Caribou
Management Report
of survey-inventory activities
1 July 1998–30 June 2000

Carole Healy, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation
December 2001

Please note that population and harvest data in this report are estimates and may be refined at a later date.

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If used in part, the reference would include the author's name, unit number, and page numbers. Authors' names can be found at the end of each unit section.

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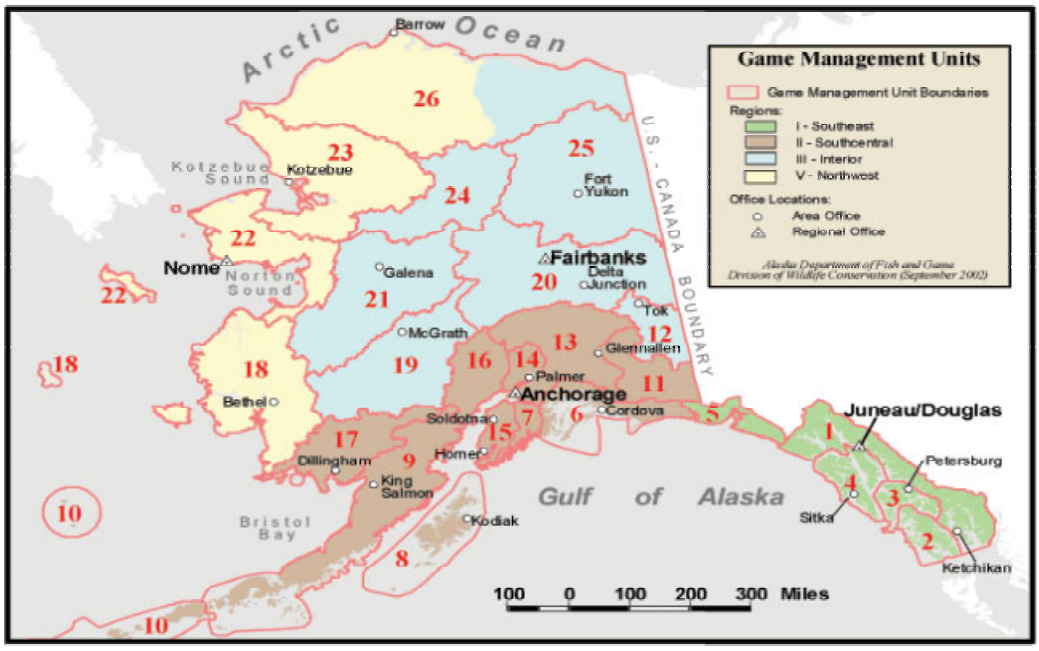
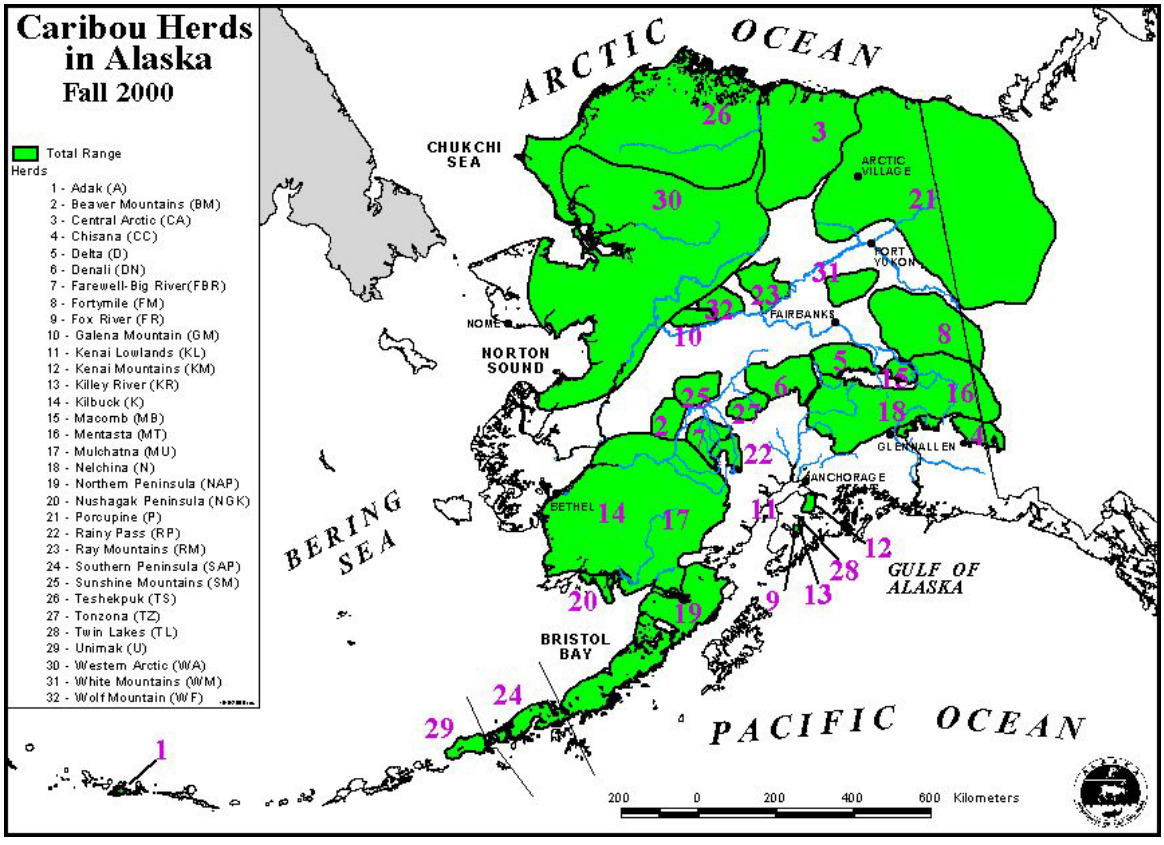
Alaska's Game Management Units



Caribou Herds in Alaska



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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 25A, 25B, 25D, and 26C (59,400 mi^2)

HERD: Porcupine

GEOGRAPHIC DESCRIPTION: Eastern portions of the Arctic Slope, Brooks Range, and northeastern Interior Alaska

BACKGROUND

The Porcupine caribou herd (PCH) migrates between Alaska and the Yukon and Northwest Territories in Canada. Most of the herd's 130,000-mi^2 range is remote, roadless wilderness. The PCH typically calves on the coastal plain of the Arctic National Wildlife Refuge (ANWR), which is also the most promising onshore petroleum prospect in the United States (Clough et al. 1987). Both industry and government have an interest in developing potential oil resources on the coastal plain. Therefore, various state and federal agencies and their Canadian counterparts are cooperating in baseline ecological studies of the PCH. These studies are expected to provide the basis for mitigation of any adverse effects of petroleum development on caribou.

In 1987 the United States and Canada established the International Porcupine Caribou Board to coordinate management and research among government and user groups. The board includes a representative of ADF&G, representatives of the governments of the United States, Canada, Yukon and Northwest Territories, and members from communities and Native organizations from Alaska and Canada. Managing the herd to provide for a variety of uses is impacted by variety of factors, including board recommendations, biological studies, and Congressional actions regarding the opening of ANWR to petroleum development.

The PCH remained more stable than other Alaskan herds during the 1960s and 1970s at about 100,000 caribou (Table 1). In 1979 the population began a steady increase and reached 178,000 caribou by 1989. Annual rates of growth averaged about 5% from 1979 to 1989. The PCH then decreased to 160,000 caribou in 1992, probably in response to lower yearling recruitment after harsh winters. The herd continued to decline to an estimated 129,000 animals in 1998 and 123,000 in 2002, probably due to increased adult mortality (Arthur et al., in press).

MANAGEMENT DIRECTION

Prior to the early 1970s, the PCH was a low priority for management and research because of its remote location and the small number of people who harvested PCH caribou. However, increasing pressure for oil development in northeast Alaska and growing international interest in the herd resulted in a higher management priority and heightened attention from biologists (Garner and Reynolds 1986; Griffith et al. 2002).

MANAGEMENT GOALS

The following goals, proposed by the International Porcupine Caribou Board (International Porcupine Caribou Board 1998:Appendix 1), were used to guide management activities during recent years.

- Conserve the PCH and its habitat through international cooperation and coordination so the risk of irreversible damage or long-term adverse effects as a result of the use of caribou or their habitat is minimized.
- Ensure opportunities for customary and traditional uses of the PCH.
- Enable users of the PCH to participate in international efforts to conserve the PCH and its habitat.
- Encourage cooperation and communication among governments, users of the PCH, and others to achieve these objectives.

MANAGEMENT OBJECTIVES

To accomplish goals, ADF&G established the following management objectives:

- Maintain a minimum population of 135,000 caribou.
- Monitor the harvest through field observations, hunter reports, and contact with residents.
- Conduct censuses and sex and age composition counts.

METHODS

Personnel from ADF&G, ANWR, and Yukon Renewable Resources Department (YRRD) cooperate to estimate population size with aerial photocensuses conducted at intervals of 2–3 years, using methods described in previous reports (Davis et al. 1979, Valkenburg et al. 1985, Whitten 1993*a*). However, the photocensus planned for 2000 was precluded by weather. Instead, the census was conducted on 3 July 2002. At this time the PCH was loosely aggregated on the arctic coastal plain between the Kongakut and Jago Rivers, with most of the herd located near the Aichilik River. Movements, productivity, mortality, and seasonal distribution of the herd were also monitored, primarily through periodic relocation of radiocollared caribou (Fancy and Whitten 1991, Whitten 1993*b*, 1995*a*). Calf production and survival were assessed by

monitoring radiocollared cows during June (Whitten et al. 1992). In addition, personnel from YRRD conducted composition counts on the PCH winter range during March of each year.

Harvest tickets submitted by nonlocal hunters (Alaskans residing outside Units 25, 26B and 26C) provided most data on harvest in this region in Alaska. The department's Division of Subsistence staff gathered additional data on harvest by local hunters through field interviews. Canadian harvest and composition data were obtained from YRRD. Harvest data were summarized by regulatory year (RY = 1 Jul–30 Jun; e.g., RY99 = 1 Jul 1999 through 30 Jun 2000).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Personnel from ADF&G, US Fish and Wildlife Service (FWS), YRRD, and Canadian Wildlife Service counted 127,944 caribou on aerial photographs taken in late June and early July 1998. An additional 412 caribou were seen in small groups, but were not photographed. The total count was 128,356. Because some small groups of caribou may have been missed, herd size was estimated to be about 129,000 (Table 1). The photographs taken on 3 July 2001 produced a total count of 120,368 plus 2684 caribou that were not photographed, for a total estimate of 123,052 caribou. During a previous survey in July 1994, we estimated the herd at 152,000 caribou. The highest population ever recorded was 178,000 during 1989. These results indicate the herd declined by 3–4% per year from 1989 to 1998, and 1.5% per year from 1998 to 2001. Although these censuses may have slightly underestimated the population, all censuses used similar methods and it is unlikely that census errors account for the decline that has occurred since 1989.

Population Composition

We have not estimated composition of postcalving groups since 1992, and the last fall composition count was done in 1980 (Table 2). The bull:cow ratio is unknown, but is probably between 35 and 60:100 because of relatively good recruitment and the relatively low harvest. Surveys of radiocollared cows during late June found 70 calves:100 cows during 1999 and 44 calves:100 cows during 2000 (Table 3). Winter surveys by the YRRD found 56 and 28 calves:100 cows during March 1999 and 2000, respectively (Table 3; D Cooley, personal communication). Composition surveys from different months are not directly comparable. The June surveys included only mature, radiocollared cows, and were not representative of the entire herd. Although the March surveys were not limited to radiocollared caribou, only a small proportion of the herd was classified.

Calf:cow ratios were probably influenced by demographic effects of poor calf recruitment during 1991–1993. Adverse weather during these years reduced parturition rates and increased calf mortality. Ratios initially increased during 1994–1996 because fewer nonbreeding cows, aged 1–3 years, were present in the population. Beginning in 1997, ratios declined because the larger cohorts born during 1994–1996 increased the proportion of adults, although most did not initially produce calves. Calf:cow ratios should increase to levels seen before 1991 as these cohorts enter the breeding population. Calf survival was relatively high in 1999 but declined in 2000, probably

because of an unusually late spring that delayed migration. As a result of the delay, many calves were born before the cows reached the normal calving grounds.

Reproduction and Calf Survival

Calving surveys during June 1999 were hindered by cool, cloudy weather. The presence of snow on the Alaskan coastal plain evidently deflected many caribou cows into the foothills of the Brooks Range, and caused some to remain in Canada during the peak of calving. Radiotracking on 5 June indicated that 84% of adult cows produced calves (Table 3). This was slightly above the mean annual parturition rate of 81% observed since data collection began in 1982. Of 22 calves whose survival was determined, 19 (86%) survived until 24 June.

During June 2000 spring migration and calving success likely were influenced by deep snow during the previous winter and the unusually late onset of spring. On 1 June snow cover was extensive in both Alaska and Yukon from the arctic coast to the Porcupine River. By 10 June most of the area north of the Porcupine River and east of the US–Canada border was clear of snow, although the Alaskan coastal plain remained mostly snow-covered until 15 June. Cool, cloudy weather continued in Alaska through the remainder of June, and few mosquitoes were observed on the Alaskan coastal plain until 1 July. Migration was delayed, caribou calving occurred over a larger area than usual, and many calves were born outside traditional calving areas. On 1 June, when calving probably began, all collared caribou cows were in Canada, along the southern edge of the Canadian coastal plain, in the foothills of the British Mountains, or scattered along the migration route extending southeastward from the Babbage River to the Driftwood River. From 1 June to 15 June, caribou congregated along the Canadian coastal plain near the mouth of the Babbage River. Parturition rate and early calf survival were both very low (Table 3). For 45 radiocollared cows that were observed both in early and late June, 32 (71%) were judged to be parturient. Twenty-four cows were seen with calves and 8 were assumed to have given birth and lost their calves (based on presence of hard antlers and enlarged udders). Only 20 calves of radiocollared cows survived until 1 July (63% of 32 calves believed to have been born). This survival was less than during any year from 1991–1999. The estimated ratio of 44 calves:100 radiocollared cows on 1 July was lower than during any year from 1987–1999 (Table 3). Conditions during spring 2001 were similar to 2000, with cool, cloudy weather and snow cover persisting into early June. Spring migration and the calving period were again delayed, and followed a similar pattern to 2000. Although parturition and early calf survival rates were slightly higher than during 2000 (Table 3), these rates were still low, and the estimated ratio of 51 calves:100 cows was among the lowest recorded for the PCH.

