of the DCH are accumulating and will allow comparisons with Fairbanks data in the future. Summer 1997 appeared to be favorable for caribou in Interior Alaska, with no long stretches of dry, hot weather. March 1998 was unusually warm in the Interior, but April and May were cold, resulting in a late spring in the alpine calving areas of the Interior herds. In southwest Alaska, it was unusually hot and dry in summer 1997. Winter 1997–1998 in all areas was moderate, with heavy snowfall in October and November and very little snow for the remainder of the winter.

Mortality of Female Radiocollared Caribou Older Than 4 Months in the DCH

Mortality of female calves (4–16 months of age) and yearlings (16–28 months of age) continued to be high (Table 4). In contrast, mortality of adult females was relatively low. Many (43/107) radiocollared caribou that died were killed by wolves. In contrast to the late 1970s and early 1980s, fall calf:cow ratios in the DCH have not been good indicators of recruitment because of the high mortality rate of calves aged 4–16 months.

Calf Mortality Study in the DCH

Results of the third year (1997) of the calf mortality study were similar to the first 2 years. Wolves, grizzly bears, and golden eagles (*Aquila chrysaetos*) were the most important mortality factors during the first 4 months of life (Table 5). Eagles seldom killed calves after mid June, and bears killed few after July. Results of the first year of the calf mortality study were submitted to the *Wildlife Society Bulletin*, but the article was rejected with the suggestion that data from all 3 years be included to bolster sample sizes.

In a separate project on calf mortality in the Northern Alaska Peninsula herd in 1998, calf mortality was initially low (about 20% over the first 3 weeks), but increased in late June and early July, probably from disease. Data and results of this study are still being collected and analyzed; we will report the data elsewhere (Sellers et al. 1998) and cite in future reports on the DCH and other caribou studies.

DIVERSIONARY FEEDING IN THE DCH

Effects of Diversionary Feeding on Numbers of Calves Killed by Wolves on the Wells Creek Calving Area

During the calving period in 1997, members of the Wells Creek pack killed few calves on the calving area and seemed satisfied to stay near the den with food provided by us. However, on 29 May they began to travel to the calving area and hunt calves. The caribou also remained in the Wells Creek area until about 20 June, and many calves died from wolf predation. Four collared calves were killed between 29 May and 20 June when the caribou left.

Effects of Diversionary Feeding on Pack Hunting Behavior

Most members of the Wells Creek pack were collared again in 1997 and tracked daily. They did not travel to the calving area until 27 May. The supplemental food appeared to successfully keep the pack at the den until 29 May. However, on that day we saw the wolves feeding on a caribou carcass at the den in the early morning and then traveling to the calving area later in the day. The diversionary feeding stopped 5 June, and we stopped daily monitoring of caribou and wolves.

GPS Collar

A GPS collar was placed on the pack's alpha male on 14 May. The collar provided hourly locations until about 25 June. Data are being analyzed and will be presented in future reports.

MOVEMENTS, DISTRIBUTION, AND HARVEST IN THE DCH

DCH caribou spent the summer on their normal summer ranges on the Gold King Benches, Iowa Ridge, upper Buchanan Creek and upper Tatlanika/Moose Creek. Most of the herd moved to the upper Wood River and Dick Creek where the rut occurred. The main wintering areas were in the lower Yanert, and Alaska Range foothills from the Little Delta to Donnelly Dome. Three collared caribou wintered about a mile west of Donnelly Dome and 1 wintered about 1 mile to the east across the Richardson Highway. Snowmelt was late in May 1998, and most caribou calved south of the recently used Wells Creek calving area. Two radiocollared caribou calved south of the Denali Highway, and many calved in the Monahan Flats. In 1997 hunters took 40 bull caribou during the drawing permit hunt.

