Population Monitoring and Status of the Reintroduced Nushagak Peninsula Caribou Herd

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Progress Report

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SUMMARY

Radiocollared Nushagak Peninsula caribou were monitored monthly throughout the year and weekly during calving to determine calf production and recruitment, adult mortality, distribution, home ranges and movements. Additionally, non-collared caribou were surveyed to estimate herd sex and age composition and population size. Ten female caribou (10 months old) were captured and radiocollared in early April 2000. Calf production was estimated to be 90.9 calves per 100 adult females, however recruitment to fall was 30.0 calves per 100 adult females, the lowest recorded in the 13 years of this study. Average adult calf production during 1990 - 1994 was significantly higher than from 1995 - 2000 ($\chi^2 = 12.73$, $P<0.005$), however, average calf recruitment rate during 1990 - 1994 did not differ from 1995 - 2000 ($\chi^2 = 0.584$, $P<0.5$). Annual mortality rate for the 2000 monitoring period (April 2000 - March 2001) was 0.143, slightly above the 1988 - 1999 average of 0.124. Average mortality rates during 1988 - 1993 (0.025) and 1994 - 2000 (0.207) were significantly different ($\chi^2 = 17.64$, $P<0.005$). Caribou continue to reside primarily on the Nushagak Peninsula, however, a majority of the herd left in October but most had returned by late November. Annual home range size for collared caribou ($n = 15$) averaged 395.4 km^2. Average life home range size for 57 radiocollared caribou was 520.5 km^2 (range 201.7 - 867.8 km^2). Caribou with ≥ 30 locations ($n = 45$) had life home ranges averaging 562.5 km^2. A helicopter composition survey of 707 caribou in early October yielded estimated ratios of 51.5 males and 38.1 calves per 100 females. A population count in February 2001 estimated 1,037 caribou, a decrease of 27.4 percent ($r = -0.107$) from the peak of 1,399 caribou estimated in 1997. Subsistence hunters from Dillingham and Manokotak reported harvesting 126 caribou, over twice the previous 5 year average annual harvest ($\bar{x} = 51.4$). The increased harvest was likely due to limited winter access to moose and Mulchatna caribou, and outreach efforts to promote compliance with hunting regulations for Nushagak Peninsula caribou. The current size of the herd is close to the management objective of maintaining a maximum of 1,000 caribou on the Nushagak Peninsula. Management recommendations include continued population and range monitoring and outreach efforts to promote hunter compliance.

BACKGROUND

Historically, a large caribou herd roamed the coast of the Bering Sea from Bristol Bay to Norton Sound. Archaeological excavations near the village of Togiak in 1960 suggested caribou were important to the Native population (Kowta 1963). Presumably, caribou once concentrated in the mountains upriver from Togiak Bay and in the rocky headland toward Cape Newenham. Large caribou herds were also observed "roaming over the mountains of the Nushagak Peninsula" (Petrov 1900). Petrov (1884) noted caribou were virtually absent from the lower Yukon - Kuskokwim River area by 1880. While still numerous in the upper Kuskokwim drainage (Capps 1929), caribou were absent in the Togiak and Goodnews drainages as early as 1900. Alaska Game Commission reports noted only small scattered herds in the Kilbuck Mountains by the mid 1930s. Caribou disappeared during a period of human population growth, which included an influx of Caucasians and intense commercial trade.

Caribou were reintroduced to the Nushagak Peninsula in February 1988, after an absence of more than 100 years (Hotchkiss 1989). The purpose was to reestablish a herd in the area which would eventually provide local residents with the opportunity to hunt caribou. The Nushagak Peninsula caribou herd grew rapidly from 146 reintroduced caribou to over 1,000 in 6 years; an exponential rate of increase of r = 0.317 (Hinkes and Van Daele 1996). The dramatic growth of the herd was attributed to the initial high percentage of females in the herd, high calf production and survival rates, pristine range condition, few predators, and no hunting until 1995. The population continued to grow from 1993 to 1997, but at a lower rate (r = 0.087). The herd peaked at 1,399 caribou in 1997. Population density on the Nushagak Peninsula reached approximately 1.2 caribou per km^2 in 1997 and 1998. Season length and harvest limit have doubled since hunting was initiated in 1995. The herd is managed under the auspices of the Nushagak Peninsula Caribou Management Plan (USDI 1994) and regulations promulgated by the Federal Subsistence Board.