Distribution and Movements

Information on movements and distribution of the PCH has been summarized by Garner and Reynolds (1986), Whitten (1987, 1993*b*, 1995b), Whitten and Regelin (1988), Fancy et al. (1989), Golden (1989, 1990), Whitten and Fancy (1991), and Griffith et al. (2002). During 1997 and 1998 snowmelt and new plant growth occurred earlier than in previous years, continuing a trend seen in 1995 and 1996. Due to relatively light snow cover, caribou began their spring migration to the coastal plain earlier than in years with more snow, and most reached ANWR and the coastal plain by 1 June. In contrast, during both 1999 and 2000 deep snow and cold weather delayed the spring migration, and prolonged the calving period. This was especially

pronounced in 2000, when calving occurred over a much wider area than usual, and many calves were born south and east of the traditional calving area, including parts of northwestern Yukon and northeastern Alaska. Caribou left the coastal plain and moved into the Brooks Range foothills of Alaska and Canada during late June and early July. Most of the PCH was in Canada by mid-August, and few returned to Alaska during fall, except in winter 1999–2000 when a substantial number wintered in the vicinity of Arctic Village. Few caribou wintered in Alaska during the following year. There appears to be a long-term decline in the number of PCH caribou wintering in Alaska. Consequently, fall subsistence harvests in Alaska were probably low. In the Yukon, caribou were accessible from the Dempster Highway during much of both winters, and harvests were relatively high.

MORTALITY

Harvest

Season and Bag Limit. The state of Alaska hunting season for all hunters during this reporting period was 1 July to 30 April; in addition, hunters could take only bull caribou during 23–30 June in Unit 26C. The bag limit for nonresidents was 5 caribou. The bag limit for all Alaska residents was 10 caribou.

Alaska Board of Game Actions and Emergency Orders. The Alaska Board of Game took no regulatory action regarding the PCH during RY98 and RY99.

Hunter Harvest. Harvest data from northern Yukon are not yet available for RY99 and RY00. Estimated harvests in Alaska were 300–400 during these years. Total harvests for the PCH were approximately 2437 and 1671 during RY96 and RY97, respectively (Table 4). This represents 1–2% of the estimated population (Table 1).

Harvests by local and nonlocal residents in Alaska were reported differently. Nonlocal hunters used statewide caribou harvest ticket report cards. Standardized reporting of harvest by hunters living north of the Yukon River was not required after 1989, and prior to 1989, most local residents did not report even though it was required. Therefore, local harvest was estimated based on knowledge of local hunting patterns and the availability of caribou near communities.

Harvest by nonlocal hunters was a minor part of the overall PCH harvest, although it increased slightly during this report period. Most harvest by nonlocal hunters occurs in Unit 25A (Table 5). Most nonlocal hunters were Alaska residents, and harvested primarily bull caribou.

In Alaska local harvest depends largely on the relative availability of caribou. Caribou were available to Kaktovik residents primarily in early summer during this report period. Caribou were briefly available to most villages south of the Brooks Range during late summer and fall. Harvest in Canada probably continued to be relatively high because caribou often move through the Old Crow area several times each year. During late summer and fall of both 1999 and 2000, many caribou traveled south along the Dempster Highway, where they were accessible to residents of Aklavik, Fort McPherson, and other road-connected communities.

Hunter Success. Nonlocal hunter effort and success varied among game management units depending on herd distribution (Table 5). Word travels quickly when PCH caribou are scarce in

Alaska, and few hunters travel to the PCH range. Because of their wide ranging movements and the difficulty and expense of traveling to the area, the PCH has never been subject to a substantial harvest by nonlocal hunters.

In Alaska local hunter success during this report period was generally low. Caribou left the Kaktovik area in both 1999 and 2000 before sea ice receded, and local residents were unable to travel to traditional hunting areas by boat. Caribou were available near Arctic Village for only a few weeks in late summer 2000, but in RY99 wintered in large numbers in the area. Hunters from other Gwichin communities took small numbers of caribou along the Porcupine River near the Alaska–Yukon border in fall. In most years the majority of the herd remains in Canada during the winter.

Harvest Chronology. Nearly all nonlocal harvest of the PCH in Alaska occurs during August and early September. Caribou were available during winter 1999–2000 in sparsely populated eastern Unit 25A, but there was little or no harvest by nonlocal hunters. Local harvest chronology depends on availability of caribou near villages, and harvest occurs whenever caribou are present. However, caribou may be present but inaccessible at Kaktovik during June because traveling conditions are poor.

Transport Methods. Traditionally, nonlocal hunters fly into the PCH range, and a few travel by boat up the Porcupine River. Local residents use boats or ATVs in summer and snowmachines in winter.

HABITAT

Assessment

Population density of the PCH reached approximately 1.0 caribou/mi^2 (0.4/km^2) during the late 1980s. Results of studies on the calving ground indicate calving caribou select areas with rapid plant growth, rather than specific sites or habitats. Rapid plant growth occurs in different areas annually, but tends to occur most frequently in the region identified by previous research as the primary calving area of the PCH (Fancy and Whitten 1991). This study indicates that, over time, all of the traditional calving area is important for caribou. Preserving or protecting only portions of the calving area may not adequately protect the herd.

Enhancement

No habitat enhancement programs are underway or planned on the PCH's range. Much of the herd's range within Alaska is designated wilderness, and the northern portion of the Yukon Territory is a national park. Most of the area is classified as "limited" for fire suppression, and a natural fire cycle generally prevails.

CONCLUSIONS AND RECOMMENDATIONS

Although the 1998 and 2001 population estimates were below ADF&G's objective, the actual population was likely higher than estimated, and the herd is still above levels observed in the 1970s, when it numbered 102,000–110,000. The second management objective is being met, although knowledge of local harvests and timeliness of harvest reporting could be improved. The

third objective was partly accomplished. Weather delayed a photocensus planned for 2000 until 2001, but composition surveys were completed.

The most likely cause of the initial decline in numbers following the 1989 census was reduced calf production or survival during 1991–1993 due to adverse weather, as reflected in low March calf:cow ratios. Calving surveys indicated that calf production (measured as a proportion of adult cows) from 1994–1999 was good, but declined dramatically in 2000 and 2001 (Table 3). Population modeling indicates the decline should have ended by 1998, as relatively large cohorts became adults. The continuing decline indicates that adult survival may also have been reduced during the 1990s, perhaps due to increased predation or human harvest (Arthur et al., in press). Although no change in management strategy is needed at this time, the population should be monitored closely during the next 2–3 years. A continuing decline could make it necessary to reduce harvest of females.

The PCH was lightly hunted, and harvest probably played a relatively small role in recent population changes. However, existing harvest levels will have a greater influence on population dynamics if the herd continues to decline. The generally high productivity, survival, and good physiological condition of caribou in the herd probably reflect adequate forage quality and quantity as well as generally mild climatic conditions. If mild weather continues, the herd may increase.

Existing management objectives are suitable for the next reporting period. Activities required to meet these objectives include 1) completing a photocensus every 2–3 years, 2) conducting annual calving and herd composition surveys, 3) monitoring herd movements by periodically relocating radiomarked caribou, and 4) continuing to work with local communities to improve the accuracy of harvest estimates.

The department is cooperating with US Geological Survey/Biological Resources Division, FWS, and Canadian government agencies to assess the importance of the ANWR coastal plain to the PCH. The department previously identified a portion of the ANWR coastal plain between the Hulahula and Aichilik Rivers as especially important to calving and postcalving caribou and recommended this area for special consideration in any plans to develop ANWR. However, more recent studies indicate all of the ANWR coastal plain and adjacent areas in Canada may be important to the herd over the long term (Fancy and Whitten 1991; Griffith et al. 2002). The department should continue to work with other agencies to identify factors affecting population dynamics of the PCH and evaluate potential effects of development on the coastal plain.

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Table 1 Porcupine caribou herd population estimates, 1961–2001

Year	Population estimate[a]	Type of estimate
1961	110,000	Calving ground census[b]
1972	99,959	APDCE[c]
1977	105,000	APDCE
1979	105,683	Modified APDCE
1982	125,174	Radiocensus[d]
1983	135,284	Radiocensus
1987	165,000	Radiocensus
1989	178,000	Radiocensus
1992	160,000	Radiocensus
1994	152,000	Radiocensus
1998	129,000	Radiocensus
2001	123,000	Radiocensus

[a] All estimates include calves except for the 1961 estimate.
[b] Data presented by RO Skoog at the 1962 Alaska Science Conference.
[c] Aerial photo-direct count extrapolation (Davis et al. 1979).
[d] Valkenburg et al. 1985.

Table 2 Porcupine caribou herd historical postcalving composition counts, 1971–1992[a]

Approximate survey date	Bulls:100 Cows[b]	Calves:100 Cows	Percent calves	Percent cows	Percent yrlgs	Percent small bulls (% of bulls)	Percent large bulls (% of bulls)	Percent bulls	Composition sample size
7/71	24	38	21	56	10			13	29,197
7/72	23	49	26	53	9			12	11,721
7/73	16	47	27	58	6			9	19,101
7/74	9	67	37	55	3			5	14,127
7/75	23	52	27	52	9			12	18,814
7/76	5	58	32	55	10			3	13,762
7/77	7	39	24	61	11			4	25,520
7/78	30	68	32	47	7			14	18,669
7/79	15	55	30	55	7			8	19,154
7/80	59	66	26	39	11			23	9,046
7/82[c]	95	43	15	36	15		46	34	19,718
7/83	9	73	38	52	5	61	39	5	2,583
7/86[c]	57	52	22	42	12			24	19,499
7/87[c]	72	62	24	38	10	49	51	28	33,044
7/88	28	54	27	50	10	57	43	14	6,420
7/89	17	46	25	55	11	77	23	9	23,242
7/90[d]									
7/91	36	46	28	46	10			17	16,060
7/92	27	55	27	49	10	62	38	13	18,217

[a] Beginning in 1993 composition data were obtained from observations of radiocollared cows (see Table 3).
[b] These figures do not represent overall herd composition of bulls. Accurate bull:cow ratios are usually obtainable only during or prior to the rut in October.
[c] Only these surveys sampled all portions of the herd, including bull groups.
[d] No counts completed.

Table 3 Porcupine caribou herd demographic data, 1987–2001

Birth year	June calving surveys: Cows observed[a]	June calving surveys: Parturition rate	July Calves:100 Cows[b]	March Calves:100 Cows[c]	Population estimate
1987	51	0.78	55		165,000
1988	91	0.84	55		
1989	74	0.78	58	43	178,000
1990	74	0.82	74		
1991	77	0.74	61	22	
1992	78	0.86	49	33	160,000
1993	63	0.81	45	32	
1994	98	0.91	70	40	152,000
1995	95	0.69	59	41	
1996	74	0.89	72	46	
1997	48	0.75	58	38	
1998	58	0.83	68	27	129,000
1999	39	0.84	70	56	
2000	44	0.73	44	28	
2001	70	0.84	51	31	123,000

[a] Number of radiocollared cows observed during May and June.

[b] Includes only radiocollared adult cows >3 years old.

[c] As of March of the year following birth of each cohort. Includes all cows >1 year old.

Table 4 Porcupine caribou herd harvest, regulatory years 1984–1985 through 1999–2000

Regulatory	Reported				Estimated unreported			
year	M	F	Unk	Total	Alaska	Canada	Total	Total
1984–1985	49	4	0	53	500–700	4000	4500–4700	4553–4753
1985–1986	52	12	1	65	500–700	4000	4500–4700	4565–4765
1986–1987	70	14	0	84	1000–2000	500–1000	1500–3000	1584–3084
1987–1988	106	22	1	129	<500	2000–4000	2500–4500	2629–4629
1988–1989	82	7	0	89	<500	2000–4000	2500–4500	2589–4589
1989–1990	104	8	0	112	500–700	2000	2500–2700	2612–2812
1990–1991	19	1	0	20	100–150	1680	1780–1830	1800–1850
1991–1992	101	3	0	104	100–150	2774	2874–2904	2978–3028
1992–1993	78	1	0	79	658	1657	2315	2394
1993–1994	77	5	0	82	250	2934	3184	3266
1994–1995	72	3	0	75	200	2040	2240	2315
1995–1996	61	7	0	68	200	2069	2269	2337
1996–1997	76	2	0	78	200	2159	2359	2437
1997–1998	58	4	1	63	300	1308	1608	1671
1998–1999	81	11	1	93	300	n/a	n/a	
1999–2000	82	4	0	86	400	n/a	n/a	

Table 5 Porcupine caribou herd nonlocal[a] hunter success, regulatory years 1991–1992 through 1999–2000

Regulatory year/ Hunters	Unit					Total Units 25 and 26C
	25A	25B	25D	25	26C	
1991–1992						
Total hunters	62	8	2	72	22	94
Successful	43	1	0	44	7	51
% Successful	69	13	0	61	32	54
1992–1993						
Total hunters	67	23	0	90	6	96
Successful	48	11	0	59	4	63
% Successful	72	48	0	66	67	66
1993–1994						
Total hunters	45	9	1	55	28	83
Successful	33	1	1	35	19	54
% Successful	73	11	100	64	68	65
1994–1995						
Total hunters	49	13	2	64	14	78
Successful	36	2	0	38	8	46
% Successful	73	15	0	59	57	58
1995–1996						
Total hunters	57	9	1	67	21	88
Successful	32	2	0	34	10	44
% Successful	56	18	0	51	48	50
1996–1997						
Total hunters	47	20	0	67	9	76
Successful	29	16	0	45	2	47
% Successful	62	80	0	67	22	62
1997–1998						
Total hunters	56	10	3	69	17	86
Successful	34	5	0	39	6	45
% Successful	61	50	0	57	35	52
1998–1999						
Total hunters	85	12	2	4	13	116
Successful	63	3	2	1	6	75
% Successful	74	25	100	25	46	65
1999–2000						
Total hunters	80	23	146	6	6	129
Successful	55	14	5	2	3	79
% Successful	69	61	3	33	50	61

[a] Nonlocal includes Alaskans residing outside Units 25, 26B, and 26C.

