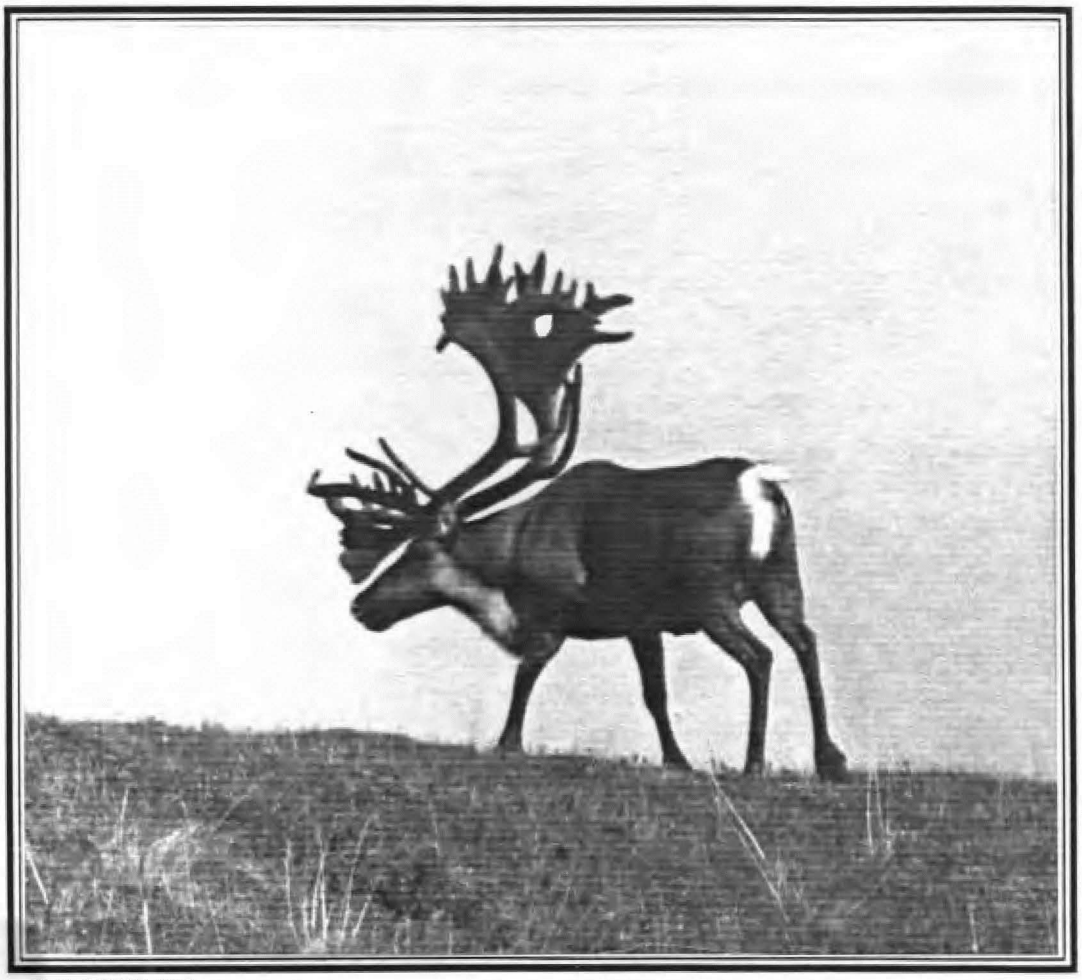
Alaska Department of Fish and Game
Division of Wildlife Conservation

Federal Aid in Wildlife Restoration
Research Progress Report
1 July 1994 - 30 June 1995

Investigation of Regulating and Limiting Factors in the Delta Caribou Herd

Patrick Valkenburg



TIM LEWIS RUE

Grant W-24-3
Study 3.37
September 1995

Alaska Department of Fish and Game
Division of Wildlife Conservation
September 1995

Investigation of Regulating and Limiting Factors in the Delta Caribou Herd

Patrick Valkenberg

Federal Aid in Wildlife Restoration
Research Progress Report
1 July 1994–30 June 1995

Grant W-24-3
Study 3.37

STATE OF ALASKA
Tony Knowles, Governor

DEPARTMENT OF FISH AND GAME
Frank Rue, Commissioner

DIVISION OF WILDLIFE CONSERVATION
Wayne L. Regelin, Director

Additional copies of this report and other Division of Wildlife Conservation publications are available from:

Publications Specialist
ADF&G, Wildlife Conservation
P.O. Box 25526
Juneau, AK 99802
(907) 465-4190

RESEARCH PROGRESS REPORT

State: Alaska

Cooperators: T Boudreau, R Eagan, R Tobey, J Woolington, C Gardner, and J Ver Hoef, ADF&G; D Klein, Alaska Cooperative Wildlife Research Unit; L Adams, National Biological Service

Project No.: W-24-3 Project Title: Wildlife Research and Management

Study No.: 3.37 Study Title: Investigation of Regulating and Limiting Factors in the Delta Caribou Herd

Period Covered: 1 July 1994-30 June 1995

SUMMARY

The recently declining Delta Caribou (*Rangifer tarandus)* Herd (DCH) stabilized between 1994 and 1995 at about 4600 caribou, primarily because the natural mortality rate of adult females declined, and calf survival improved. The natality rate of radiocollared females older than 2 years was 87% in 1995 and 7 of 11 3-year-olds were parturient. These rates are comparable with rates observed while the herd was rapidly increasing during the early 1980s.