STUDY AREA

A majority of our work was performed on the Nushagak Peninsula located in northern Bristol Bay (Fig. 1). The Nushagak Peninsula proper (the land south of the Igushik River, Tuklung River and Tuklung Hills, west to Tvativak Bay) is approximately 1,100 km^2 consisting primarily of lowland tundra and wetlands. Vegetation classification and range monitoring are described by Johnson (1994). The majority of uplands are within Togiak National Wildlife Refuge. The Peninsula lies within portions Game Management Units 17C and 17A. Climate is primarily maritime influenced with temperatures ranging from an average minimum of -16° C in January to an average maximum of 16° C in July. Total annual precipitation averages 60 cm with 150 to 180 cm annual snowfall (USDI 1986).

On occasion, our work was performed in the drainages flowing into Kulukak Bay. This area is adjacent to the northwest corner of the Nushagak Peninsula and includes the southern portion of the Wood River Mountains.

METHODS

Capture and Radiocollaring

We used a Cessna 185 to locate caribou groups and monitor darted individuals. Female caribou, 10 - 11 months old, were pursued with a Robinson 44 helicopter and darted with a mixture of 1 mg carfentanil and 33 mg xylazine fired from a CO_2 pistol (Valkenburg et al. 1999). We collected standard measurements (total length, neck and heart girth, metatarsus, hind foot, jaw and weight) and blood samples and fitted immobilized caribou with a VHF radiocollar (Telonics Model 600). Additionally, body condition scores were assigned using criteria in Gerhart et al.

(1996). Standard measurements and body condition scores were averaged by year. Age was estimated by visual examination of the state of eruption and attrition of the mandibular tooth row (Miller 1974). Naltrexone (100 mg) was administered intramuscularly as a reversal.

Blood samples were kept unfrozen and were centrifuged the same day collected. Whole blood, plasma and serum samples were transferred to labeled 1.8 ml cryovials and frozen. Samples were sent to the Alaska Wildlife Serum Bank in Fairbanks for storage and future analysis.

Radiotracking

We attempted to radiotrack all caribou on a monthly basis, using either a Piper SuperCub (PA-18) or Cessna 185. During the calving period adult females, not previously observed with a newborn calf, were monitored weekly. During October, calf association with radiocollared adult females was used as an index of fall recruitment. During telemetry flights we recorded location, determined by onboard GPS, and group size of all caribou encountered, regardless of any radiocollared individuals present. Additionally, we recorded locations and numbers of brown bears, wolves and coyotes observed during flying. Information was recorded on a field data form and entered in the Wildlife Database (Microsoft Access) at Togiak Refuge headquarters.

Calf Production, Chronology, Survival and Recruitment

Female caribou were divided into 2 age classes; subadults (2 year olds) and adults (3 or more years old). Calf production was calculated as the sum of all calves observed in association with radiocollared females divided by the number of radiocollared females multiplied by 100. Calf birth date was the mid-point between the dates a female was last seen without a calf or 13 May, whichever came later, and when first observed with a calf before 11 June. Mean calving is defined as the date by which $\geq$ 50% of calves are born. Chronology data from 1992 - 1995 and 1996 - 2000 was pooled for comparison. Calf survival to fall was estimated by the number of calves associated with radiocollared females divided by the number of calves produced. We censored calves of missing females and of females not observed. We assumed calves did not survive if their mothers died before October of the same year. Calf recruitment to fall was estimated by the number of calves associated with radiocollared females divided by the total number of females multiplied by 100. For recruitment analysis we censored females (and their calves) that were missing, dead or whose calf status was unknown. Chi-square analysis was used to test for differences in average production, survival and recruitment of calves between age classes (subadults and adults) and between time periods (1990 - 1994 and 1995 -2000). In comparing age classes, we pooled years both age classes were represented (1992, 1996 and 1998) to increase sample size. In comparing time periods, we used adults only for production and recruitment, whereas for survival we pooled adults and subadults. The Cox - Stuart test for trend was used to determine if recruitment rates from 1990 - 2000 exhibit a trend.