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 26A (56,000 mi^2)

HERD: Teshekpuk

GEOGRAPHIC DESCRIPTION: Western North Slope

BACKGROUND

The presence of old drive sites near Teshekpuk Lake indicates that caribou have been hunted in the area since at least late prehistoric times (Silva 1985). The area was used extensively for reindeer herding in the 1930s and 1940s, and local residents report observing caribou in the area since the 1930s. Davis and Valkenburg (1978) documented the Teshekpuk Caribou Herd (TCH) in the mid-1970s as a separate herd from the Central Arctic (CAH) and the Western Arctic (WACH) Caribou herds.

The Alaska Department of Fish and Game (ADF&G) and U. S. Bureau of Land Management (BLM) staff completed visual counts during 1978–1982, and estimated that 3000–4000 caribou inhabited the Teshekpuk Lake area (Davis and Valkenburg 1979, Reynolds 1981, and Silva 1985). In an effort to assess the size and distribution of the TCH, 12 cows and 8 bulls were instrumented with radio collars in 1980 and monitored jointly by the department and BLM. During July 1984, the first photocensus of the herd was completed using a modified aerial photo-direct count extrapolation (APDCE) technique; department and BLM staff counted 11,822 animals from photographs. Trent and Toovak made a visual count in 1985 and counted 13,406 caribou (department files). We completed photocensuses and counted 16,649 caribou in 1989 (Carroll 1992), 27,686 in 1993 (Carroll 1995), and 25,076 caribou in 1995 (Carroll, 1997).

The TCH is an important subsistence resource to hunters from several North Slope villages. Collection of TCH harvest data has been difficult because not all hunters report their harvest and because hunters from most North Slope villages harvest caribou from more than one herd.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Maintain stable or increasing numbers of caribou in the TCH
- Provide continued hunting opportunity on a sustained yield basis

MANAGEMENT OBJECTIVES

- Determine the population size of the herd every 2 to 3 years;
- Monitor recruitment and calf production through late winter recruitment and summer calving ground surveys each year;
- Define critical habitat areas such as calving, insect relief, and wintering areas;
- Identify and map the movements and distribution of the herd throughout the year using aerial survey, radiotelemetry, and satellite telemetry data;
- Encourage local participation in research and management decisions;
- Work with the North Slope Borough and the Department Subsistence Division to collect harvest information;
- Determine the hunter induced mortality rate and significant sources of nonhunter mortality;
- Monitor mortality events through radiotelemetry, field observations, and sample collection;
- Work with management agencies, oil companies, and caribou users to minimize conflicts between the herd and major exploration and development projects;
- Collar caribou every 1 to 2 years to maintain a sample size of around 40 operational collars. Capture caribou without the use of drugs;
- Weigh measure and collect blood, fecal, and hair samples from all captured caribou to gain information about disease, parasites, contaminants, and condition;
- Conduct composition surveys during mid-summer and fall to determine relative numbers of bulls, cows, and calves; and
- Involve students in caribou research operations, work with students to track satellite collared caribou movements, and lecture to school classes about caribou biology.

METHODS

We used a modified APDCE technique (Davis et al. 1979) to conduct a photocensus. Photographs were taken from a DeHavilland Beaver (DHC-3) aircraft with a floor-mounted camera on 11 July 1999 while TCH caribou were in insect relief aggregations. A Cessna 185 with telemetry equipment was used to detect how many radiocollared TCH animals were in the photographed groups and if there were any instrumented WAH caribou in the area. Images of caribou on the photographs were counted during the following winter.

We flew spring short yearling surveys in a Cessna 185 on 21–23 April 1999 and on 10, 11, and 25 April 2000 and fall composition surveys on 13 October 1998. We used telemetry equipment to locate radiocollared cows and counted approximately 100 adults and calves in the area surrounding the collared animal. Locating the radiocollared animals allowed us to distribute our sampling effort throughout the range of the TCH.

A Cessna 185 aircraft was used to fly calving surveys on 4–12 June 1999 and 2–14 June 2000. We flew surveys over most of the TCH range and used telemetry equipment to locate as many collared cows as possible and observed them at close range to determine the success, timing, and location of calving. For each observation we recorded whether the cow had a calf and whether it had hard antlers, soft antlers (covered with velvet), or no antlers. We continued to observe each collared cow until it was seen with a calf or it was determined that it had soft antlers and was therefore not pregnant. We used a Garmin Global Positioning System (GPS) receiver to determine the latitude and longitude of the location where we first saw each cow with a calf, and recorded this as the calving location along with the date. Calving locations of cows that calved successfully and locations of cows that either did not have calves or had calves that died before they were observed during the June 2 –16 calving season were entered in a spreadsheet and mapped using ArcView GIS.

We used a Robinson 220 helicopter on 30 June 1998 and a Hughes 500 helicopter on 10 July 2000 to conduct postcalving composition surveys. We flew transects north and west of Teshekpuk Lake and categorized caribou as cows, calves, or bulls.

Through a cooperative effort with the NSB and BLM, we captured 11 caribou north of Teshekpuk Lake on June 29, 1998 using a Robinson 220 helicopter with a hand-held net gun, and attached 2 Platform Transmitter Terminal collars (satellite radio collar transmitters or "PTT's") and 9 VHF radiocollars. We also captured 20 caribou north of Teshekpuk Lake from July 8–10, 2000 using a Hughes 500 helicopter with a skid-mounted net gun, and attached 5 PTT’s and 12 VHF radiocollars. In both capture operations caribou were restrained using blindfolds and hobble ropes. We collected blood, fecal, and hair samples and measured, weighed, and assessed the body condition of the captured caribou. The radiocollars were used to aid in population, productivity, and movement studies.

The PTT's were designed to transmit on a 6-hour per 48-hour duty cycle. We received satellite location data from the Service Argos Data Collection and Location System (ARGOS) in Landover, Maryland using 2 methods. We retrieved current location information from ARGOS,

using a computer and modem as needed. Otherwise, we used monthly summaries of all locations distributed on microcomputer files by ARGOS. In addition to receiving caribou locations from ARGOS, we completed periodic VHF radiotracking flights to collect information on caribou mortality, movements, and distribution.

In order to determine hunter harvest of TCH caribou, we examined data from harvest surveys that have been done in villages within the range of the TCH. The estimated harvest from the survey reports and the human population for the year of the survey were used to calculate the number of caribou harvested per person per year. We obtained current human population estimates from the Department of Commerce and Economic Development and multiplied this by the per capita harvest for each village to estimate the total caribou harvest for 1999–2000. Because villages harvest caribou from more than one herd we had to estimate what percentage of the caribou harvested in each village were from the TCH. VHF radiotracking and satellite collar information was used to make our best estimation of which herds were in the hunting areas of the villages when hunting was taking place in 1999–2000. We multiplied the total number of caribou harvested times the percentage of them that were most likely from the TCH to determine the total number of TH caribou harvested from each village, and totaled these to calculate the total TCH harvest for 1999–2000. We recognize that the harvest estimates (calculated above) are based on approximate proportions of caribou from respective herds in the local hunting areas. Increased confidence in the estimation procedure is possible in the future by conducting more VHF radiotracking flights and analyzing satellite collar information to determine the when caribou from the various herds are present in local hunting areas

We determined mortality rates of cows with VHF radiocollars by examining radiotracking survey data collected since 1990. The VHF transmitters were configured with MS6 mortality sensors, so they doubled their rate of transmission signals when the caribou stopped moving for over 5.5 hours (mortality mode). In addition to collars heard on mortality mode, some collars were simply not detected after some date. We assumed that these "not detected" caribou died somewhere out of the survey area during the collaring year previous to the first calving period when they were not heard. We totaled the number of caribou found on mortality mode and "not detected" caribou for each collaring year, which ran from 1 July to 30 June. We then divided this by the number of active conventional radiocollars that were on the air at the beginning of the collar year to calculate the mortality rate for each year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

From census photographs taken on 11 July 1999, we counted 28,627 caribou. Previous censuses in 1989 (16,649 caribou), 1993 (27,686 caribou), and 1995 (25,076 caribou) show the TCH increased at a rate of 14% per year during the period 1989–1993, and since then the herd has fluctuated slightly but has remained fairly stable (Table 1).

Population Composition

Calving surveys were flown on 4, 6, 10, 11, 12, and 24 June 1999. We located 36 collared cows and 24 of these had calves at heel, for 67% calving success (Table 2). Most of the calves were born between 6–11 June. In 2000, calving surveys were flown on 2, 5, 6, 7, 9, 12, and 14 June. We located 29 collared cows and 23 of these had calves at heel, for 79% calving success (Table 2). Most of the calves were born after 7 June, which was slightly later than normal. We flew fall composition surveys on October 13, 1998. Among 458 caribou, we counted 90 calves for 20% calves, or 25 calves:100 adults. Short Yearling counts were flown from 21–23 April 1999. We located 25 collared cows, 8 of which had had short yearlings at heel (32 short yearlings per 100 cows). We also classified 2040 caribou in the areas surrounding the collared animals and counted 1608 adults and 432 short yearlings. This computes to 21% short yearlings or 26 short yearlings:100 adults. The spring 1999 results were similar to the 1998 fall composition results indicating that overwinter calf survival was similar to adult survival (Table 3).

Short Yearling counts were also flown on 10, 11, and 25 April 2000. We located 21 collared cows, 7 of which had short yearlings at heel (33 short yearlings:100 cows). We also classified 1985 caribou in the areas surrounding the collared animals and counted 1591 adults and 394 short yearlings. This computes to 20% short yearlings or 25 short yearlings:100 adults. (Table 3)

During summer composition surveys, which were flown on June 30, 1998, we observed 3302 caribou and classified 1364 as cows, 1023 bulls, and 915 calves. We counted 67 calves:100 cows and 75 bulls:100 cows. We also conducted summer composition surveys on 10 July 2000 and classified 3943 caribou and saw 1858 cows, 908 bulls, and 1177 calves. We counted 63 calves:100 cows and 49 bulls:100 cows. The number of calves was in the mid-range of what we have seen in past years. The number of bulls counted has been variable over the years and is more a reflection of bull distribution at that time than actual composition (Table 3).

Distribution and Movements

Most TCH caribou move toward Teshekpuk Lake during May. During past years most of the pregnant females moved into the area northeast, east, and southeast of Teshekpuk Lake to calve in early June (Figure 1). A late snow melt-off seemed to hold the caribou farther south in 1999 and caused a greater than normal number (20 of 24) of caribou to calve south of the lake (Figure 2). In 2000 snow melt-off was even later than in 1999 and seemed to slow the eastward migration of the caribou. Calving occurred on all sides of Teshekpuk Lake, with many more calves than usual being born south and west of the lake (Figure 3).

During late June through July, caribou of both sexes seek relief from insect harassment along the Beaufort Sea coast from Dease Inlet to the mouth of the Kogru River, around the edges and on islands of Teshekpuk Lake, and on sand dunes along the Ikpikpuk River and south of Teshekpuk Lake. Fall and winter movements are highly variable, with most of the herd wintering in a different area each year.

Satellite collar information indicates that TCH caribou winter in varied locations from near Teshekpuk Lake to the Chukchi Sea coast to south of the Brooks Mountain Range (Philo et al. 1993). In 1990–1991 about half of the herd wintered south of the Brooks Range and half were on the Chukchi coast. In 1991–1992 most of the herd wintered within 30 miles of Teshekpuk Lake.

In 1992–1993 the herd was split between the northern foothills of the Brooks Range and the coastal plain. During 1993–1994 icing on the coastal plain caused most of the TCH to move into the area between Umiat and Anaktuvuk Pass with a portion of the herd moving to the south side of the Brooks Range. During 1994–1995, most of the herd was along the Chukchi Sea coast from Wainwright to Cape Lisburne. In 1995–1996 the TCH wintered on the coastal plain, mostly between Dease Inlet and Wainwright. During 1996–1997 most of the herd traveled south of the Brooks Range and were distributed between Cape Lisburne and the Seward Peninsula. During 1997–1998 most of the herd wintered in the Atqasuk and Wainwright area with some scattered as far east as the Teshekpuk Lake area.

All 3 caribou that we monitored during 1998–1999 stayed on the coastal plane. One caribou we collared in 1997 (ID 9705 and PTT 8760) summered north of Teshekpuk Lake and in the Cape Simpson area, wintered south of Admiralty Bay, then traveled back to Teshekpuk Lake in June and had a calf. We attached satellite collars to 2 caribou in 1998. Caribou ID 9808 (PTT 8761) summered north of the lake and around Admiralty Bay, wintered around Atqasuk, and traveled back to Teshekpuk Lake in June, but was not seen with a calf. Caribou ID 9809 (PTT 8762) spent most of the summer and all of the winter south of Teshekpuk Lake and had a calf there.

During 1999–2000, we monitored the movements of the 3 satellite-collared caribou and they all stayed on the coastal plain all winter. Caribou ID 9808 (PTT 8761) wintered between Wainwright and Atqasuk during 1999–2000, traveled back to Teshekpuk Lake in June, and had a calf to the west of the Lake. Caribou ID 9809 (PTT 8762) also wintered between Wainwright and Atqasuk, traveled to Teshekpuk, and had a calf to the south of the lake in early June. The satellite transmitter on caribou ID 9705 (PTT 8760) failed in fall of 1999. At the time, ID 9705 was north of Atqasuk. All three collars (PTTs 8760, 8761, 8762) were removed from the caribou during collaring operations in July 2000. Caribou ID 9705 was refitted with a VHF collar.

MORTALITY

Harvest

Season and Bag Limit. The hunting seasons and bag limits were the same for both regulatory years of the reporting period.

Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 26A Resident Hunters: 5 caribou per day; cow caribou may not be taken 16 May–30 Jun	1 Jul–30 Jun	
Nonresident Hunters: 5 caribou total; cow caribou may not be taken 16 May–30 Jun.		1 Jul–30 Jun

Board of Game Actions and Emergency Orders. There were no Board actions or emergency orders for the TCH during the reporting period.