Weights of female calves in October were significantly higher in 1995 than in 1993 or 1994, but calf weights still remained low in April 1995, suggesting that caribou calves declined in condition over the winter.

Nelchina caribou calves collected in April 1995 were in poor condition, and their mean body weight was the lowest recorded for an Interior caribou herd. In contrast, White Mountains caribou calves continued to be in excellent condition with a mean weight comparable to weights attained by Delta Herd calves during the early 1980s.

Mortality of radiocollared DCH females remained low (6% in 1994-1995 and 11% in 1993-1994). However, calf survival remained poor, even after calves were 4 months old. From 1 October 1993 to 30 September 1994, 9 of 23 (39%) radiocollared calves died, and from 1 October 1994 to 31 July 1995, 5 of 15 calves died. Most calf deaths were from wolf predation.

Of 45 newborn calves collared in late May 1995, 30 were dead by 31 July. Wolves killed 12, grizzly bears 9, golden eagles 7, and 2 were not reunited with their dams and were killed by predators. Although a wolf control program reduced the 1993-1994 wolf population from 267 to about 100, calf survival to early October 1994 increased less than

expected. In 1994-1995 wolf numbers were reduced from 180 to 114, but summer calf mortality from wolf predation continued to be high.

During winter 1994-1995 all but 2 of 65 collared caribou remained within Unit 20A. During summer 1995 1 of these (a 2-year-old) remained in the Chulitna Mountains, southeast of Cantwell.

Key words: caribou, Delta Herd, Denali Herd, mortality, natality, Nelchina Herd, nutrition, predation, *Rangifer tarandus*, weather, wolf.

CONTENTS

BACKGROUND

A continuing long-term population dynamics study of the Delta Caribou (*Rangifer tarandus*) Herd (DCH) began in 1979. Results of the first 11 years of research were presented in 8 progress reports, 2 final reports (each covering 5 years) (Davis and Valkenburg 1985, Davis et al. 1991), and numerous scientific papers (see Davis et al. 1991). 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. (1993).

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 Delta Caribou Herd 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 expanded 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.

STUDY OBJECTIVES

To 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 from 1991 to 1995 annually.
- Determine the annual natality rate and timing of calving in the DCH.
- Determine recruitment from annual fall and spring composition counts.
- Monitor harvest annually.
- Collar male and female calves in fall to assess the accuracy of April composition counts and timing of mortalities.
- Determine weight and size of calves in April to determine the 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.
- Collar 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-age females.

METHODS

We censused the DCH on 20 June 1995 using 4 aircraft equipped with radiotracking gear. We visually searched areas which were likely to contain aggregations, and located all radiocollared caribou except for 1 that was inadvertently deleted from receivers early in the day and 1 known to be outside the range of the DCH. We photographed all groups larger than 100 caribou with a Zeiss RMK-A, 9x9 inch camera mounted in a DeHavilland

Beaver. Smaller groups were either counted directly or photographed with 35 mm cameras and Kodak Ektar 100 color print film.

To evaluate the influence of intensive management (i.e., wolf control) on calf survival, we greatly expanded fieldwork during calving in 1995. On 10 May we located all radiocollared cows known to be active in the DCH and determined their distribution and breeding status. Beginning on 14 May all females that were judged to be pregnant were observed daily, except on 21 May, which was foggy. All observed calves (26) were collared within 3 days of birth, except for 1 that was already too old to catch on 14 May. In addition, 20 calves of uncollared cows were collared from 14 to 30 May to increase the sample of collared calves. Standard expandable/drop-off radiocollars (Telonics, Inc., Mesa, Ariz.) with mortality sensors (1 hour delay) were placed on calves and the calves were weighed and released. All collared calves were subsequently observed either the same day or the following day to determine whether they reunited with their mothers. We monitored all calves daily until 5 June, and then biweekly through 31 July. We investigated mortalities to determine cause of death by flying to the site in a Robinson R-22 helicopter the day they were found from 19 May to 5 June or the following day from 6 June through 31 July. Radiocollared caribou that had not appeared pregnant on 10 May were rechecked between 19 May and 27 May to confirm their breeding status. On 2 June we classified caribou on the calving areas of the DCH to independently measure early calf survival.