Sex and Age Composition

We used a Cessna 185 to locate and monitor classification status of caribou groups. A Robinson 44 helicopter served as the platform for classifying caribou age and sex. A front seat observer classified caribou as calves, females or males. Males were further classified as small, medium or

large based on antler characteristics. A rear seat observer/recorder used a five-place tally meter to enter classification data called out by the front seat observer. After each group of caribou surveyed, composition information was recorded to a field data sheet and the tally meter reset to zero. Additionally, video footage was acquired of several caribou groups, to be made into a training video.

Mortality

Radiocollars with built-in mortality sensors have been deployed on Nushagak Peninsula caribou since 1992. Radiocollars on caribou from the reintroduction did not have this feature. However, we attempted to get visual confirmation of all instrumented animals thought to have died. For confirmed mortalities, we used the midpoint between dates last known alive and first known dead. For some caribou (hunter kills), the exact date of death is known. We attempted to determine cause of mortality based on examination of the site of death. Mortality rates were calculated annually (April - March) and averaged by year. We excluded 2 males and censored caribou missing or dead from capture related causes. Caribou were deemed missing if their status was unknown. Subadults are defined as caribou 10 - 34 months old and adults as 35 months or older. Chi-square analysis was used to test for differences in mortality rates between age classes (subadults and adults) and between years (1988 - 1993 and 1994 - 2000). In comparing age classes, we pooled years both age classes were represented (1992, 1995 - 1998, 2000) to increase sample size. In comparing time periods, we pooled adults and subadults.

Population Estimate

Caribou population size on the Nushagak Peninsula was estimated using a total count technique during late winter. We attempted to census caribou when there was complete snow cover and ideally, when snow cover was fresh, lighting was bright and winds less than 25 kph. A Cessna 185, with two observers and pilot, flew 150 - 200 m above ground level at 150 - 200 kph ground speed over latitudinal transects spaced 1.85 km apart. Transects vary in length and begin on 58° 24' N and end on 58° 50' N. Odd-numbered transects were flown west to east while even-numbered transects were flown east to west (Fig. 2). Both observers and pilot searched for caribou within 1 km of the aircraft. Occasionally we deviated from a transect line to obtain a more accurate count, especially for distant or groups >50 caribou. On-board GPS was used in navigating and allowed us to return to transect departure points. Often, three independent estimates of a group of caribou were made. For dissimilar estimates we would either conduct a recount or decide by consensus the number of caribou present depending on the amount of disparity relative to group size. Incidental observations of other wildlife were recorded.

In some years, 1 - 2 radiocollared caribou were not on the Nushagak Peninsula proper when a count was conducted. We enumerated these and other caribou associated with them by conventional radiotracking, and added them to the peninsula count to obtain an estimate of herd size.

We projected year-end estimates of caribou numbers using the formula: $N_{t+1} = (N_t - H)S + (N_c \times R \times 0.90)$ where N_{t+1} is the projected estimate, N_t is the most recent population count or estimate;

H is reported harvest during the calendar year; S is the previous 5 year average survival rate for radiocollared caribou; N_c is the most recent estimate of the number of females $\geq$ 2 years old; and R is the previous 5 year average fall calf recruitment rate for radiocollared females $\geq$ 2 years old. We assumed male survival equaled that for females or 0.90, whichever was less, and calf survival from fall to the end of the year was 0.90. For projections beyond 2001 we used 1996 - 2000 average survival and fall calf recruitment rates and average annual harvest for 1997 - 2001.