ANALYSIS OF WINTER FECAL PELLETS

The primary purpose of collecting winter fecal pellets was to compare the relative proportion of lichens, mosses, and other components of the diet between herds, years, and winter ranges and to relate diet composition to animal condition. Caribou herds (White Mountains, Killey River) with large bodied calves in fall and winter (i.e., generally good nutrition) had a high

proportion of lichens and low proportion of moss in the winter diet (Table 6). In contrast, DCH, Nelchina (Unit 13 and southern Unit 12), Mulchatna, and Northern Alaska Peninsula herds had a relatively low proportion of lichens in the diet. The Nelchina winter range in Unit 13 has relatively poor lichen cover (Lieb 1994). Because calf weight in fall is primarily determined by summer nutrition, there is probably not a direct relationship between lichen proportion and calf weight in October. The relationship may occur because heavy calves are generally found in very low-density herds where winter range is not limiting. On the Kenai, for example, both the Kenai Mountains and Killey River herds had a high proportion of lichens in the winter diet. However, calves in the Killey River herd were very heavy, but those in the Kenai Mountains were relatively light, and the Kenai Mountains herd has declined in the past (Spraker 1995). Further work on the Kenai winter ranges would be instructive.

ACKNOWLEDGMENTS

We thank R Boertje, B Booysen, T Boudreau, R Eagan, M Keech, J Larrivee, L Larrivee, A Magoun, D Miller, S Murley, D Reed, B Scotton, R Swisher, and K Taylor for help with fieldwork, flying, data analysis, and lab work. L Adams provided unpublished data from the Denali Herd for comparison with the DCH. K Whitten, L McCarthy, and M Hicks provided editorial review.

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Table 1 Natality rates of radiocollared known-aged DCH[a] females observed in late May 1980–1998

Year	Proportion parturient (%) in late May													
	Yearlings		2-year-olds		3-year-olds		4-year-olds		5-year-olds		6-year-olds and older		All cows 3 years and older	
1980			7/11	(64)										
1981	0/7	(0)	1/1	(100)	10/13	(77)							10/13	(77)
1982	0/10	(0)	0/7	(0)	2/2	(100)	5/8	(63)					7/10	(70)
1983	0/12	(0)	1/8	(13)	7/7	(100)			6/8	(75)			13/15	(87)
1984	0/12	(0)	0/11	(0)	8/9	(89)	6/6	(100)	1/1	(100)	6/7	(86)	21/23	(91)
1985			1/9	(11)	9/10	(90)	6/7	(86)	6/6	(100)	7/8	(88)	28/31	(90)
1986					8/9	(89)	9/9	(100)	3/4	(75)	8/9	(89)	28/31	(90)
1987	0/6	(0)	0/2	(0)			8/8	(100)	8/9	(89)	9/11	(82)	25/28	(89)
1988	0/11	(0)	0/5	(0)	1/1	(100)			8/8	(100)	15/16	(94)	24/25	(96)
1989	0/10	(0)	0/11	(0)	3/5	(60)	2/2	(100)			21/23	(91)	26/30	(87)
1990			0/4	(0)	6/10	(60)	5/6	(83)	0/1	(0)	17/17	(100)	28/34	(82)
1991	0/4	(0)			2/7	(29)	8/10	(80)	3/3	(100)	11/14	(79)	24/34	(71)
1992	0/16	(0)	0/5	(0)	0/1	(0)	6/7	(86)	8/8	(100)	12/12	(100)	26/28	(93)
1993	0/11	(0)	0/10	(0)	0/5	(0)	0/1	(0)	1/3	(33)	6/15	(40)	7/24	(29)
1994	0/10	(0)	0/12	(0)	2/9	(22)	4/5	(80)	1/1	(100)	13/15	(87)	20/30	(67)
1995	0/13	(0)	0/7	(0)	7/11	(64)	8/8	(100)	4/5	(80)	13/13	(100)	32/37	(86)
1996	0/16	(0)	1/11	(9)	5/5	(100)	9/10	(90)	6/6	(100)	15/16	(94)	35/37	(95)
1997	0/12	(0)	0/11	(0)	5/10	(50)	3/4	(75)	8/9	(89)	16/17	(94)	32/40	(80)
1998	0/17	(0)	1/8	(13)	9/10	(90)	7/7	(100)	3/3	(100)	18/22	(80)	37/42	(88)

[a] Figures may differ slightly from previous reports because only DCH female were considered here (no Yanert females or those whose age was not known were used in this analysis).