On 3-4 October and 6 October 1994, we used the Robinson R-22 helicopter to classify 2131 caribou (over 50% of the herd) throughout the range of the DCH to determine recruitment and sex/age ratios. Results were weighted proportionally according to the distribution of radiocollared caribou. Caribou were classified into 5 categories: large, medium, and small bulls, cows, and calves.

The caribou hunting season has been closed in Unit 20A since 15 September 1991. A winter hunt for caribou occurred in Unit 13 beginning on 1 January 1995, and 1 radiocollared Delta caribou moved into this area in late December. We estimated the number of DCH caribou taken in this hunt based on the number of DCH caribou:radiocollared DCH caribou and the number of caribou counted in Unit 13E on 15 January. We censused caribou in Unit 13E by locating caribou tracks in new snow and directly counting the caribou found.

We captured, weighed, measured, and radiocollared 15 female calves in fall 1994 (14-23 October) and replaced 7 3-5-year-old collars on adult females to preclude battery failure. On 3 April 1995 we captured, measured, and weighed 15 additional calves and collared 2 of them to maintain a sample of 15 collared calves in the 1994 cohort in the DCH. In addition to determining the condition of calves in the Delta Herd, we also had the opportunity to weigh, measure, and determine the condition and fatness of calves in the low density Ray Mountains, Wolf Mountain, and Galena Mountain herds in October. In addition, we sampled calf weight in the high density Nelchina, Northern Peninsula, and Mulchatna herds in early April. In the Nelchina Herd, we collared 15 10-month-old females and collected 15 caribou; edible meat from collected caribou was distributed in Tok. Twenty female calves were collared in the Northern Alaska Peninsula Herd in mid

April, and 10 female calves were collected from the Mulchatna Herd on 12 April. In addition, 5 female calves were collected from the newly introduced Nushagak Peninsula Herd west of Dillingham, and 10 female calves were collared. Meat from the Nushagak collection was distributed in Manakotak, and meat from the Mulchatna collection was distributed in Port Allsworth.

We continued to analyze weather data in an ongoing effort to determine the effect of variations in summer and winter weather patterns on the DCH. Results of these analyses will be presented in a final report due in 1996. A manuscript (Boertje et al., in press) which reviews the effect of weather and other factors on caribou, moose, and wolves in Unit 20A through 1994 was accepted for publication.

Preliminary results of a project to determine the effects of sunny versus cloudy summers were presented in poster papers at the 6th North American Caribou Workshop in Prince George, BC (Klein and Valkenburg et al., in press), and at the Second International Northern Ungulate Conference in Fairbanks in August 1995. Three cooperating graduate students at the University of Alaska, Department of Biology and Wildlife are in their second year of fieldwork on projects relating to the influence of weather, insect harassment, and microclimate on caribou nutrition.

We continued to collect fecal samples from caribou winter ranges in Interior Alaska and from the Alaska Peninsula and Mulchatna herds. Collection efforts will continue and results will be presented in the final report.

From late September 1994 to late September 1995, we located radiocollared adult caribou monthly to determine herd movements, distribution, and mortality rates. Mortality rates of collared caribou were calculated by dividing the number of radiocollared caribou dying during 1 October through 30 September by the number alive in early October.

RESULTS AND DISCUSSION

1995 CENSUS

We counted 4646 caribou during the photocensus of the DCH on 20 June (Table 1). All but 2 radiocollared caribou were found. One of these was inadvertently not monitored, and the other was a 2-year-old that had spent the calving period in the Chulitna Mountains southeast of Cantwell. Four of 5 2-year-old males were found alone in the northeastern portion of the range outside the area included in the census. As usual, many bulls were present in the Mystic Creek drainage. One collared Nelchina caribou that had spent the latter part of the winter in Revine Creek in the lower Yanert River drainage was located on the calving grounds of the Nelchina Herd. There was no evidence that caribou from other herds were present within the range of the Delta Herd during the census.

NATALITY RATE OF THE DCH IN 1995

The 1995 natality rate of radiocollared DCH females $\geq$ 3 years of age was significantly greater than in 1990, 1991, 1993, and 1994, and similar to 1992 ($x^2 = 7.71$, $p < 0.01$)

(Table 2). None of 7 2-year-old females, and 7 of 11 3-year-olds were parturient in late May. However, in comparison to 1994, the increased natality rate in 1995 affected mainly young females, which are rare in the herd. Thus, the absolute number of calves born in the DCH in 1995 was probably similar to 1994.

1994 Fall Composition Count

Calf survival to fall improved considerably and the calf:100 cow ratio was the highest in the DCH since 1989 (Table 3). Weather was unseasonably warm during the counts, and many bulls were not with cow/calf groups. Thus, bulls may have been underrepresented.

Weight and Size of Calves

In the DCH the mean weight of 4-month-old female calves in October was significantly greater ($t = 2.72$, d.f. = 41, $p < 0.05$) than during the past 2 years (Table 4). However, the mean weight of a sample of 10-month-old calves weighed in April continued to be low and similar to previous years (Table 5).