Human-Induced Harvest. It has been difficult to determine TCH harvest because not all hunters report their harvest and because each North Slope village harvests caribou from more than one herd. However, there have been several harvest monitoring projects, which provided information on the number of caribou harvested and the human population of the villages (Table 4). We used this harvest information to calculate an average number of caribou harvested per person per year for each of the villages. This per capita caribou harvest was multiplied by the 1999 human population number to estimate the number of caribou harvested by each village. Distribution of the various caribou herds is variable from year to year, so we examined telemetry data for 1999–2000 to determine the availability of TCH caribou, compared to caribou from other herds, in the hunting area of each village and estimated the percentage of the harvest that was most likely TCH caribou. The total harvest of each village was calculated from the estimate of caribou harvested and the estimated percentage that were TCH caribou. We totaled the village harvests to produce an estimate of 2503 TCH caribou harvested in 1999–2000 (Table 5). This represents an 8.7% harvest of the herd. We will gain more confidence in this estimate as we increase VHF radiotracking flights during the periods when differing herds are present in the hunting areas around each village and as we examine satellite collar information.

Permit Hunts. There were no permit hunts for caribou in Unit 26A during the reporting period.

Hunter Residency and Success. Most TCH harvest is from local subsistence hunters because the area is remote and largely inaccessible to nonlocal hunters. Nonlocal resident and nonresident hunters took a small proportion of TCH caribou, primarily from the Colville River drainage. No quantitative data are available on hunter success, but we believe success rates were high.

Harvest Chronology. Caribou are harvested throughout the year, but most harvest is during July through October (Table 6 and Table 7).

Transport Methods. Caribou hunters in Unit 26A used a wide variety of transport methods. Most residents of the unit used boats and ATV's during July, August, and September; and they used snowmobiles during the remainder of the year. Some use of aircraft occurs throughout the year, primarily by nonlocal residents and nonresidents. Hunters occasionally used highway vehicles when caribou moved near the limited road systems, particularly the gas well road near Barrow.

Other Mortality

We reviewed radiotracking data beginning in 1990 and determined how many collared caribou died each year and used these figures to estimate the annual TCH mortality rate. During most years the mortality rate ranged from 11% to 19% with the average rate for all years being 15%. The highest mortality rate (28%) was 1996–1997, when much of the herd migrated south of the Brooks Range. Reasons for increased mortality may have included higher stress from the long migration, increased hunter harvest, and the increased risk of predation and other factors associated with unfamiliar territory. The lowest mortality rate was in 1998 –1999 when 6% of the collared cows died (Table 8).

We have recorded sizable caribou die-offs in past years within the range of the TCH. During the winter of 1989–1990, many dead and lethargic caribou were found in an area between Teshekpuk Lake, the Ikpikpuk River, and the Colville River. We estimate approximately 2000–3000 caribou died in this area, but it is impossible to determine how many were from the TCH since caribou from the WACH and the CAH were also present in the area (Carroll 1992). During the winter of 1992–1993 at least several hundred, and probably over 1000, caribou died in the area to the east of Teshekpuk Lake and south of the Kogru River during a period of extremely cold, windy weather. Radiocollars indicated that most of these animals were from the TCH. (Carroll 1995).

HABITAT

Assessment

Results of satellite telemetry studies (Philo et al. 1993), VHF radiotracking flights, and composition surveys have indicated that the areas to the south, southeast, east, and north of Teshekpuk Lake are critical for calving, grazing, migration, and insect relief.

In 1997 BLM began the process of opening the National Petroleum Reserve-Alaska (NPRA), which encompasses much of the TCH range, to oil exploration and development. The first area to be considered was a 4.6 million-acre planning area in the northeast corner of NPRA. This area includes important TCH calving, insect relief, grazing, and migration habitats located near Teshekpuk Lake. After a compilation and review of the available data and many public meetings, it was decided that 87% of the planning area would be available for oil and gas leasing. However, most of the TCH critical habitat areas north and east of the lake would not be available for leasing at this time. It was also decided that there would be no surface exploration or development activity allowed in a strip of land to the west and south of the Teshekpuk Lake and around the Kogru River.

Enhancement

There were no habitat enhancement activities during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

There were no nonregulatory problems or needs identified for caribou in Unit 26A during the reporting period.

CONCLUSIONS AND RECOMMENDATIONS

We conducted a photocensus in 1999 and counted 28,627 caribou. This indicates an increase of 3.4% per year since 1995 when 25,076 caribou were counted. Previous censuses in 1989 (16,649 caribou), 1993 (27,686 caribou), and 1995 (25,076 caribou) show the TCH increased at a rate of 14% per year during the period 1989–1993, and since then the herd has fluctuated slightly but has remained fairly stable.

We examined the recruitment and mortality for each year during the last decade. Our recruitment results indicated the percentage of short yearlings ranged from 14% to 26% of the population and averaged about 20%. The mortality rate ranged from 6% to 28% with an average of about

15%. A fairly high recruitment and low mortality rate in recent years appear to have contributed to a recent growth in population.

We used the results of several harvest monitoring projects, human population numbers, and caribou distribution data to estimate that approximately 2500 TCH caribou were harvested in 1999–2000. This represents an 8.7% harvest of the herd, and the herd will need to maintain a fairly high recruitment rate to sustain this level of harvest.

We have used a helicopter and net gun to capture caribou since 1990 because local people requested that we do not drug caribou and because federal laws prohibit the use of capture drugs in areas where the hunting season is open. After netting, we used hobbles and masks to control the caribou. We were able to measure, weigh, and collect blood from the animals without the use of sedatives. We had 2 capture mortalities in 2000 and the carcasses were donated to the Senior Citizen's Center in Barrow.

Satellite radiotelemetry has been very useful in increasing our understanding of TCH movements. It has shown that TCH caribou move much more extensively than previously known. Some of these movements would have been impossible to track using standard VHF radiotelemetry. Satellite telemetry has clearly illustrated that while movements are fairly consistent during the spring and early summer there is great variability in winter movements. VHF collars have also been very useful, primarily in conducting censuses, composition surveys, and productivity studies. We need to continue telemetry studies to monitor herd status.

We have provided educational opportunities for North Slope students by allowing them to assist in caribou capture operations, collect samples from captured caribou, and help with necropsy work. In addition, we have been working with several school classes, teaching them to plot caribou locations so they can track the movements of satellite-collared caribou. We plan to continue to work with students whenever possible.

Using satellite and VHF collars, we have learned that the area to the south, east, and northeast of Teshekpuk Lake are important for calving in the spring, and the area north and northwest of the lake is important for insect relief and grazing each summer. As discussed in this report's Habitat Assessment section, BLM began the process of opening a planning area in the northeast corner of NPRA to petroleum leasing and development, which includes these critical habitat areas. After a public review process, it was decided that 87% of the planning area would be open for leasing but that the most critical habitat areas for the TCH would not be available for leasing or surface development activity at this time. However, the critical TCH habitat area also has the highest prospects for petroleum reserves, so the issue will probably be revisited. It is important to continue surveys in this area so resource managers make informed decisions regarding the habitat of the Teshekpuk Caribou Herd.

Because the TCH population remains high, we do not recommend any regulatory changes.

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Table 1 Population estimates and average annual rate of change of the Teshekpuk caribou herd, 1978–1999

Year	Population estimate	Average annual rate of change
1978–1982	3000–4000[a]	N/A
1984	11,822[b]	N/A
1985	13,406[a]	N/A
1989	16,649[b]	7.1%[c]
1993	27,686[b]	13.5%[c]
1995	25,076[b]	-4.8%[c]
1999	28,627[b]	3.4%[c]

[a]Derived from visual estimate.
[b]Derived using aerial photocensus.
[c]Rate of change calculated using only numbers derived from photocensus.

Table 2 Teshekpuk caribou herd calving and postcalving composition counts, June–July, 1991–2000

	Calving survey[a]	Summer composition counts[b]				
Date	Calves:100 cows	Percent bulls	Calves: 100 cows	Percent calves	Percent cows	Composition sample size
1991		13	66	35	52	3673
1992		34	80	29	37	3047
1993		37	39	15	38	2959
1994	63					
1995	73	29	73	30	41	1987
1996	89					
1997	53	18	46	26	56	3771
1998	63	31	67	28	41	3302
1999	67					
2000	79	23	63	30	47	3943

[a] Surveys conducted early to mid June
[b] Surveys conducted in July

Table 3 Spring and fall composition data for the Teshekpuk caribou herd, 1990–2000

Year	Adults	Short yearlings	Total	Short yearlings:100 adults	Percent short yearlings
1990(spring)	278	74	352	27	21
1991(spring)	532	168	700	31	24
1992(spring)	635	223	858	35	26
1993(spring)	1197	265	1462	22	18
1994(spring)	1281	205	1486	16	14
1995(spring)	1382	255	1637	18	16
1996(spring)	1787	575	2362	32	24
1996(fall)*	733	191	924	26	21
1997(fall)*	895	145	1040	16	14
1998(fall)*	368	90	458	25	20
1999(spring)	1608	432	2040	26	21
2000(spring)	1591	394	1985	25	20

Table 4 Summary of community-based harvest assessments for communities within the range of the Teshekpuk Caribou Herd, 1985–1999.

Community	Survey year	Human population	Nr. of caribou harvested	Reference for harvest information
Anaktuvuk Pass	1990	314	592	Pedersen and Opie, 1990
Anaktuvuk Pass	1991	272	545	Pedersen and Opie, 1991
Anaktuvuk Pass	1992	270	566	Fuller and George 1997
Anaktuvuk Pass	1993	318	574	Pedersen and Opie, 1993
Anaktuvuk Pass	1994–1995	318	322	Brower and Opie 1996
Barrow	1987	3016	1595	Braund et al 1991
Barrow	1988	3379	1533	Braund et al 1991
Barrow	1989	3379	1656	Braund et al 1991
Barrow	1992	3908	1993	Fuller and George 1997
Atqasuk	1994–1995	237	262	Hepa et al. 1997
Nuiqsut	1985	337	513	Pedersen, 1995
Nuiqsut	1992	418	278	Fuller and George 1997
Nuiqsut	1993	361	672	Pedersen, 1995
Nuiqsut	1994–1995	418	258	Brower and Opie 1997
Nuiqsut	1999–2000	468	413	Pedersen, 2001
Point Lay	1987	121	157	Pedersen, 1989
Point Hope	1992	699	225	Fuller and George 1997
Wainwright	1988	506	505	Braund et al 1993
Wainwright	1989	468	711	Braund et al 1993
Wainwright	1992	584	748	Fuller and George 1997

Table 5 Estimated harvest of Teshekpuk Herd Caribou during the 1999–2000 regulatory year by residents living within the range of this herd.

Community	Human population	Per Capita Caribou Harvest	Estimated total community harvest	Approximate % TCH in harvest	Estimated Nr. of TCH caribou harvested	Assessments used to estimate Per Capita Caribou Harvest
Anaktuvuk Pass	312	1.76	549	10	55	Anak. Pass 1990–1995
Atqasuk	273	1.11	302	60	181	Atqasuk 1994–1995
Barrow	4541	0.50	2270	70	1589	Barrow 1988, 1989, 1992
Nuiqsut			413	50	207	1999–2000 Harvest Survey[a]
Point Lay	217	1.3	282	20	57	Pt. Lay 1987
Point Hope	792	0.32	255	0	0	Pt. Hope 1992
Wainwright	545	1.27	690	60	414	Wainwright 1988, 1989, 1992
Total Harvest					2503	

[a]The Estimated Total Community Harvest was derived from an ADFG Subsistence Division harvest survey that was conducted in Nuiqsut in 1999–2000 (Pedersen, 2001)

Table 6 Percent and chronology of annual caribou harvest among Barrow and Wainwright residents 1987–1990[a]

Year	Mar–Apr	May–Jun	Jul–Aug	Sep–Oct	Nov–Dec	Jan–Feb	Annual harvest
Barrow							
1987–1988	5%	5%	40%	44%	1%	5%	1595
1988–1989	5%	6%	38%	41%	4%	6%	1533
1989–1990	6%	2%	49%	29%	3%	11%	1656
Wainwright							
1988–1989	2%	2%	31%	53%	9%	3%	505
1989–1990	11%	<1%	38%	31%	4%	15%	711

[a]Data from Braund et al. 1991 and 1993.

Table 7 Percent and chronology of annual caribou harvest among Nuiqsut and Atqasuk residents 1994–1995[b]

Village	Jul–Aug	Sep–Oct	Nov–Dec	Jan–Feb	Mar–Apr	May–Jun	Annual harvest
Atqasuk	40%	37%	14%	5%	1%	2%	187
Nuiqsut	38%	35%	7%	6%	8%	7%	249
Anaktuvuk Pass	50%	14%	12%	2%	15%	7%	322

[b]Data from Brower et al. 1996, 1997 and Hepa et al. 1997.