Table 2 Mean weight of samples of 4- and 10-month-old female calves from the DCH, 1979–1998

	10-month-olds				4-month-olds			
Year	$\bar{x}$ (lb)	$\bar{x}$ (kg)	$s_{\bar{x}}$ (lb)	N	$\bar{x}$ (lb)	$\bar{x}$ (kg)	$s_{\bar{x}}$ (lb)	N
1979	132.3	60.1	2.4	11				
1981	137.0	62.1	7.4	5				
1982	135.1	61.3	3.9	11				
1983	137.2	62.2	3.3	13				
1984	126.9	57.5	1.3	14				
1987	120.8	54.8	2.8	9				
1988	131.3	59.6	2.9	12				
1989	133.6	60.6	2.7	9				
1990	119.9	54.4	3.3	9				
1991	113.1	51.3	2.3	9	127.6	57.9	2.6	14
1992	119.1	54.0	2.6	17	119.1	54.0	2.6	17
1993	122.3	55.5	2.9	12	122.9	55.8	3.0	11
1994[a]					131.4	59.6	3.0	15
1995	123.1	55.8	2.7	15	131.1	59.5	2.7	15
1996	120.8	54.8	3.3	15	123.0	55.8	3.0	14
1997	118.3	53.7	2.5	14	128.3	58.2	2.2	20
1998	123.7	56.1	3.0	12				

[a] There were too few calves to obtain a sample of 10-month-olds in April 1994.

Table 3 Weights of newborn caribou calves from selected Alaskan herds

	Males			Females		
Herd and year	Weight (kg)	SE[a]	*N*	Weight (kg)	SE	*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[c]	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	6.7	0.67	9	5.4	0.57	9
Porcupine 1983[e]	7.40	0.19	24	6.60	0.16	28
Porcupine 1984[e]	7.30	0.22	33	6.70	0.18	23
Porcupine 1985[e]	7.70	0.23	27	7.30	0.20	26
Porcupine 1993[f]	na	na	na	6.2	0.7	68

[a] With standard errors of about 0.2 kg, a difference in means of 0.6 kg would be significant at the 0.05 level.
[b] Denali data is corrected for calf age; uncorrected weights would be 0.3–0.5 kg higher (Adams et al. 1995).
[c] Unpubl data from L Adams.
[d] Unpubl data from Jenkins (1996).
[e] Data from Whitten et al. (1992).
[f] Data from Whitten (1995).

Table 4 Annual total mortality[a] of radiocollared known-aged female DCH[b] caribou, 1979–1996

Year	Proportion dying (%) (cause of death) by age class			
	Calves (4–16 mo)	Yearlings (16–30 mo)	Older than yearlings (>30 mo)	Yearlings and older (>16 mo)
1979–1980		0/11 (0)		0/11 (0)
1980–1981		0/2 (0)	0/11 (0)	0/13 (0)
1981–1982		0/7 (0)	0/11 (0)	0/18 (0)
1982–1983		2/10 (20) (2 unk)	0/18 (0)	2/28 (7)
1983–1984		0/12 (0)	2/24 (8) (1 unk, 1 hunting)	2/36 (6)
1984–1985		0/11 (0)	2/21 (10) (1 grizzly, 1 unk)	2/32 (6)
1985–1986			7/39 (18) (4 wolf, 1 hunting, 1 poached, 1 unk)	7/39 (18)
1986–1987			3/32 (9) (2 unk, 1 poached)	3/32 (9)
1987–1988		1/6 (17) (1 poached)	1/32 (3) (1 unk pred.)	2/38 (5)
1988–1989		1/11 (9) (1 unk pred)	5/32 (16) (5 unk)	6/43 (14)
1989–1990		1/8 (13) (1 wolf)	5/41 (12) (4 unk, 1 wolf)	6/49 (12)
1990–1991			9/41 (22) (5 unk, 2 wolf, 2 unk pred)	9/41 (22)
1991–1992	5/12 (42) (2 wolf, 2 unk pred, 1 unk)	0/4 (0)	5/31 (16) (3 wolf, 1 unk pred, 1 unk)	5/35 (14)
1992–1993	8/15 (53) (3 lynx, 3 unk pred, 2 unk)	1/11 (9) (1 unk)	5/30 (17) (4 wolf, 1 coyote)	6/41 (15)
1993–1994	7/10 (70) (5 wolf, 1 unk., 1 poached)	0/7	4/32 (13) (3 unk, 1 wolf)	4/39 (10)
1994–1995	5/15 (33) (3 wolf, 2 unk pred)	2/7 (1 grizzly, 1 hunting)	5/41 (12) (3 wolf, 1 unk pred, 1 breached birth)	7/48 (15)
1995–1996	4/14 (29) (3 wolf, 1 unk)	1/11 (9) (1 wolf)	4/39 (10) (3 wolf, 1 unk pred)	5/50 (10)
1996–1997	6/13 (46) (2 wolf, 3 unk pred, 1 unk)	3/14 (21) (3 wolf)	3/42 (7) (2 wolf, 1 unk)	
Totals	35/79 (44)(15 wolf, 10 unk pred, 6 unk, 3 lynx, 1 poached)	12/132 (9)(3 unk, 5 wolf, 1 unk pred, 1 grizzly, 1 poached, 1 hunting)	60/517 (12)(24 unk, 23 wolf, 6 unk pred, 2 hunting, 2 poached, 1 grizzly, 1 coyote, 1 breached birth)	72/649 (11)