Since 1979, in conjunction with work on the Western Arctic and Interior caribou herds, we have calculated mean weights of 43 samples of female caribou calves from 12 different herds (Table 6). Calf weights varied from 71.5 lbs in the Western Arctic Herd to 143.4 lbs in the Galena Mountain Herd. Of particular interest at the present time are weights from Nelchina caribou calves, which have declined by over 20 lbs during the last 3 years, suggesting severe nutritional stress. Whether nutrition is poor due to short-term changes in weather or a longer term response to high caribou density remains uncertain. Beginning in 1995 we plan to monitor weight and condition of calves in fall in the Nelchina Herd. Data from April 1995 collections in other herds appear in Tables 7 and 8.

Weather

Weather data are being analyzed and will be presented in the final report and in a manuscript submitted to the *Journal of Wildlife Management*. In general, the 1994 growing season appeared normal, with no early freezes or snows, but November was very cold with higher than normal snow. After 1 January 1995, south winds in the Alaska Range and lack of snow created ideal grazing conditions for caribou and sheep. Spring 1995 came early, and new green vegetation (i.e., *Eriophorum* flowers) was available to caribou by about 25 April.

Food Habits of the DCH and Other Interior Herds

We continued to collect fecal samples from Interior herds and from the Northern Alaska Peninsula and Mulchatna herds. These samples will be analyzed and presented in the final report.

Mortality of Radiocollared Caribou

Mortality of radiocollared adult female DCH caribou continued to decrease and was only about one-third to half the levels observed in 1991-1992 and 1992-1993 (Table 9).

Although the reduction in adult mortality coincided with the wolf control program initiated in fall 1993, mortality of adult caribou also declined in the adjacent Denali Herd where wolf control did not occur (Adams, pers commun). Wolves declined in both areas during 1993 from natural causes in the range of the Denali Herd and from wolf control in the range of the Delta Herd. In contrast to adult mortality, calf mortality remained at high levels. Of 23 DCH calves collared in October 1993, 9 died (39%) through 30 September 1994; 4 were killed by wolves during winter, 3 were killed by wolves during summer, 1 was illegally killed by humans in August, and 1 died of unknown causes during March. The following year 5 of 15 died through 31 July 1995; 1 was killed by wolves in winter, 2 were killed by wolves in May, 1 was killed by a wolf or bear in July, and 1 was killed by an unknown predator in December.

Of the 4 radiocollared adults that died in 1993-1994, 1 was killed by a wolf during winter, and 3 died of unknown causes during summer. In 1994-1995, 2 radiocollared adults were killed by wolves during winter, 1 died as a result of a breached birth in May, and a yearling was killed by a grizzly bear in May.

EFFECTS OF WOLF CONTROL ON THE DELTA HERD

The wolf control program that began in October 1993 was suspended in early December 1994 before wolves could be reduced to the goal of 75 wolves remaining in Unit 20A prior to caribou calving. There were approximately 267 wolves in the precontrol population in fall 1993 and about 180 in fall 1994. After control in winter 1993-1994 there were about 100 wolves remaining, and after control in 1994-1995 there were about 114.

A pack of 13 wolves was present on the portion of the DCH calving area of upper Wells Creek in Unit 13E in fall 1994. They were subsequently reduced to 11 during winter 1994-1995. Two of these wolves were collared at the end of the calving period in late May 1995 in Wells Creek. These collared wolves were followed daily in conjunction with collared caribou calves until caribou left the Wells Creek calving area at the end of the first week of June.

Another pack of 11 wolves resided in the Yanert drainage. Four of these wolves were collared, and they were located every few days during calving. In addition, a pair residing in upper Dick Creek and upper Wood River were also collared. These 3 packs totaling 24 individuals were the only known wolves preying on DCH calves until the caribou herd left the calving area and moved to postcalving ranges on the north side of the Alaska Range about 10 June.

The Wells Creek pack was not seen on the calving area until 31 May, and there was no evidence of wolf predation on caribou calves until 20 May—about a week after calving began. This observation is similar to that of Adams et al. (1995), who found that wolf predation commences near the peak of calving and peaks about a week later. Members of the Yanert pack also hunted caribou calves, as did the pair in upper Dick Creek.

Despite reduction of the wolf population in Unit 20A from about 267 wolves in fall 1993 to about 100 wolves in April 1994, the survival of DCH calves increased only slightly to 23:100 cows in early October 1994. In the adjacent Denali Herd where wolves were not controlled, the calf:cow ratio was similar (20:100). However, wolves declined naturally in the Denali Herd's range, probably due to lack of food (Adams et al. 1995). Because the wolf control program was conducted primarily by trapping and snaring, key adult members of packs were not removed (ADF&G files) and 11 packs still remained on the caribou summer range. Comparing early June and early October calf:100 cows ratios, we concluded that many calves died during mid to late summer in 1994. In 1995 the calf:100 cow ratio on 2 June was 49:100 compared with 63:100 on 2 June 1994, indicating that early calf mortality may have been more severe in 1995.