Distribution, Home Range and Movements

Home ranges of individual collared female caribou were calculated on two different time scales, annual and life. For annual home ranges, the 100% minimum convex polygon (MCP) technique (Mohr 1947) was used to calculate a home range using the first location in April to the last location in March of the following year. For the 1999 monitoring period (April 1999 - March 2000) we excluded all locations obtained on 4 February 2000 as 8 of 16 radiocollared caribou were located off the Nushagak Peninsula. Likewise, for the 2000 monitoring period, we excluded locations obtained on 31 October 2000 as 12 of 17 radiocollared caribou had moved off the peninsula. Additionally, animals with few locations or with home ranges extending off the Nushagak Peninsula were excluded from analysis as these individuals are not representative of the herd. We pooled annual home ranges by monitoring period for subadults (10 - 22 months old), adults (>22 months old), and all ages. For life home ranges, MCP's were constructed after five percent of all locations associated with an individual were removed using harmonic mean analysis. We excluded animals with less than one years data (n = 10) and animals with ranges still extending off the Nushagak Peninsula (n = 7). Further exclusions included locations prior to April 1988 and locations obtained 31 October 2000 for caribou captured in 2000. We did not consider salt water as caribou habitat and recalculated any home ranges by excluding the salt water portion only.

The Animal Movement Analysis extension for ArcView was used to estimate home range size and distances moved between relocations (Hooge and Eichenlaub 1997) for subadults and adults. For seasonal movement analysis, winter was defined as November - April, spring (calving) as May - June, summer as July - August and fall (rut) as September - October. Friedman two-way analysis of variance by ranks was used to test for differences between months, seasons and age classes.

Subsistence Harvest

Hunting for Nushagak Peninsula caribou is managed under regulations determined by the Federal Subsistence Board. The Nushagak Peninsula Caribou Planning Committee determines, by consensus, the number of federal registration permits to be made available to villages with a positive customary and traditional use determination for this resource. Tribal Councils administered the permits in their respective villages. Hunters (permittees) are required to report on the outcome of their hunt, regardless of whether or not they hunted. We determined reported harvest by returned hunt reports and telephone inquiry of non-responders.

RESULTS AND DISCUSSION

Capture and Radiocollaring

During 2 - 3 April, 2000 we radiocollared 10 female calves (10 months old). Calves were captured on the Nushagak Peninsula proper (n = 8) and near Tvativak and Metervik bays (n = 2). No mortalities occurred during capture operations and all new captures were alive on 12 April 2000. By 15 May 2000, however, 2 of the recent captures had died. Based on evidence at the site of mortality and distance moved from the capture location, we suspect one was predated and the other died due to capture related causes.

Standard measurements were obtained for all caribou captured (Table 1). Body condition scores and weights averaged 2.2 and 49.2 kg, respectively, and were the lowest recorded for this herd (Table 2). We lack objective data on duration and amount of snowfall to gauge or compare winter severity, however, the 1999 - 2000 winter may have been the most severe since the early 1990's. Substantial snow accumulation from numerous storms during November - January persisted well into March. Average monthly (October - January) temperatures in Dillingham were below the 40 year mean. December and January average monthly temperatures were the coldest and second coldest, respectively, on record. On 4 February 2000, the first documentation of a majority of Nushagak Peninsula caribou off the peninsula proper occurred. Caribou observed off the peninsula were taking advantage of the windswept hills surrounding Kulukak Bay. Decreased lichen biomass on the Nushagak Peninsula and decreased availability, due to snow cover, were probably responsible for lower calf weights and body condition scores. Valkenburg et al. (2000) showed that body weight was significantly limited by density-dependent nutritional factors.