[a] Mortality rate was calculated from 1 Oct to 30 Sep each year.

[b] Mortality rates differ slightly from previous reports because only DCH caribou are considered here (no Yanert caribou are included).

Table 5 Mortality of radiocollared calves and calves of radiocollared females by cause in the DCH from birth to 30 September 1995–1997

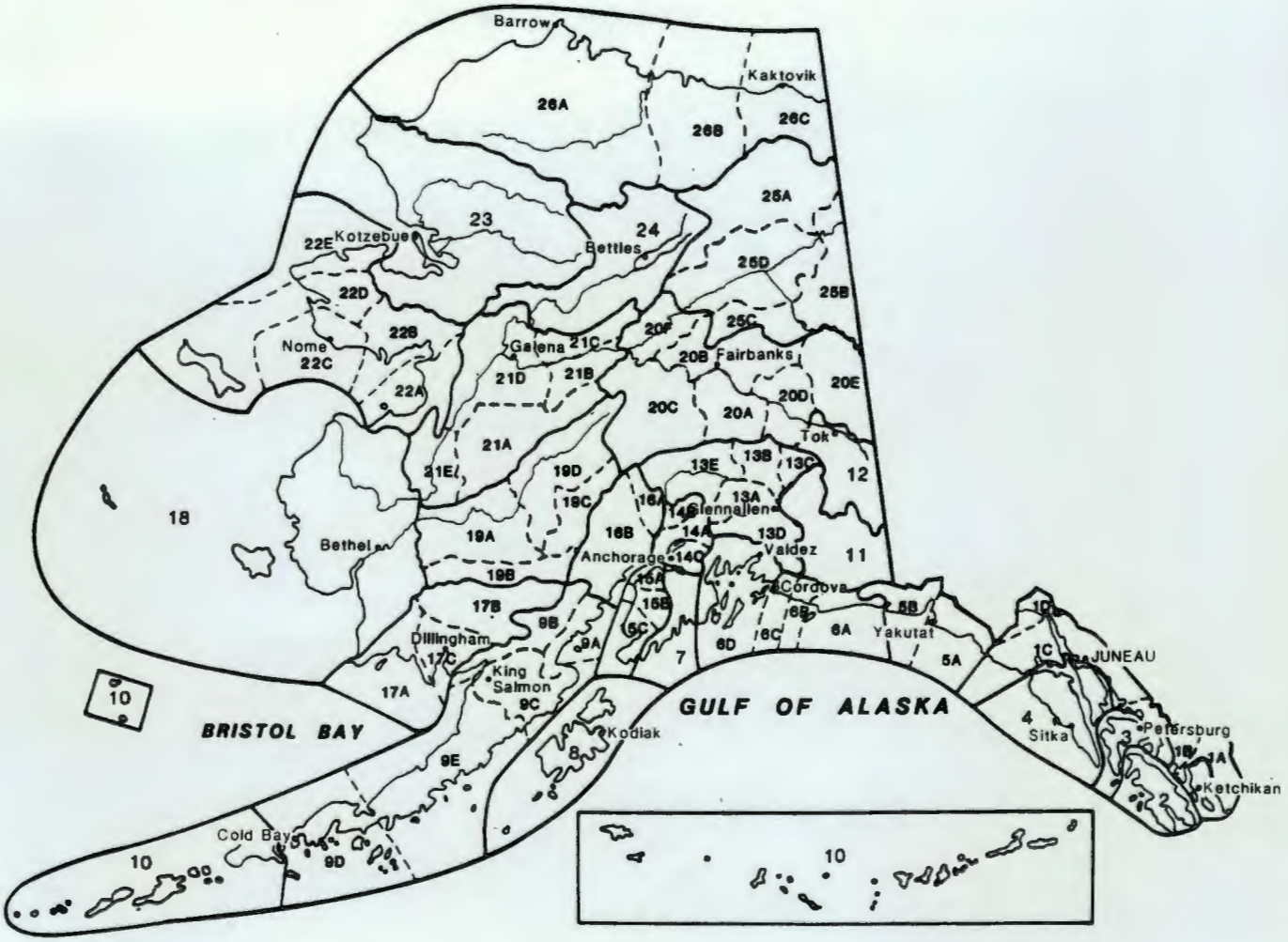
		Proportion dying (%)							
	Year	Neonatal	Wolf	Grizzly bear	Golden eagle	Coyote	Unk	Total	Capture-induced
All radiocollared calves	1995		13/43 (30)	9/43 (21)	7/43 (16)	0	0	29/43 (67)	2/45 (4)
	1996		9/50 (18)	11/50 (22)	6/50 (12)	1/50 (2)	4/50 (8)	31/50 (62)	0/50 (0)
	1997		19/73 (26)	13/73 (18)	11/73(15)	2/73 (3)	0	45/73 (62)	1/74 (1)
All calves of known-aged radiocollared cows	1995	7/31 (23)[a]	5/31 (16)	5/31 (16)	3/31 (10)		1/31 (3)	21/31 (68)	1/32 (3)
	1996	4/33 (12)	5/33 (15)	8/33 (24)	3/33 (9)		1/33 (3)	21/33 (64)	0/33 (0)
	1997	3/31 (10)	5/31 (16)	7/31 (19)	1/31 (3)	2/31 (6)	0	15/31 (48)	0