CALF MORTALITY STUDY

Of 45 caribou calves collared from 14 to 31 May 1995, only 15 were surviving on 1 August. Of the 30 that died, 12 were killed by wolves, 9 by grizzly bears, 7 by eagles, and 2 probably did not reunite with their mothers and were subsequently killed by a bear and a small predator. Two deaths ascribed to eagles could actually have been caused by collared wolves known to be in the vicinity.

MOVEMENTS AND DISTRIBUTION OF DCH CARIBOU AND HARVEST

During winter 1994-1995, 2 of 65 radiocollared DCH caribou moved out of Unit 20A. One 3-year-old wintered in the vicinity of Jarvis Creek south of Delta Junction. A yearling wintered in the Chulitna Mountains southeast of Cantwell, where 2282 caribou were counted on 15 January. Only 1 radiocollared Nelchina caribou was present. Most of the 2282 caribou were probably from a small herd that calves on the upper Susitna River and mixes with the Nelchina Herd during summer and winter. Little is known of this herd but all previous surveys have located about 2000-2500 caribou in summer. The winter caribou season in Unit 13E was closed by emergency order in February after about 510 caribou were taken; we assume that very few (< 15) were from the DCH. During January the 1 radiocollared Nelchina caribou moved north into Revine Creek and wintered there. In May this collared caribou moved east to the Susitna River and then south to the Nelchina calving area.

About half of the radiocollared DCH caribou wintered in the Wood River drainage from Cody Creek north to Mystic Mountain. Other wintering areas included the lower Yanert valley and the 100-mile Creek area of eastern Unit 20A. Very few caribou were present on the Tanana Flats. Unseasonably warm weather in April hastened snowmelt, and new *Eriophorum* flowers were available to caribou about 25 April. Leafout in Fairbanks was very early (about 30 April).

In early May caribou from the Yanert and Wood River wintering areas moved northeast to Delta Creek, and then southwest to the upper Wood River and Wells Creek. The weather remained unseasonably warm until about 20 May, when 3 to 6 inches of snow fell. At least two-thirds of DCH calves were born in Wells Creek and most of the rest were born in

Dick Creek and the upper Wood River. Most caribou had left Wells Creek by 10 June and returned to the north side of the Alaska Range. Most caribou spent summer in upper Gold King Creek, the upper Tatalanika and the Gold King benches. An easterly movement began during the last week of July. Caribou remained aggregated until about 28 July when a cold front arrived.

ACKNOWLEDGMENTS

We thank D Reed and K Whitten for editorial assistance, and B Scotton, K Taylor, M Keech, and D Reed for help with fieldwork.

LITERATURE CITED

Adams LG, BW Dale, and LD Mech. 1995. Wolf predation on caribou calves in Denali National Park, Alaska. Pages *in* LN Carbyn, SH Fritts, DR Seip, eds. Ecology and conservation of wolves in a changing world. Can Circumpolar Inst, Univ Alberta, Edmonton. In Press.

Boertje RD, P Valkenburg, and ME McNay. In Press. Long-term increases in moose, caribou, and wolves associated with temporary wolf control in Interior Alaska, 1975-94. *J Wildl Manage*.

Davis JL and P Valkenburg. 1985. Demography of the Delta caribou herd under varying rates of natural mortality or harvest by humans. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj W-21-2, W-22-1, W-22-2, W-22-3, and W-22-4. Juneau. 50pp.

_____, _____, ME McNay, RM Beasley, and VL Tutterrow. 1991. Demography of the Delta caribou herd under varying rates of natural mortality and human harvest and assessment of field techniques for acquiring demographic data. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj W-22-5, W-23-1, W-23-2, and W-23-3. Juneau. 112pp.

Prepared by:

Patrick Valkenburg
Wildlife Biologist III

Submitted by:

Kenneth R. Whitten
Acting Research Coordinator

Approved by:

Wayne L. Regelin, Director
Division of Wildlife Conservation

Steven R. Peterson, Senior Staff Biologist
Division of Wildlife Conservation

Table 1 Distribution of radiocollars and size of groups seen during the photocensus of the Delta Herd, 1995

Group No.	9x9 Frame No.	Count	Number of radios	Location
1	205	473	6	Mystic Creek
2	207, 208	191	5	Mystic Creek
3	210, 212	470	8	Mystic Creek
4/5	217	246	4	Mystic Creek
6	218	54	0	Mystic Creek
12	220, 221	604	7	Dry Creek
13	223	109	1	Dry Creek
14	--	60	1	West Fork Little Delta
16	226	309	9	McIntyre Creek
17	228	328	6	West Fork Little Delta
18	230, 231	207		Yanert River
19	233, 234	189	5	Yanert River
20	236	20		Yanert River
21	238	121	2	Yanert River
JB 1,2	35 mm	67	2	Nenana Glacier
JB 3	35 mm	42	0	Nenana Glacier
KT 1,2	35 mm	76	3	North of Mystic Creek
	SUBTOTAL		59	
Other small groups visually counted		1078	20	All areas
TOTAL		4646	79[a]	

[a] There were 81 active radiocollars during the census; 1 was not monitored, and 1 was known to be on a 2-year-old female in the Chulitna Mountains southeast of Cantwell.