Table 8 Annual mortality for Teshekpuk Caribou Herd cows collared with conventional radiocollars, 1990–2000

Collar Year[a]	Sample Size[b]	Mortalities[c]	Mortality Rate[d]
1990–1991	13	3	23%
1991–1992	21	3	14%
1992–1993	21	4	19%
1993–1994	30	4	13%
1994–1995	29	5	17%
1995–1996	31	4	13%
1996–1997	25	7	28%
1997–1998	28	3	11%
1998–1999	35	2	6%
1999–2000	34	4	12%
Totals	267	39	15%

[a] Collar year defined as July 1–June 30.
[b] Sample Size - the total number of active conventional radiocollars at the beginning of the collar year.
[c] Number of radiocollared cows that died during the collar year
[d] Mortality rate - Mortalities/Sample Size

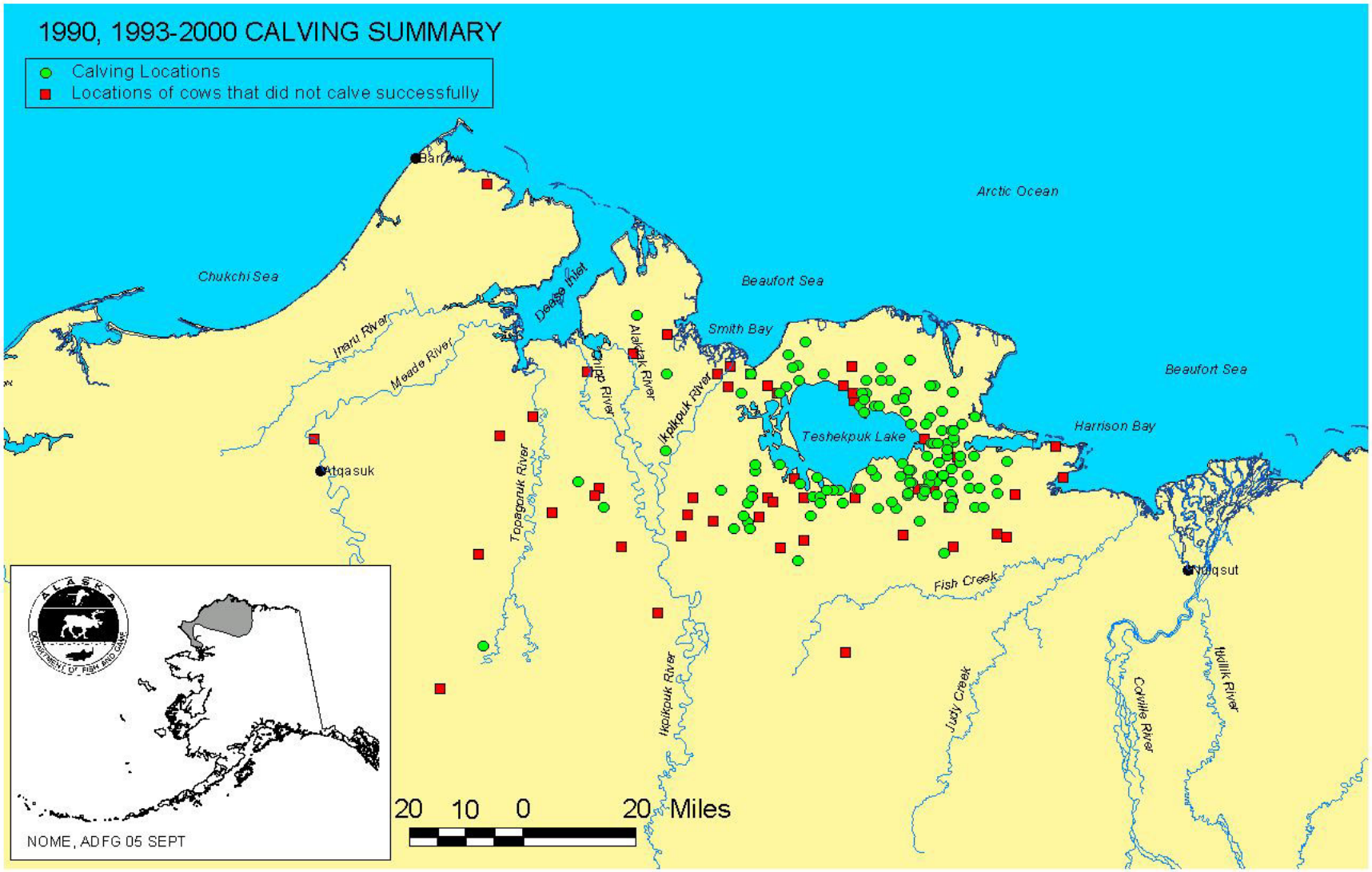

Figure 1 Calving locations of cows that calved successfully and locations of cows that either did not have calves (nonparturient cows) or had calves that died before they were observed during the June 2 –16 calving season, 1993-2000

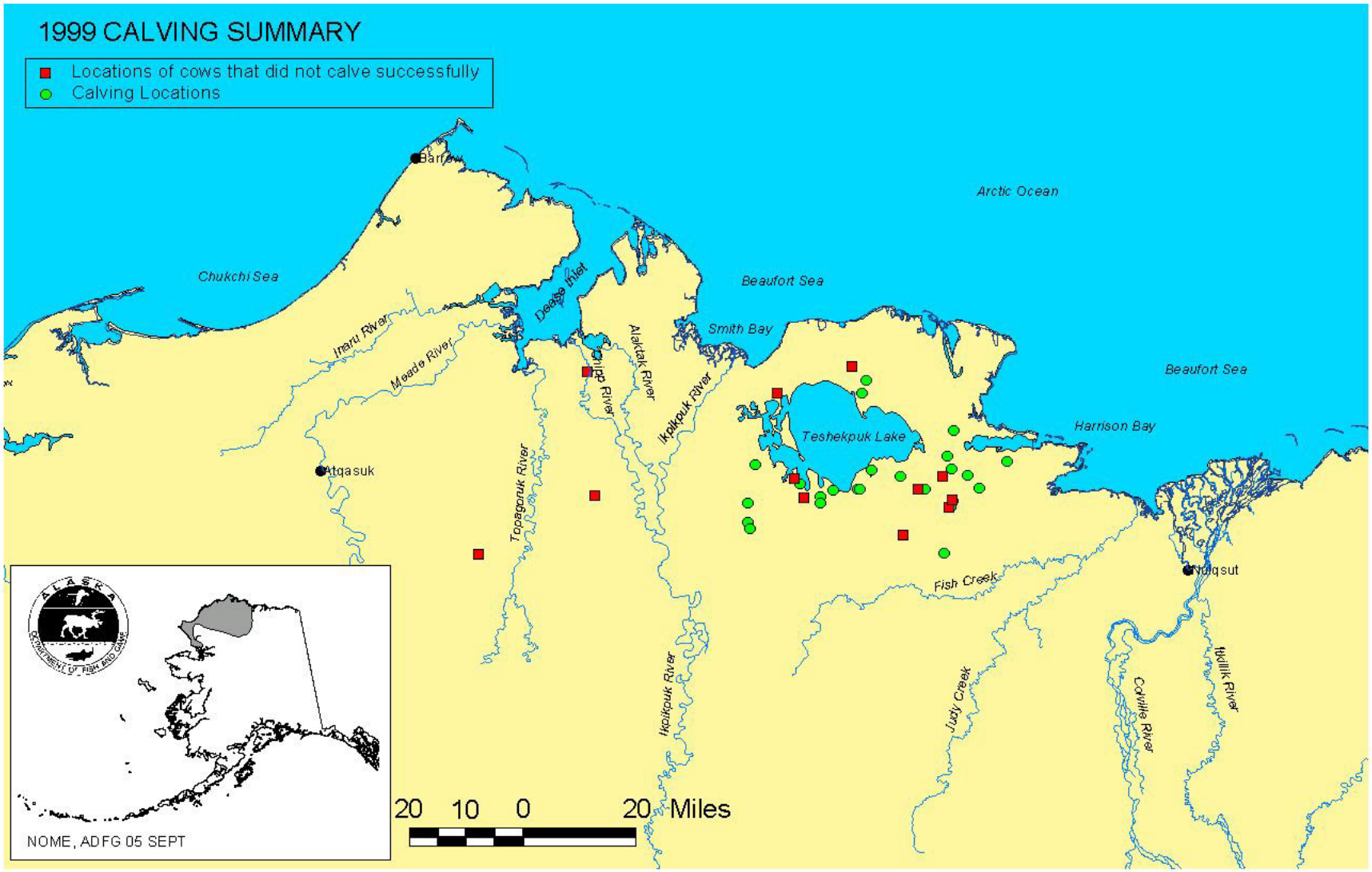

Figure 2 Calving locations of cows that calved successfully and locations of cows that either did not have calves (nonparturient cows) or had calves that died before they were observed during the June 2 –16 calving season, 1999

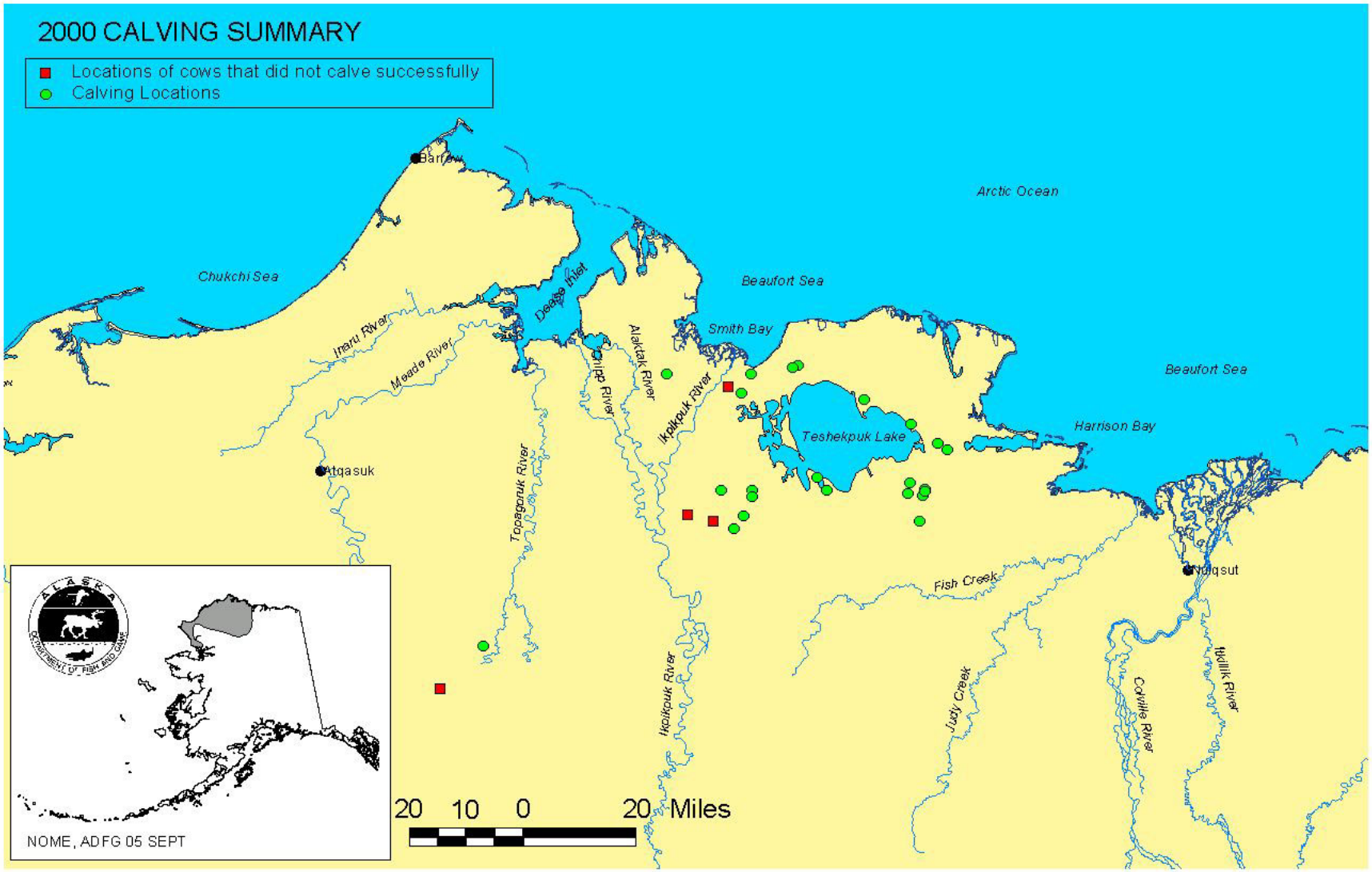

Figure 3 Calving locations of cows that calved successfully and locations of cows that either did not have calves (nonparturient cows) or had calves that died before they were observed during the June 2 –16 calving season, 2000

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 26B and 26C (25,787 mi^2)

HERD: Central Arctic

GEOGRAPHIC DESCRIPTION: Central Arctic Slope and Brooks Range

BACKGROUND

The Central Arctic caribou herd (CAH) was recognized as a discrete herd in the mid-1970s and was estimated at 5000 caribou in 1975 (Cameron and Whitten 1979). The CAH increased to approximately 13,000 by 1983 and to over 23,000 by 1992 (Valkenburg 1993). The herd declined to 18,100 in 1995 and stabilized for a few years. Herd size was estimated at 19,700 in 1997 and increased substantially during 1997–2000 to over 27,000 animals because of low adult mortality (<10%), high parturition rates and high calf survival (≥90 and ≥75% respectively, for females ≥4 years old in 1998, 1999, and 2000.

The herd's summer range extends from Fish Creek, just west of the Colville River, eastward along the coast (and inland approximately 30 miles) to the Katakturuk River. Much of the summer range lies within, or adjacent to, the industrial area near Prudhoe Bay. The CAH winters in the northern and southern foothills and mountains of the Brooks Range. The herd's range often overlaps with the Porcupine caribou herd (PCH) on summer and winter range to the east and with the Western Arctic and Teshekpuk Herds on summer and winter range to the west. However, there is no record of permanent exchange of caribou among these herds.

Oil exploration and development on the North Slope began in the late 1960s and provided the impetus for long-term Alaska Department of Fish and Game (ADF&G) studies of population dynamics, distribution, movements, and effects of development on the CAH. During the 1980s calving activity was rare in the Prudhoe Bay oilfield (Whitten and Cameron 1985), where it was known to occur before development. Additionally, cows and newborn calves were underrepresented along the trans-Alaska pipeline corridor and around oil production facilities in the early 1990s (Cameron et al. 1992; Cameron and Smith 1992). By the mid-1980s, major movements of CAH caribou through the Prudhoe Bay oilfield in summer had ceased and caribou distribution and movements within the Kuparuk oilfield were altered substantially (Smith and Cameron 1983, 1985*ab*; Whitten and Cameron 1983, 1985; Curatolo and Murphy 1986). In the

mid-1990s research on the Central Arctic Herd was reduced substantially and efforts were focused on monitoring population parameters and their relationship to management objectives.

MANAGEMENT DIRECTION

Based on the hypothesis that displacement, if of sufficient magnitude, would be harmful to the CAH (Cameron 1983), ADF&G proceeded with 2 management approaches. We worked with the oil industry to minimize disturbance to caribou movement from physical barriers created by oil development. Acting on the assumption that stress is cumulative, ADF&G also reduced hunting activity in areas adjacent to the oilfield and the pipeline haul road. The current management objectives reflect these concerns.