[a] Includes 1 due to breached birth where both cow and calf died.

Table 6 Proportions of discerned plant fragments in 18 fecal samples from 7 Alaskan caribou herds

Sample #	Herd	Date	Location	Percent of discerned plant fragments by plant group							
				Lichens	Mosses	Sedges	Shrubs	Equisetum	Forbs	Other	Total
104772	NAP	4/9/95	Pilot Station	38	1	9	32	18	1	1	100
104773	NAP	4/10/95	6 S King Salmon	55	2	22	17	4	0	0	100
104774	NAP	4/10/95	6 N King Salmon	48	8	35	7	2	0	0	100
104775	Mulchatna	4/12/95	Koktuli River	41	0	26	18	10	3	2	100
104776	Nelchina	4/8/96	Suslota Lake	39	14	10	32	5	0	0	100
104777	Nelchina	4/8/96	Suslota Lake	34	17	5	40	3	0	1	100
104789	Nelchina	1/10/95	Jahtamund Lake	76	4	3	10	6	0	1	100
104790	Nelchina	2/18/95	Mansfield Creek	77	2	1	1	18	0	1	100
104778	DCH	4/3/95	Kansas Creek	63	11	4	11	5	1	5	100
104779	DCH	4/3/95	Upper Delta Creek	70	11	14	5	0	0	0	100
104792	White Mtns	April 92	VABM Beaver	95	1	1	1	2	0	0	100
104793	White Mtns	April 92	Noodor Dome	82	1	4	2	2	8	1	100
104794	White Mtns	April 92	N of VABM Beaver	89	0	2	6	0	2	1	100
104795	White Mtns	April 92	VABM Duncan	84	0	2	10	0	4	0	100
104796	White Mtns	April 92	VABM Beaver	95	1	1	2	0	0	1	100
104797	Kenai Mtns	4/12/96	Kenai Mtns	89	1	5	4	0	1	0	100
104798	Kenai Mtns	4/12/96	Kenai Mtns	91	1	3	4	0	1	0	100
104799	Killey River	4/11/96	Killey River	88	1	2	8	0	1	0	100

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.

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