Table 2 Late May natality rates of radiocollared Delta Herd caribou, 1984-1995

	Percent parturient (proportion)	
Year	≥ 36 months old	≥ 48 months old
1984	90 (28/31)	92 (22/24)
1985	93 (38/41)	94 (29/31)
1986	83 (33/40)	77 (24/31)
1987[a]		89 (25/28)
1988	88 (28/32)	90 (27/30)
1989	83 (25/30)	92 (22/24)
1990	72 (28/39)	76 (22/29)
1991	71 (25/35)	79 (22/28)
1992[a]		96 (27/28)
1993	30 (7/23)	39 (7/18)
1994	66 (20/30)	86 (18/21)
1995	87 (33/38)	96 (26/27)

[a] No 3-year-olds in the sample of radiocollared cows.

Table 3 Fall composition counts in the Delta Caribou Herd, 1970-1994

Survey date	Bulls:100 cows	Calves:100 cows	Calves %	Cows %	Small bulls % of bulls	Medium bulls % of bulls	Large bulls % of bulls	Total bulls %	Composition sample size
10/21-23/70[a]	77	34	14	43	--	--	--	33	896
10/29-31/71[a]	29	15	10	65	--	--	--	19	1139
10/27-31/72[a]	33	11	7	67	--	--	--	22	1185
10/23-24/73[a]	29	10	7	70	--	--	--	20	1050
10/23-25/74[a]	28	2	1	76	--	--	--	21	1141
10/29-31/76[a,b]	38	45	24	54	--	--	--	21	1055
10/26-31/77[a]	33	42	23	55	--	--	--	18	1365
10/26/78	75	39	17	45	--	--	--	33	725
12/7/79	39	65	32	49	--	--	--	19	361
10/25/80	85	49	21	43	--	--	--	36	1369
10/2/81	46	41	22	53	47	3	50	25	1451
10/8/82[c]	42	31	18	58	48	4	48	24	1565
10/4/83	35	46	25	55	59	6	36	20	1208
10/17/84	42	36	20	56	28	32	40	24	1093
10/9-12/85	49	36	20	54	57	24	19	26	1164
10/22/86	41	29	17	59	49	30	21	24	1934
10/05/87	32	31	19	61	53	23	24	20	1682
10/14/88	33	35	21	60	50	38	12	20	3003
10/10/89	27	36	22	62	64	28	7	16	1965
10/4/90	38	17	11	65	45	39	16	24	2411
10/1/91	29	8	6	73	55	29	16	21	1705
9/28/92	25	11	8	74	46	43	11	19	1240
9/25/93[d,e]	35	6	3	73	43	30	26	24	1525
10/3-4,6/94[d,e]	25	23	16	68	33	29	39	17	2131

Table 3 Continued

[a] Indicates ratios may not be comparable because yearlings were classified in this count.
[b] Wolf control began in 1975.
[c] Wolf control ended in 1982.
[d] Weighted according to distribution of radiocollars.
[e] Wolf control was conducted during 1993-1994 and in fall 1994.

Table 4 Weights (pounds) of female Delta Caribou Herd caribou calves, fall 1991-1993

	Year			
	1991	1992	1993	1994
	152	139	138	152
	137	138	136	142
	135	137	136	142
	134	127	134	141
	133	124	127	139
	128	121	125	138
	124	117	124	137
	124	116	122	132
	124	116	122	130
	123	114	118	127
	121	113	115	124
	118	111	113	117
	118	110	105	117
	116	102	98	117
				115
Mean	127.6	120.4	122.4	131.4
SE	2.6	2.9	3.2	3.0
n	14	14	14	15

Table 5 Mean weight of 10-month-old Delta Caribou Herd calves and fall calf:cow ratio, 1979-1995

Year	Mean weight of calves in April (lb) (kg, *n*)	Calves:100 cows in early October (number of cows counted)
1979	132.3 (60.0, 11)	65 (176)
1981	137.0 (62.1, 5)	41 (776)
1982	135.1 (61.3, 11)	29 (908)
1983	137.2 (62.2, 13)	41 (666)
1984	126.9 (57.5, 14)	36 (612)
1987	120.8 (54.8, 9)	36 (1026)
1988	131.3 (59.6, 12)	35 (1801)
1989	133.6 (60.6, 9)	36 (1213)
1990	119.9 (54.4, 9)	17 (1567)
1991	113.1 (51.3, 9)	8 (1237)
1992	119.1 (54.0, 17)	11 (1240)
1993	122.3 (55.5, 12)	6 (1109)
1994[a]		23 (1433)
1995	123.1 (55.8, 15)	na

[a] There were too few female calves in the herd to obtain a sample of weights.