Previous to 2000, a Hughes 500 helicopter with a skid-mounted net gun was used to capture caribou for radiocollaring and reintroduction (Hotchkiss 1989, Hinkes and Van Daele 1996). A total of 66 caribou were radiocollared using this method; 20 in 1988; 16 in 1992; 10 in 1995; and 20 in 1997. With the exception of two males in 1988, all other instrumented animals were females. Estimated age of females at capture has ranged 10 - 118 months old.

Radiotracking

We obtained 285 locations associated with 25 radiocollared caribou during 23 flights from 2 April 2000 - 27 March 2001. Locations per animal averaged 11.4 and ranged from 1 to 17. Additionally, we obtained 97 locations of unmarked animals suspected to be Nushagak Peninsula caribou. Prior to this monitoring period, 3,666 locations of radiocollared caribou and 897 locations of unmarked caribou had been obtained. Total relocations from 19 February 1988 (first flight after reintroduction) to 27 March 2001 stands at 4,945.

Calf Production, Chronology, Survival and Recruitment

In 2000, 10 of 11 radiocollared adult females produced 10 calves suggesting a production rate of 90.9 calves per 100 females (Table 3). Calf production averaged 91.0 per 100 adult females from 1990 - 2000. Production rates are minimum estimates as some calves might not have been

observed. Including subadults with adults gives an estimate of 84.4 calves per 100 females produced annually. Average calf production rates were significantly different between subadults and adults monitored the same years ($\chi^2 = 27.62$, $P<0.005$). Average adult calf production during 1990 - 1994 was significantly higher than from 1995 - 2000 ($\chi^2 = 12.73$, $P<0.005$). Valkenburg et al. (2000, In Press) provided evidence that caribou natality was significantly limited by density-dependent nutritional factors.

Calving generally begins in mid- to late May and is nearly complete by early June. During 2000, radiocollared adult females were observed with 0 (0%) calves by 22 May; 8 (80%) calves by 30 May; and 9 (90%) calves by 8 June (Table 4). Mean calving date from 1992 - 2000 was 24 May (Fig. 3). From 1992 - 1995, mean calving occurred by 21 May, while from 1996 - 2000 it was 26 May. This apparent delay may be related to a change in nutritional status.

Calf survival rate to late October 2000 was 0.300 (Table 3). One radiocollared adult female (92-23) died between 17 July and 21 August and we assumed her calf did not survive as well. Calf survival averaged 0.621 for all calves from 1990 - 2000 (Table 3). Survival rate for calves born to subadults was similar to calves born to adults ($\chi^2 = 0.047$, $P>0.9$). Average survival rates for all calves between 1990 - 1994 and 1995 - 2000 was similar ($\chi^2 = 0.165$, $P>0.75$). Three sources of bias may affect estimated calf survival. Calves that were "missed" (born and died between observation periods) would inflate our survival estimate. On the other hand, calves separated from their mothers would lower estimated survival. Valkenburg (pers. comm.) observed as high as 50 percent of male calves and 10 percent of female calves, in the Delta Herd, in which the bond with the adult female had been broken by the onset of rut. Lastly, our small sample size ($n = 10$ calves) may not be reflective of the population at large.

Fall 2000 recruitment rate was 30.0 calves per 100 adult females, the lowest recorded to date. Calf recruitment during 1990 - 2000 averaged 59.7 calves per 100 adult females (Table 3). Overall recruitment, including subadult females, averaged 55.0 calves per 100 females. Average calf recruitment rates were significantly different between subadults and adults monitored the same years ($\chi^2 = 10.63$, $P<0.005$). Average calf recruitment rate during 1990 - 1994 did not differ from 1995 - 2000 ($\chi^2 = 0.584$, $P<0.5$), however, recruitment of calves from 1990 - 2000 shows a declining trend ($P = 0.0312$).