MANAGEMENT GOALS AND OBJECTIVES

- Minimize the adverse effects of development on caribou.
    - Work with industry to ensure free passage of caribou.
    - Work with industry and other agencies to minimize disturbance to caribou in proximity to developments, except where caribou constitute a hazard.
    - Maintain necessary restrictions on caribou hunting.
- Provide for continued caribou hunting, especially in areas away from developments, at a level that does not significantly affect population dynamics of the CAH.
    - Determine the influence of current harvest levels on the CAH.
    - Minimize harvest of cows from the CAH.
    - Maintain a bull:cow ratio of at least 40:100.
- Maintain opportunities for people to see caribou along the Dalton Highway and in the oilfields.
    - Work with industry and other agencies to minimize disturbances to caribou in proximity to developments, except where caribou constitute a hazard.
    - Regulate hunting along the Dalton Highway so conflicts between hunters and nonconsumptive users are minimized and caribou are not displaced from the vicinity of the road by hunting.

METHODS

POPULATION STATUS

Population size was estimated in July 1997 and 2000 using the modified aerial photo-direct count technique (Davis et al. 1979). Postcalving aggregations of caribou were located by radiotracking collared animals. ADF&G staff conducted each census when large aggregations had formed.

These usually occurred when temperatures were >55°F and wind was <8 mph. Groups of caribou were photographed with a Ziess RMK-A 9×9-inch aerial camera mounted in a DeHavilland Beaver aircraft. Caribou were counted directly from photographs.

Initial productivity was determined by estimating parturition rates of radiocollared females ≥2 years old during the first half of June 1994, 1995, and 1997–2001. Parturition rates were estimated during 30 May–15 June in 1988–1993. We determined parturition status based on the presence of calves or the timing of antler shedding and/or udder distension (Whitten 1991). The animal was classified as parturient (calf may have been lost already) (Whitten 1991) if a caribou had hard antlers but we could not determine whether udders were distended. Observations were made from fixed-wing aircraft.

Cameron (ADF&G [retired], personal communication) estimated that 80% of CAH cows maintain fidelity to calving areas west or east of the Sagavanirktok River from year to year. Because there is some indication that 2 different geographic areas have been used for calving, parturition and early survival data were stratified as Unit 26B West (west of the west bank of the Sagavanirktok River) or Unit 26B East (east of the Sagavanirktok River). These 2 calving areas may not be totally separate, but are nonetheless somewhat distinct. Because some overlap does occur, we arbitrarily chose the line that separates Unit 26B West, where there is substantial oil exploration and development, from Unit 26B East, where little exploration and development has occurred.

Early calf survival rates were monitored by estimating calf:cow ratios (calves:100 females). Rates were based on observations of radiocollared females ≥2 years old in the last half of June 1994–2001, after most calving should have occurred. Calf:cow ratios were determined from the last half of June through mid-August during 1988–1993. If distended udders were detected but no calf was seen, we assumed the cow had recently lost a calf and she was classified as "without calf." Data were stratified based on the location of caribou east and west of the Sagavanirktok River, as described above.

Parturition rates and calf:cow ratios were calculated for 3 categories: known–age females, females ≥4 years old, and “sexually mature” females. “Sexually mature” females were those that were known to have been parturient prior to being included in the sample. By only looking at females known to be sexually mature, variability at first age of reproduction is eliminated (R Cameron, ADF&G [retired], personal communication).

We used logistic regression to compare parturition rates and early calf survival for females ≥4 years old for Unit 26B across years and in Unit 26B West and Unit 26B East. We tested for differences due to year, area, and the year/area interaction ($P = 0.05$).

POPULATION COMPOSITION

Prior to 1994 calving surveys were conducted every year in conjunction with ongoing research. Beginning in 1994 they were conducted every 3 years.

We conducted calving surveys on the calving grounds during 10–14 June 1997 and 15–17 June 2000. A pilot and observer in an R-22 (1997) or R -44 helicopter (2000) searched for caribou along 16 3.2-km-wide strip transects oriented north-south and spaced at 10-km intervals from the

Colville River to the Canning River. Transects extended from the coast to 69°50'N and from 150°29'W to 148°57'W in the area west of Prudhoe Bay. Additional transects were added to the zone within the Milne Point road system to provide additional information in the developed area. This zone was apportioned into 1-km-wide strata with transects extending from the coast to 70°15'N and from 149°53'W to 150°02'W. To the east of Prudhoe Bay, transects extended from the coast to 69°45'N and from 148°27'W to 146°25'W. We recorded total number, sex and age composition, distance from the coast (1997), and latitude and longitude (2000) for each group of caribou located. In previous years a Bell 206B or Hughes 500D helicopter with 3 observers was used and map location or latitude/longitude was recorded. In addition, previous transects in the area west of Prudhoe Bay extended south only to 70°N. Because we observed caribou calving further south on the west side during the past few years, we extended transects to include these areas in 1997. Fall composition was estimated from a helicopter in mid-October 2000 and 2001. Caribou were classified as cows; calves; and small, medium, or large bulls. No fall composition surveys were conducted during RY97–RY99 (RY = regulatory year, e.g., RY99 = 1 Jul 1999–30 Jun 2000) because of poor weather.

MOVEMENTS AND DISTRIBUTION

Movements of the CAH were determined by relocating radiocollared females during June and July, mid-October, and late March or early April. Distribution during the calving season was determined during calving surveys, as described above.

HARVEST

Harvest and hunting pressure for Alaska residents living south of the Yukon River, and for nonresidents, were monitored using harvest reports submitted by hunters. Total harvest, residency and success, chronology, and transportation were summarized by regulatory year.

Alaska residents living north of the Yukon River were not required to obtain caribou harvest tickets/report cards. However, they were required to register with ADF&G or an authorized vendor. The Alaska Department of Fish and Game's Division of Subsistence estimated caribou harvest by residents of Kaktovik and Nuiqsut. Caribou harvested by hunters from Nuiqsut included animals from the Teshekpuk and Western Arctic caribou herds, as well as some CAH caribou.

A checkstation was operated on the Dalton highway near the Yukon River Bridge during August and September in 1991, 1992, 1993, 1996, 1997, and 1998. Checkstation reports are on file at ADF&G, Fairbanks.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We estimated 27,128 caribou in July 2000 based on a photocensus conducted during the postcalving aggregation. This represented a 37.5% increase (an average of 12.5% annually) from the July 1997 estimate of 19,730 (Table 1). Population modeling indicates this increase can be accounted for by the high parturition rates, high summer calf survival, and low adult mortality

observed during this period (Tables 2, 3, 4). In 1998, 1999 and 2000, observations of radiocollared females indicated parturition rates were greater than 90% and late June calf:cow ratios were high – greater than 75%. Adult mortality among radiocollared animals was low (<10%) in RY97, RY98, and RY99. It is likely that the CAH has continued to increase since July 2000 because parturition rates and late June calf:cow ratios in 2001 were still high and adult mortality for RY00 was <15%. A census was not conducted in 2001.

Parturition rates of radiocollared females ≥4 years old in Unit 26B increased between 1994 and 2001 (P = <0.0004, Table 2), and exceeded 90% during 1998–2001. Parturition rates for 3-year-olds were also high during 1998–2001 (≥75%), although sample sizes were small (range = 4–13; Table 4). Variability in parturition rates can be relatively high among 3-year-old cows, but a high rate is indicative of good nutritional condition (Valkenburg et al. 2000). In 1995, when the population appeared to decline somewhat (Table 1), no 3-year-old females were pregnant (n = 4) and parturition rates for females ≥4 years old was also low (56%, Table 2). No data are available for 1996, but parturition rates for females ≥4 years old increased slightly in 1997 (61%; Table 2); only two 3-year-olds were relocated and neither was parturient. Parturition rates of "sexually mature" females were similar to females ≥4 years old (Table 2).

During 1994–2001 the parturition rate was considerably higher in Unit 26B West than in Unit 26B East in some years (Table 2). However, parturition rates for females ≥4 years old during 1994–2001 did not differ between West and East (P = 0.34), and there was no significant area/year interaction (P = 0.51). A significantly lower mean parturition rate was detected in animals in the West than in the East (P = 0.003) during 1988–1994 (Cameron 1995; Cameron et al. 2002; Table 2), when the population was declining.

Although our analyses used the Sagavanirktok River to separate eastern and western areas, there are several reasons to view this approach and the results with caution. Even though density of calving caribou is lower near the Sagavanirktok River than in areas further east or west, there is not complete separation between calving concentrations, and there may be no biological reason to separate caribou based on calving areas. Also, this may not be the best dividing line if calving distribution changes. Furthermore, we may not be able to detect differences between areas because of small sample sizes in some years.

Late June calf:cow ratios for radiocollared females ≥4 years old was 75–86% during 1997–2001 (Table 3), indicating consistently high early calf survival during the past 5 years. During 1998–2001, variability in calf:cow ratios was higher for 3-year-olds than for the overall sample in the herd (33–60%, Table 5), suggesting that calves born to 3-year-olds tend to have lower survival rates. However, sample sizes were small. Late June calf:cow ratios were somewhat lower in 2000 and 2001 (75 and 79%) than in 1998 and 1999 (81 and 86%); probably because of an extremely late spring in both 2000 and 2001 which may have reduced early summer calf survival. As in the case of parturition rates, late June calf:cow ratios were considerably higher in Unit 26B West than in Unit 26B East in 1995 and 1997, but logistic regression indicated that there were no significant differences due to area (East or West; P = 0.70) or area/year interaction (P = 0.69) for females ≥4 years old during 1994–2001 (Table 3). In contrast to parturition rates, there was no significant difference in calf:cow ratios between years (P = 0.15). However, calf:cow ratios were lower (<65%) during years when the herd was declining or stable (1994–1996) than in years when the

herd was increasing (1997–2001, ≥75%). Late June calf:cow ratios for "sexually mature" females were similar to those observed for females ≥4 years old (Table 3).

High parturition rates and calf:cow ratios in 1998, 1999, and 2000 appear to be the major factors accounting for the increase in population that occurred between 1997 and 2000. Low adult mortality also contributed to the increase.

Population Composition

We estimated 72 calves:100 cows during calving ground surveys in both 1997 and 2000 (Table 1). Estimated calf:cow ratios in Unit 26B West were 69:100 during 1997 and 72:100 during 2000, and in Unit 26B East they were 81:100 in 1997 and 70:100 in 2000. Because these surveys were limited to calving areas, nonparturient cows are underrepresented and the data do not accurately reflect overall herd composition.

Fall composition surveys in October 2000 and 2001 indicated bull:cow ratios of 84:100 and 73:100 and calf:cow ratios of 57:100 and 54:100 (Table 6). These high bull:cow ratios indicate that harvest has had little effect on sex ratios. Bull:cow ratios have been high since 1976 (>50:100). The high calf:cow ratios indicate that summer calf survival rates were relatively high in 2000 and 2001. These surveys occurred in the Brooks Range in the Chandalar Shelf, Atigun Pass, and upper Sagavanirktok River areas. No surveys were conducted during 1997–1999.

Distribution and Movements

The proportion of the CAH calving southwest of the Kuparuk oilfield appeared to be higher during the early 1990s than in the 1980s, when calving was relatively common in the Kuparuk oilfied (ADF&G files). Preliminary analysis of calving survey data for 1994, 1997 and 2000, and telemetry data for 1994–2001, indicate a similar pattern. No directional shift in distribution of caribou calving east of the Sagavanirktok River was noted. However, calving survey and telemetry data for 1994, 1997, and 2000 will be analyzed further.

In 2000 and 2001, exceptionally late spring and deep snow delayed migration and many caribou calved before they reached the traditional calving grounds. In addition, calving distribution in 2001 deviated somewhat from previous years. Three radiocollared females were found west of the Colville River in the Fish Creek drainage in Unit 26A.

Movements during summer (postcalving) are influenced by insect abundance, which is largely dependent on temperature and wind speed. Generally, when temperature is >55°F and wind speed is <8 mph, caribou are found along the coast or on large gravel bars. CAH caribou were not radiotracked during July and August from 1995 through 2000 except in connection with a photocensus. Anecdotal observations indicate that postcalving distribution and movements during July did not vary significantly during 1994–2001, with caribou distribution depending on weather conditions. Caribou were concentrated along the coast during warm weather but moved inland on cool and windy days. During the 1997 and 2000 July censuses, some groups were located as far east as the Tamayariak and Katakturuk Rivers, respectively, and a dead radiocollared caribou was found on Marsh Creek, east of the Katakturuk River. In 1997, one small group (<250) ranged as far west as Fish Creek, west of the Colville River.

The CAH begins migrating toward the foothills of the Brooks Range during August and by September most caribou are found along the foothills of the Brooks Range, particularly around Toolik Lake, Galbraith Lake, Accomplishment Creek, the Ivishak River and the upper Sagavanirktok River. However, summer distribution during 2001 was different than in previous years. In late July an estimated 5000 Central Arctic caribou were found inland in the Fish Creek drainage in Unit 26A. Unusually warm temperatures persisted during most of September, and most of the CAH remained on the North Slope as far north as the White Hills and Franklin Bluffs until about mid-October.

During the rutting season in October, CAH caribou are frequently found on the Chandalar Shelf and Dietrich River. In October 2000 approximately 5000 caribou were located along the Chandalar Shelf and the upper North Fork Chandalar River. There were several groups between Thru Creek and Your Creek in the Chandalar drainage, about 5000 caribou were along the Middle Fork Chandalar and Wind Rivers, and approximately 350 were in Atigun Pass. Due to poor weather and budget constraints, we did not radiotrack caribou west of the Dalton Highway and north of the Brooks Range. During the 2001 rutting season, there were approximately 8000 caribou in the Atigun Pass area and 3500 in the west fork of the Atigun River. These animals were probably migrating to rutting and wintering grounds. There were approximately 6000 caribou in the Chandalar Shelf area and in the upper North Fork Chandalar River. On the north side of the Brooks Range, a group of 2000 animals were found in Accomplishment Creek, 1500 animals were in the east fork of the upper Sagavanirktok River, and approximately 1000 caribou were located in the upper Itkillik River.

Many Central Arctic caribou wintered in the Chandalar Shelf area and east into the Wind River drainage, and also in the Tinayguk and upper North Fork Koyukuk Rivers during several years prior to 1995 (ADF&G files). In late March 2001 we observed approximately 12,000 caribou while radiotracking collared females. In the area south of the Brooks Range and east of the Dalton Highway, we estimated there were approximately 1500 caribou in the upper Wind River, 2600 along the Middle Fork Chandalar River, and 3900 near Your Creek. Approximately 500 caribou wintered in the upper John River, west of the Dalton Highway, and an estimated 2750 were located in the upper Sagavanirktok River, north of the Brooks Range. We were unable to search the remaining drainages north of the Brooks Range and east of the Dalton Highway. We counted approximately 600 caribou on the North Slope, west of the Dalton Highway.