Table 6 Ranked mean weight, standard error, and sample size of 43 cohorts of female caribou calves from 8 Alaskan herds, 1979-1995

Herd	Year of sample	Season	Mean weight	Standard error	Sample size
Western Arctic	1994	Fall	71.5	2.8	15
Western Arctic	1993	Spring	82.1	2.2	14
Western Arctic	1992	Spring	87.0	2.0	16
Western Arctic	1994	Spring	88.3	2.8	15
Western Arctic	1992	Fall	89.2	4.1	13
Nelchina	1995	Spring	105.0	1.9	29
Macomb	1990	Fall	107.3	2.6	12
Nelchina	1994	Spring	107.8	4.2	11
Nelchina	1992	Spring	109.4	7.2	8
Mulchatna	1995	Spring	110.6	3.0	10
Chisana	1990	Fall	112.6	3.8	14
Delta	1991	Spring	113.1	2.9	10
N Alaska Peninsula	1995	Spring	113.3	3.0	19
Fortymile	1990	Fall	116.3	2.5	14
Nelchina	1993	Spring	118.0	3.3	11
Macomb	1994	Fall	118.8	3.1	10
Fortymile	1991	Fall	118.9	3.0	14
Delta	1992	Spring	119.1	2.6	17
Delta	1990	Spring	119.9	3.3	12
Fortymile	1994	Fall	120.0	2.7	14
Delta	1992	Fall	120.4	3.0	14
Delta	1987	Spring	120.8	2.8	9
Fortymile	1992	Fall	121.5	3.7	14
Delta	1993	Spring	122.3	2.9	12
Delta	1993	Fall	122.9	3.0	11
Delta	1995	Spring	123.1	2.7	15
Fortymile	1993	Fall	123.7	1.9	15
Nelchina	1992	Spring	124.4	2.7	9
Nelchina	1993	Spring	125.7	4.0	7
Nushagak	1995	Spring	125.8	2.9	15
Delta	1984	Spring	126.9	1.9	14
Delta	1991	Fall	127.6	2.6	14
White Mtns	1995	Spring	130.1	3.0	8
White Mtns	1991	Fall	131.1	4.7	9
Delta	1988	Spring	131.3	2.9	12

Table 6 Continued

Herd	Year of sample	Season	Mean weight	Standard error	Sample size
Delta	1994	Fall	131.4	3.0	15
Delta	1979	Spring	132.3	2.4	11
Delta	1989	Spring	133.6	2.7	9
Ray Mtns	1994	Fall	134.4	3.8	20
Delta	1982	Spring	135.1	3.9	11
Delta	1981	Spring	137.0	7.4	5
Delta	1983	Spring	137.2	3.3	13
Galena Mtn	1994	Fall	143.4	3.2	9

Table 7 Mean weights and measurements of calves handled alive or collected during April 1995

Herd	Weight	Neck	Total l.	Girth	Metatarsus	Hindfoot	Jaw
Nelchina	105.0 (1.9, 29)[a]	35.3 (0.5, 29)	159.8 (1.3, 29)	92.2 (0.8, 29)	36.7 (0.2, 29)	53.4 (0.3, 29)	22.6 (0.1, 29)
Delta	123.1 (2.7, 15)	39.1 (0.6, 15)	169.5 (1.2, 15)	96.1 (0.9, 15)	37.2 (0.2, 14)	54.2 (0.2, 15)	23.3 (0.1, 14)
White Mtns	130.1 (3.0, 8)	40.4 (0.8, 8)	172.5 (1.7, 8)	98.5 (1.3, 8)	40.1 (2.6, 8)	56.8 (0.8, 8)	24.4 (0.2, 8)
Mulchatna	110.6 (3.0, 10)	36.8 (0.8, 9)	156.0 (2.1, 10)	93.9 (1.5, 10)	36.9 (0.3, 10)	52.4 (0.3, 10)	22.4 (0.2, 10)
Northern Peninsula	113.3 (3.0, 19)	37.0 (0.6, 19)	161.1 (2.1, 19)	92.6 (1.1, 19)	35.8 (0.3, 19)	51.9 (0.5, 19)	22.5 (0.2, 19)
Nushagak Peninsula	125.8 (2.9, 15)	39.9 (0.8, 15)	167.5 (2.7, 15)	98.3 (0.9, 15)	36.9 (0.3, 15)	52.3 (0.4, 15)	23.4 (0.2, 15)

[a] Number in parentheses are standard error, followed by sample size.