In early March 2002, winter distribution was determined by tracking radiocollared females. Approximately half of the Central Arctic Herd was on the south side of the Brooks Range with the largest concentrations in Your Creek and Thru Creek. Subsequently, the largest groups were found in the north fork of the East Fork Chandalar River, and some occurred in the Middle Fork Chandalar River. Numerous tracks were observed in the upper North Fork Chandalar River, but few caribou were observed. Few tracks or caribou were observed in the headwaters of the Middle Fork Chandalar River or in the Wind River. One collared caribou was located by Ackerman Lake and 2 were located in Glacier Creek and Hammond River (west of the Dalton Highway), but the number of caribou in these areas was not estimated. The rest of the herd was located primarily on the north side of the Brooks Range along the foothills between the Sagavanirktok and Canning Rivers. The largest concentrations were in the Sagavanirktok, and Saviukviayak and Flood Creek drainages. Caribou also occurred along Accomplishment Creek, in the Ribdon, Lupine, Ivishak,

and Echooka drainages, and near the Canning River. Although budget and weather constraints precluded thorough surveys west of the Dalton Highway, it appeared that most of the herd wintered east of the highway.

During some years, caribou from the Western Arctic Herd mixed with the CAH during fall and winter. Central Arctic caribou probably also mix with the Teshekpuk Herd during late summer, fall and winter, and their range sometimes also overlaps with the PCH during winter and summer (ADF&G files). During 1995–2000, there was little or no mixing with the PCH during summer, largely because the PCH remained on the calving ground for only a short time and returned to Canada soon after calving. Some mixing may have occurred during summer 2001 when about 10,000 Porcupine caribou inhabited the Sadlerochit Mountains and Central Arctic caribou were located near the Canning River, 10–20 miles away. During winter we detected a small amount of overlap in CAH and PCH distribution when approximately half of the PCH was thought to have wintered in Alaska near Arctic Village. One Central Arctic radiocollared caribou was found on the Junjik River near some collared PCH caribou and a hunter killed a Central Arctic radiocollared female near Arctic Village in January 2002. One collared PCH caribou was found on the Ribdon River near some CAH animals.

MORTALITY

Harvest

Most harvest occurred in Unit 26B, but some also occurred in Units 24, 25A, and 26A. Parts of the Western Arctic Herd occasionally mixed with the CAH in fall and winter, and some of these animals may have been harvested and recorded as harvest from the CAH.

Season and Bag Limit (RY96–RY00).

Unit/Location	Resident Open Season/Bag Limit	Nonresident Open Season/Bag Limit
Unit 24, except for the Kanuti drainage upstream from and including Kanuti Chalatna Creek, and the Fish Creek and Bonanza Creek drainages of South Fork Koyukuk River.	1 Jul–30 Jun; 5 caribou per day; however, cow caribou may not be taken 16 May–30 Jun.	1 Jul–30 Jun; 5 caribou total; however, cow caribou may not be taken 16 May–30 Jun.
Unit 25A.	1 Jul–30 Apr; 10 caribou.	1 Jul–30 Apr; 5 caribou.
Unit 26B within the Dalton Highway Corridor Management Area.	1 Jul–30 Apr; 2 caribou; however, only 1 caribou may be taken from 1 Jul–30 Sep and cow caribou may be taken only from 1 Oct–30 Apr.	1 Jul–30 Apr; 2 bulls; however, only 1 bull may be taken 1 Jul–30 Sep.

Unit/Location	Resident Open Season/Bag Limit	Nonresident Open Season/Bag Limit
Unit 26B, that portion north of 69°30´ and west of the east bank of the Kuparuk River to a point at 70°10´N latitude 149°04´W longitude, then west approximately 22 miles to 70°10´ latitude 149°56´W longitude, then following the east bank of the Kalubik River to the Arctic Ocean.	1 Jul–30 Apr; 10 caribou	1 Jul–30 Apr; 5 caribou
Remainder of Unit 26B.	1 Jul–30 Apr; 2 caribou; however, only bulls may be taken from 1 Jul–30 Sep and cow caribou may be taken only from 1 Oct–30 Apr.	1 Jul–30 Apr; 2 bulls
Unit 26C.	1 Jul–30 Apr; 10 caribou; however; only bull caribou may be taken 23–30 Jun.	1 Jul–30 Apr; 5 caribou

Additional state regulations that affect caribou hunting include special restrictions along the Dalton Highway. The Dalton Highway Corridor Management Area (DHCMA) extends 5 miles from each side of the Dalton Highway from the Yukon River to the Prudhoe Bay Closed Area. The area is closed to hunting with firearms. Big game, small game, and fur animals can be taken by bow and arrow only, but hunters must possess a valid Alaska Bowhunter Education Program card or a recognized equivalent certification. In addition, no motorized vehicles except aircraft, boats, and licensed highway vehicles may be used to transport game or hunters within the DHCMA. During the March 2002 Board of Game meeting, additional restrictions were established (see below).

Federal subsistence hunting regulations also apply on federal lands within the DHCMA. Beginning in RY92, federal regulations allowed the use of firearms for hunting on federal land within the DHCMA by qualified rural subsistence hunters. During the first year of the regulation, qualified hunters included any rural resident. Subsequently, qualified hunters included residents of the corridor and the nearby villages of Anaktuvuk Pass, Wiseman, Nuiqsut, and Kaktovik.

Board of Game Actions and Emergency Orders. In RY96 the bag limit for caribou in Unit 26B outside the DHCMA (not including that area southwest of the Kalubik and Kuparuk Rivers) was changed from 1 to 2 caribou. No changes in seasons or bag limits were considered during the March 1998 and 2000 Board of Game meetings, and no emergency orders were issued during RY96–RY00.

During the March 2000 Board of Game meeting, 'Intensive Management' population and harvest objectives were established for the CAH. The population objective is 18,000–20,000 caribou and the harvest objective is 600–800 caribou (N Babbitt, ADF&G, personal communication).

During their March 2002 meeting the Board of Game considered a number of proposals related to bow hunting and the use of motorized vehicles in the DHCMA, some of which will affect CAH caribou harvest. The board established the North Slope Closed Area, which is closed to big game hunting. The area includes the portion of Unit 26B within ¼-mile of the Dalton Highway from

Atigun Pass north to the Prudhoe Bay Closed Area. The board also established a requirement that hunters using the DHCMA mark arrows with their bowhunter education certification number, extended the restrictions on the use of motorized vehicles in the DHCMA to apply to the Prudhoe Bay Closed Area, and limited the use of licensed highway vehicles in the DHCMA to publicly maintained roads. Caribou seasons and bag limits were not changed.

Hunter Harvest and Success and Residency. Reported harvest and success rate were considerably higher in RY00 than in the previous 7 years (Table 7). The change in harvest over time in the CAH probably resulted from a combination of regulatory modifications and changes in hunting pressure. Beginning in RY86, more restrictive regulations were adopted and harvest decreased substantially during the following years through RY90. In RY90 hunting restrictions were implemented on several Interior Alaska caribou herds (e.g., Delta, Macomb, Fortymile), and hunters were displaced. Because the CAH's range is accessible by road, many of these hunters began hunting it. Harvest was low in RY96, likely due to a combination of poor weather in August and September and the closure of the moose season in Unit 26B. Harvest increased in RY97 and continued to increase thereafter.

During RY98, 699 hunters reported hunting caribou in the CAH range (Table 7) and 281 hunters reported harvesting 315 caribou (45% success rate). In RY99, 722 hunters reported hunting caribou and 309 hunters reported harvesting 362 animals (50% success rate). In RY00, 808 hunters reported hunting and 415 reported harvesting 493 caribou (61% success rate). Hunter success has always been high for the Central Arctic Herd (>49%).

Bowhunters accounted for 44% of the harvest in RY00. The number of caribou harvested by archers was higher during RY96–RY00 ($\bar{x}$ = 35%) than during the previous 4 years (RY92–RY95; $\bar{x}$ = 25%; Table 7). This may reflect changes in the distribution of caribou, particularly in RY99 and RY00. The most important factor was probably the steady increase in the number of bow hunters using the DHCMA.

Harvest by nonresident hunters was small (12–17%) during RY92–RY00, although their success rate was high (60–88%). Success rate for resident hunters during the same time period was 39–54%. Harvest by local residents (residents of Units 24, 25, 26) was estimated at 200–250 caribou annually. However, it is difficult to accurately assess the harvest of CAH animals by some local residents, especially in the Nuiqsut area, because the Teshekpuk and Western Arctic Herds frequently mix with the Central Arctic Herd during periods when much of the harvest occurs.

Harvest Chronology. During RY98–RY00 most of the reported harvest occurred in August (range = 52–61%). The remaining harvest occurred primarily in September and October. The chronology of harvest was similar to previous years (Table 8). However, the proportion of harvest in August was higher during the past 5 years ($\bar{x}$ = 54%; RY96–RY00) than in the 4 years preceding that ($\bar{x}$ = 44%; RY92–RY95), probably because of the increase in new hunters hunting in August and the closure of the moose season on the North Slope in RY96 which reduced the number of hunters in the field during September. The proportion of the harvest in September was slightly higher prior to RY96 ($\bar{x}$ = 25%, RY92–RY95) than in subsequent years ($\bar{x}$ = 20%, RY96–RY00). The proportion of harvest in October was generally about 17% during RY92–RY98 but declined to 5% and 6% in RY99 and RY00, perhaps due to weather and/or caribou

distribution. A small number of caribou are taken in late winter and spring, primarily in March and April (1–5%).

Harvest by Nuiqsut residents occurred primarily in July, August, and November. During years with favorable weather, most late winter hunting occurred in March and April. When unusually cold weather persists and spring arrives late, caribou are harvested in May (S Pedersen, personal communication).

Transport Methods. Because of restrictions on the use of off-road vehicles within the DHCMA and the remoteness of Unit 26B, most hunters used highway vehicles and aircraft for access. During RY98–RY00, the proportion of hunters using highway vehicles was stable, ranging from 60 to 65%. Airplanes were the second most common transport method and were used by 18–28% of successful hunters; boats, horses, and dogs were each used by ≤15% of hunters (Table 9). Transport methods were similar to methods used in previous years, although use of boats (including airboats) on the Ivishak and Sagavanirktok Rivers has increased somewhat over the past 5 years. Residents of Unit 26 primarily used snowmachines during the winter and spring months and boats during summer months; particularly on the Colville River and Fish Creek in Unit 26A (S Pedersen, personal communication).

Natural Mortality

Radiocollared caribou were relocated infrequently during fall and winter, making it difficult to estimate adult mortality or determine causes of adult mortality. Wolves (*Canis lupis*), grizzly bears (*Ursus arctos*), and golden eagles (*Aquila chrysaetos*) are the 3 most common predators on Arctic caribou (Whitten et al. 1992). However, natural mortality of CAH caribou during calving and postcalving is relatively low because calving occurs in areas near the coast where there are few wolves, and predation by golden eagles appears to be rare compared to the Porcupine caribou herd (Murphy and Lawhead 2000). Grizzly bear numbers may have increased in the oil field, in part because of the availability of garbage associated with oil development (Murphy and Lawhead 2000), and predation by grizzly bears may have increased in recent years. Winter mortality was probably higher during the 1990s than in previous years because more CAH caribou wintered on the south side of the Brooks Range, where wolves are probably more abundant than they are on the north side of the range. However, there have been no studies of predation rates on the CAH. During the 4 years from RY97–RY00 we confirmed 3 (3%), 1 (2%), 8 (9%), and 15 (14%) mortalities among cow caribou with functioning radio collars.

CONCLUSIONS AND RECOMMENDATIONS

High parturition rates and late June calf:cow ratios, and low adult mortality during 1998, 1999, and 2000 contributed to an increase of approximately 37.5% in the Central Arctic caribou herd between 1997 and 2000 (Tables 1, 2, and 3). These population parameters were similar in 2001, suggesting that the CAH has been stable or has increased since July 2000.

Harvest increased in RY00, but was still well below sustained yield (<2% of the herd). Most hunters living outside of Unit 26 used primarily highway vehicles as a means of access with most harvest occurring in August. Harvest by bow hunters has also increased in recent years. Hunters

residing in Unit 26 used primarily snowmachines, with most of this harvest occurring in July and August.

Although herd size has increased and harvest has remained somewhat stable with a slight increase in RY00, the CAH has provided substantial hunting opportunity. We recommend no regulatory changes but suggest revised management goals and objectives for the next reporting period as follows:

MANAGEMENT GOALS

Goal 1 Minimize the adverse effects of development on CAH caribou.

Goal 2 Maintain a CAH population level that will support a harvest of at least 600 caribou without precluding population growth.

Goal 3 Provide the opportunity for a subsistence harvest of CAH caribou.

Goal 4 Maintain opportunities to view and photograph CAH caribou.