Table 8 Supplemental data from collected animals

Herd	Percent mandible fat	Percent femur fat	Number of warbles	Gutted weight (lbs)
Nelchina	27.3 (3.0, 15)	39.9 (5.6, 15)	116 (24, 15)	71.7 (1.9, 15)
Mulchatna	53.5 (4.2, 10)	76.3 (3.2, 10)	108 (20, 10)	75.8 (2.3, 10)
Nushagak Peninsula	49.4 (1.0, 5)	78.8 (2.1, 5)	295 (41, 5)	88.3 (7.0, 5)

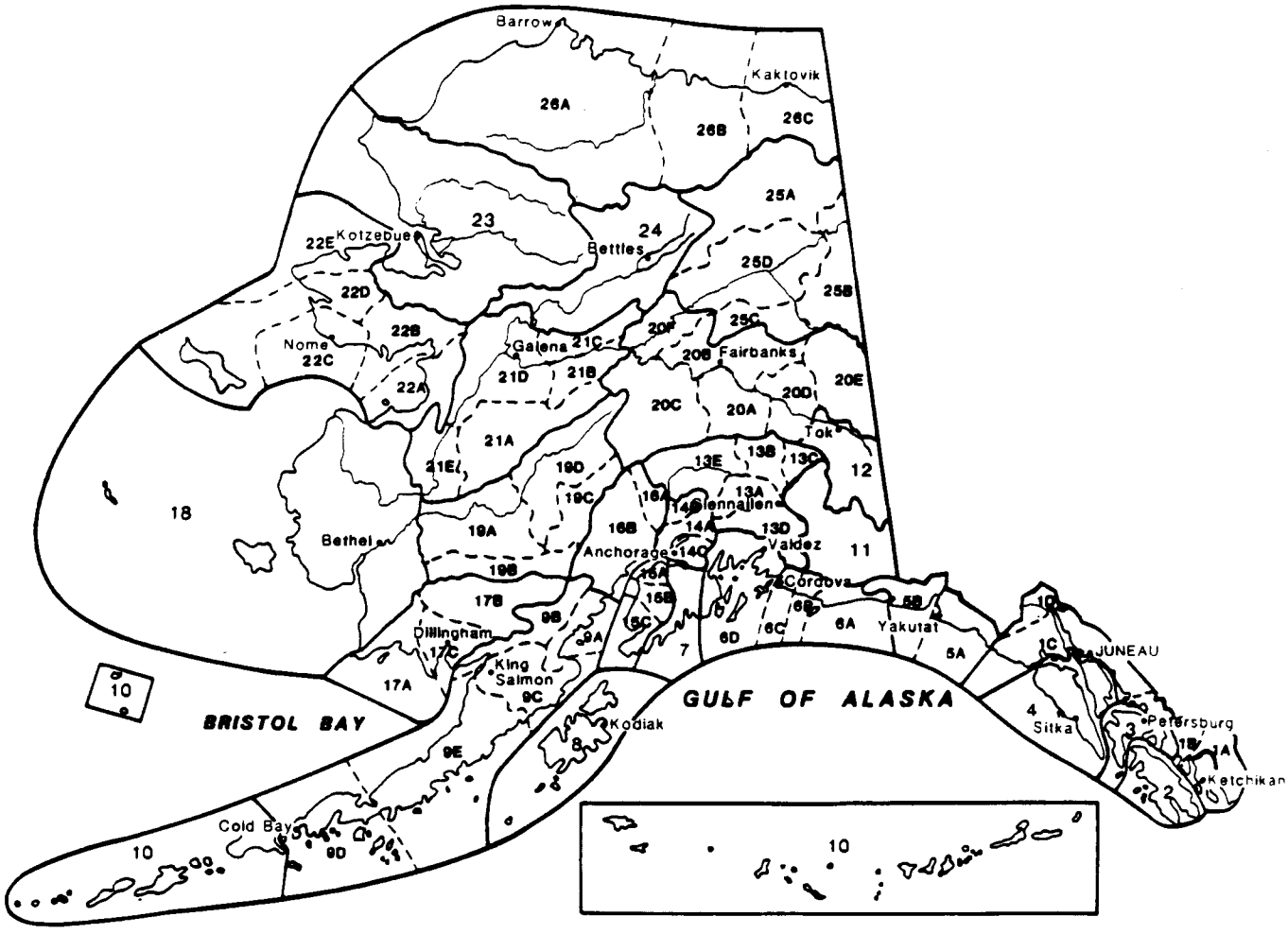
[a] Numbers in parentheses are standard error, followed by sample size.

Table 9 Annual total mortality rates of radiocollared female caribou older than 16 months

Year[a]	Number on the air	Number dying	Percent mortality
1979-1980	11	0	0
1980-1981	29	0	0
1981-1982	39	0	0
1982-1983	47	3	7
1983-1984	55	2	4
1984-1985	50	2	4
1985-1986	48	9	22
1986-1987	39	4	10
1987-1988	43	4	10
1988-1989	46	7	15
1989-1990	48	5	11
1990-1991	40	6	15
1991-1992	40	9	23
1992-1993	30	6	20
1993-1994[b]	47	4	9[b]
1994-1995	63	4	6[c]

[a] 1 October to 30 September.
[b] Revised from previous report
[c] 1 October 1993 to 31 July 1994.

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.

TIM LEWIS RUE