MANAGEMENT OBJECTIVES

Objective 1 Maintain a population of at least 18,000–20,000 caribou. (Goals 1, 2, 3)

Objective 2 Maintain accessibility of seasonal ranges for CAH caribou. (Goal 1)

Objective 3 Maintain a harvest of at least 600 caribou if the population is ≥18,000 caribou. (Goal 2)

Objective 4 Limit the annual harvest of cows to a maximum of 3% of the cows in the population. (Goals 1, 2, 3)

Objective 5 Maintain a ratio of at least 40 bulls:100 cows. (Goals 1, 2, 3)

Objective 6 Reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway. (Goal 3)

MANAGEMENT ACTIVITIES

- Conduct a photocensus every 2–3 years. (Objective 1)
- Radiocollar 10–20 yearling females every 1–2 years. (Objectives 1, 2)
- Estimate parturition rate and late June calf:cow ratios for radiocollared females. (Objective 1)
- Work with the oil industry and other agencies to minimize disturbance to caribou from resource development. (Objective 1, 2)
- Monitor early summer, fall, and winter distribution. (Objective 1, 2)

- Conduct annual fall composition counts. (Objectives 3, 4, 5)
- Monitor harvest through harvest ticket reports and Division of Subsistence harvest surveys. (Objectives 3, 4)
- Regulate hunting to maintain a maximum annual harvest rate of 3% of cows in the population. (Objective 4)
- Regulate caribou hunting along the Dalton Highway to reduce conflicts between consumptive and nonconsumptive uses. (Objective 6)

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Table 1 Central Arctic Herd caribou calving composition on the calving grounds[a] and estimated population size, 1978–2000

	Calving composition survey						Population survey	
Year	Month/ Date	Yearlings: 100 Cows	Bulls:100 Cows	Calves:100 Cows	Percent calves	Composition sample size	Date and method[b]	Estimated size
1978	Jun		19	68	36	950	Jul; STS	5000
1979	Jun	24	6	80	38	1865		
1980	Jun	48	4	69	31	787		
1981	Jun	22	9	87	40	3337	Jul; AC	8537
1982	Jun		20	62	34	1101		
1983	Jun		16	86	42	1879	Jul; APDCE	12,905
1984	12 Jun	25	9	89	40	2692		
1985	13–14 Jun	35	16	88	37	2357		
1986	12–13 Jun	33	7	56	29	891		
1987	13 Jun	19	4	74	37	4839		
1988	10–15 Jun	32	7	66	32	4892		
1989	11–15 Jun	16	6	48	28	2520		
1990	11–15 Jun	11	31	75	35	6543		
1991							18–20 Jun; GM	19,046[c]
1992	11–14 Jun	12	6	73	38	5556	8–9 Jul; APDC	23,444
1994	12–14 Jun	8	17	65	29	3638		
1995							13 Jul; APDC	18,100
1997	11–12 Jun	37	9	72	33	1995	19–20 Jul; APDC	19,730
2000	15–17 Jun	32	5	72	34	3097	21 Jul; APDC	27,128

[a] Many bulls and yearlings are not on the calving grounds during this time.

[b] STS = Systematic transect surveys; AC = Aerial count; APDCE = Aerial Photo Direct Count Extrapolation; GM = Gasaway Method; APDC = Aerial Photo Direct Count.

[c] Ninety-percent confidence interval was 14,677–23,414.

Table 2 Central Arctic Herd caribou percent parturition of radiocollared females ≥4 years, 1988–2001

Year	Date	Percent parturition by subunit					
		≥4 years old[a]			Sexually mature[b]		
		26B West (*n*)	26B East (*n*)	All 26B (*n*)	26B West (*n*)[c]	26B East (*n*)[c]	All 26B (*n*)
1988	2–14 Jun				73 (11)	100 (8)	85 (34)
1989	30 May–10 Jun				54 (13)	78 (9)	65 (23)
1990	31 May–14 Jun				83 (12)	100 (7)	87 (23)
1991	2–8 Jun				46 (11)	75 (12)	67 (30)
1992	6–12 Jun				73 (11)	75 (12)	77 (26)
1993	7–12 Jun				56 (9)	63 (8)	59 (17)
1994	10–14 Jun	67 (6)	78 (9)	73 (15)	67 (6)	88 (8)	79 (14)
1995	7–8 Jun	75 (4)	40 (5)	56 (9)	67 (3)	40 (5)	56 (9)
1996[d]							
1997	6–7 Jun	77 (13)	46 (13)	61 (26)	83 (12)	43 (7)	70 (20)
1998	3–4 Jun	93 (14)	90 (10)	92 (24)	92 (13)	100 (7)	95 (21)
1999	5, 9 Jun	100 (14)	100 (10)	100 (24)	100 (14)	89 (9)	100 (23)
2000[e]	6–7 Jun	89 (9)	100 (16)	96 (25)	83 (12)	100 (11)	92 (24)
2001[e]	3–9 Jun	89 (19)	94 (16)	91 (35)	92 (13)	93 (15)	91 (32)

[a] Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River.

[b] The criteria for a sexually mature female is that she was determined to have been parturient before including her in the sample. Data for females that were sexually mature were stratified based on the location of caribou east and west of the Sagavanirktok River. However, they were only included in the sample if they were located on the same side during the previous and current summer. Thus, the total (All 26B) may exceed the combination of Unit 26B West and Unit 26B east.

[c] 1988–1994 data are from Cameron 1995 and Cameron et al. 2002.

[d] Survey not completed.

[e] Late spring on North Slope; some caribou still migrating during parturition estimates.

Table 3 Central Arctic Herd caribou late June and summer calf:100 cow ratios[a] of radiocollared females ≥4 years old, 1988–2001

		Late June calf:cow ratios by subunit					
		≥4 years old[b]			Sexually mature[c]		
Year	Date	26B (West) (*n*)	26B (East) (*n*)	All 26B (*n*)	26B (West) (*n*)	26B (East) (*n*)	All 26B (*n*)
1988	Jun, Jul, Aug				47 (15)	100 (7)	71 (31)
1989	Jun, Jul, Aug				55 (11)	60 (5)	55 (20)
1990	Jun, Jul, Aug				67 (9)	75 (4)	63 (16)
1991	Jun, Jul, Aug				45 (11)	75 (4)	56 (22)
1992	Jun, Jul, Aug				64 (11)	82 (11)	71 (24)
1993	Jun, Jul, Aug				56 (9)	56 (9)	56 (18)
1994	27–29 Jun	50 (6)	75 (8)	64 (14)	50 (6)	67 (9)	60 (15)
1995	27, 30 Jun	75 (4)	50 (4)	63 (8)	67 (3)	50 (4)	63 (8)
1996	15–16 Jun	50 (4)	75 (4)	63 (8)	86 (7)	100 (4)	83 (12)
1997	29–30 Jun	85 (13)	64 (11)	75 (24)	83 (12)	50 (6)	74 (19)
1998	29–30 Jun	79 (14)	85 (13)	81 (27)	85 (13)	100 (9)	88 (24)
1999	22–24 Jun	92 (12)	80 (10)	86 (22)	91 (11)	78 (9)	85 (20)
2000	17–19 Jun	79 (14)	72 (18)	75 (32)	73 (15)	79 (14)	77 (30)
2001	23–25 Jun	78 (18)	81 (16)	79 (34)	73 (15)	77 (13)	77 (30)

[a] Late June calf:100 ratio was estimated during 15 June–30 June. Summer calf:100 cow ratio was estimated during 15 June–15 August for years 1988–1993.

[b] Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River.

[c] The criteria for a sexually mature female is that she was determined to have been parturient before including her in the sample. Data for females that were sexually mature were stratified based on the location of caribou east and west of the Sagavanirktok River. However, they were only included in the sample if they were located on the same side during the previous and current summer. Thus, the total (All 26B) may exceed the combination of Unit 26B West and Unit 26B East.

Table 4 Central Arctic Herd caribou known-age parturition rates (percent) of radiocollared females, 1994–2001

Year	Date	2-year-olds (*n*)	3-year-olds (*n*)	4-year-olds (*n*)	5-year-olds (*n*)	≥ 6-year-olds (*n*)
1994	10–14 Jun	0 (5)				73 (15)
1995	7–8 Jun	0 (8)	0 (4)			56 (9)
1996						
1997	6–7 Jun	0 (2)	0 (2)	29 (7)	100 (2)	67 (3)
1998	3–4 Jun	0 (6)	75 (4)	0 (1)	88 (8)	100 (3)
1999	5, 9 Jun	9 (11)	82 (11)	100 (2)	100 (1)	100 (17)
2000	6–7 Jun	0 (8)	80 (10)	100 (9)		94 (16)
2001	3–8 Jun	8 (13)	77 (13)	100 (10)	78 (9)	94 (16)

Table 5 Central Arctic Herd caribou known-age late June calf:cow ratios of radiocollared females, 1994–2001

Year	Date	2-year-olds (*n*)	3-year-olds (*n*)	4-year-olds (*n*)	5-year-olds (*n*)	≥ 6-year-olds (*n*)
1994	27–29 Jun	0 (4)				64 (14)
1995	27–30 Jun	0 (6)	0 (3)			62 (8)
1996	15–16 Jun		71 (7)	50 (4)		83 (6)
1997	29 Jun		0 (1)	57 (7)	100 (3)	100 (3)
1998	29–30 Jun	<1 (7)	50 (4)	0 (1)	86 (7)	100 (5)
1999	22–24 Jun	<1 (11)	40 (10)	100 (2)	100 (1)	80 (15)
2000	17–18 Jun	0 (11)	60 (10)	82 (11)	0 (1)	75 (20)
2001	23–25 Jun	0 (3)	33 (12)	70 (10)	89 (9)	81 (16)

Table 6 Central Arctic caribou herd fall composition counts, 1976–2001

Survey date	Bulls:100 cows	Calves:100 cows	Percent calves	Percent cows	Percent small bulls (% bulls)	Percent medium bulls (% bulls)	Percent large bulls (% bulls)	Percent bulls	Composition sample size
Oct 1976	122	44	17	38				46	1223
Oct 1977	118	55	20	37				43	628
Oct 1978	96	58	23	39				38	816
Oct 1980	132	49	18	35				47	1722
Oct 1981	81	64	26	41	22	41	36	33	1712
16-18 Oct 1992	96	47	19	41	37	27	40	40	2469
22 Oct 1996	61	67	29	44	15	43	43	27	3062
12 Oct 2000	84	57	24	42	45	40	14	35	3335
13 Oct 2001	73	54	24	44	38	39	23	32	4092

Table 7 Central Arctic Caribou Herd harvest and hunter success, regulatory years 1984–1985 through 2000–2001

Regulatory year	Reported harvest					Total hunters	Percent successful hunters	Estimated unreported harvest[b]	Total harvest
	Male	Female	Unk	Total (harvest by bow)[a]					
1984–1985	313	55	0	368				100–200	468–568
1985–1986	482	177	3	662				100–200	762–862
1986–1987	311	34	0	345		287	76	100–200	445–545
1987–1988	176	2	3	181		225	77	100–200	281–381
1988–1989	179	7	0	186		255	73	100–200	286–386
1989–1990	132	8	0	140		221	63	100–200	240–340
1990–1991	96	16	0	112		173	55	100–200	212–312
1991–1992	383	24	1	408		618	57	100–200	508–608
1992–1993	391	32	4	427	(93)	655	58	100–200	527–627
1993–1994	347	23	2	372	(90)	618	54	100–200	472–572
1994–1995	320	20	0	340	(103)	584	54	100–200	440–540
1995–1996	318	18	0	336	(79)	571	53	100–200	436–536
1996–1997	200	18	3	221	(77)	384	49	200–250	421–471
1997–1998	289	18	2	309	(96)	500	54	200–250	509–559
1998–1999	292	18	5	315	(87)	699	45	200–250	515–565
1999–2000	343	17	2	362	(136)	722	50	200–250	562–612
2000–2001	464	28	1	493	(215)	873	56	200–250	693–743

[a] Harvest by bow is included in total harvest.

[b] Estimate by area biologist and Division of Subsistence.

Table 8 Central Arctic caribou herd harvest chronology, regulatory years 1992–1993 through 2000–2001[a]

Regulatory year	Month (%)																						Unk	Total
	Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun			
1992–1993	7	(2)	197	(46)	122	(29)	73	(17)	10	(2)	1	(<1)	1	(<1)	0	(0)	6	(1)	6	(1)	1	(<1)	0	(0)	3	427
1993–1994	34	(9)	152	(41)	73	(20)	78	(21)	14	(3)	1	(<1)	2	(<2)	4	(<1)	3	(1)	8	(2)	0	(0)	0	(0)	3	372
1994–1995	28	(8)	154	(45)	109	(32)	27	(8)	1		0	(0)	0	(0)	0	(0)	12	(3)	6	(2)	0	(0)	0	(0)	3	340
1995–1996	9	(3)	150	(45)	64	(19)	65	(19)	21	(6)	1	(<1)	4	(<1)	1	(<1)	9	(3)	8	(2)	0	(0)	0	(0)	4	336
1996–1997	13	(6)	108	(49)	49	(22)	35	(16)	1		0	(0)	2	(<1)	0	(0)	2	(1)	5	(2)	0	(0)	0	(0)	5	220
1997–1998	7	(2)	189	(61)	40	(13)	44	(14)	1		3	(<1)	0	(0)	0	(0)	7	(2)	14	(4)	0	(0)	0	(0)	4	309
1998–1999	18	(6)	163	(52)	59	(19)	47	(15)	5	(2)	2	(<1)	3	(<1)	2	(<1)	3	(1)	9	(3)	0	(0)	0	(0)	4	315
1999–2000	18	(5)	201	(55)	86	(24)	16	(5)	8	(2)	1	(<1)	1	(<1)	0	(0)	8	(2)	17	(5)	0	(0)	2	(<1)	4	362
2000–2001	42	(8)	262	(53)	109	(22)	32	(6)	11	(2)	0	(0)	2	(<1)	3	(<1)	4	(1)	24	(5)	0	(0)	0	(0)	4	493

[a] Includes only harvest from harvest report cards.

Table 9 Central Arctic caribou herd successful hunter transport methods, regulatory years 1984–1985 through 2000–2001

Regulatory year	Transport methods (%)								Total
	Airplane	Horse/Dog	Boat[a]	3- or 4-Wheeler	Snowmachine	Other ORV	Highway vehicle	Unk	
1992–1993	89 (23)	7 (2)	17 (5)	6 (2)	0 (0)	0 (0)	243 (64)	18 (5)	380
1993–1994	49 (15)	4 (1)	20 (6)	4 (1)	2	0 (0)	242 (73)	12 (4)	333
1994–1995	81 (25)	0 (0)	23 (7)	0 (0)	0 (0)	0 (0)	214 (67)	0 (0)	318
1995–1996	87 (28)	4 (1)	30 (10)	0 (0)	0 (0)	0 (0)	177 (58)	7 (2)	305
1996–1997	63 (28)	8 (4)	19 (9)	0 (0)	0 (0)	0 (0)	126 (57)	5 (2)	221
1997–1998	58 (19)	7 (2)	14 (5)	0 (0)	0 (0)	1 (<1)	216 (70)	13 (4)	309
1998–1999	66 (21)	4 (1)	36 (11)	0 (0)	0 (0)	1 (<1)	205 (65)	3 (1)	315
1999–2000	100 (28)	9 (9)	29 (8)	1 (<1)	0 (0)	1 (<1)	218 (60)	4 (1)	362
2000–2001	90 (18)	17 (17)	74 (15)	1 (<1)	4	0 (0)	302 (61)	5 (1)	493

[a] Includes airboats.