Sex and Age Composition

On 8 October 2000, we classified 707 caribou or approximately 70 percent of the total population. Estimated ratios of males and calves per 100 females were 51.5 and 38.1, respectively (Table 5). The proportion of calves observed was the lowest since reintroduction. Proportions of females and males observed in 2000 increased from 1999, likely influenced by the decrease in percentage of calves present. Small antlered males increased 55.1 percent while medium and large antlered males decreased 32.2 and 5.9 percent, respectively.

Fall 2000 recruitment of calves to radiocollared adult females ($n = 10$) suggest 30.0 calves per 100 females. Typically, our fall recruitment rates based on radiocollars is less than that observed

during helicopter composition surveys made during the same time period. Two reasons partially explain the difference. First, the adult female-calf bond may be broken. Secondly, recruitment rates are based on the number of radiocollared females $\geq$ 3 years old, whereas helicopter composition includes all females > 1 year old. Recruitment by 2-year olds would yield a higher ratio of calves to adult females in the helicopter survey, however, another problem arises. Including yearling females (non-breeders) as adult females would yield a lower ratio of calves. If we assume the number of small males classified equals the number of yearling females and subtract them from the number of adult females, this would give a better estimate of adult females present in the population. Applying this to our 2000 data would result in estimates of 67.1 males and 49.7 calves per 100 females.

Mortality

Annual mortality rate for the 2000 monitoring period was 0.143, slightly above the 1988 - 1999 average of 0.124 (Table 6). Of 23 radiocollared caribou alive at the start of the monitoring period, 4 died and 1 is missing. Causes of death include predation (n = 1), capture related (n = 1) and unknown (n = 2). Two caribou died in April, one in June and one in September.

Since reintroduction, annual mortality rate has ranged from 0.0 - 0.409. Average annual mortality rate since reintroduction is 0.125. Of 76 caribou radiocollared during 1988 - 2000, 2 males and 1 female were excluded from analysis. The excluded female was likely a member of the Mulchatna herd and has been missing since 12 days after her capture. From the remaining 73 collared caribou, 13 missing and 3 capture related mortalities were excluded. Thus, of 57 caribou used in the analysis, 39 have died and 18 were alive at the end of the monitoring period. Causes of death were: 69.2% (n = 27) from unknown causes; 20.5% (n = 8) from hunting; 7.7% (n = 3) from predation; and 2.6% (n = 1) from other causes. The average age of caribou dying from unknown causes was 8.4 years, from hunting 5.2 years and from predation 3.8 years. Mortalities have occurred in every month except December with the highest number dying during March (n = 12) and September (n = 7). Average subadult caribou mortality rate (0.089) was almost one-half that for adults (0.174) monitored during the same years, but was not significantly different ($\chi^2 = 2.16$, $P>0.10$). Average mortality rates during 1988 - 1993 (0.025) and 1994 - 2000 (0.207) were significantly different ($\chi^2 = 17.64$, $P<0.005$).

Population Estimate

On 9 February 2001 we estimated 1,037 caribou on the Nushagak Peninsula proper. This is the first time a decline was observed from the previous count (Fig. 4). Survey conditions included complete and fresh snow cover, low to medium light intensity, patchy thin ground fog, and winds south at 5 knots. Thicker fog occurred along the base of the Tuklung Hills and we stopped surveying with only 4.0 km left on the last transect. Total survey time was 4.4 hours. We did not confirm absence or presence of radiocollared caribou within the survey area, nor did we conduct any surveys over adjacent areas.

The Nushagak Peninsula caribou herd grew rapidly from 146 reintroduced caribou to over 1,000 in 6 years; an exponential rate of increase of r = 0.317 (Hinkes and Van Daele 1996). The herd

continued to grow for the next 4 years peaking at 1,399 caribou in 1997 (r = 0.226). From 1997 - 2000 the herd decreased 27.4 percent or r = -0.107. If we compare numbers of caribou counted only on the Nushagak Peninsula proper, the rate of decrease from 1997 - 2000 would be 18.5 percent or r = -0.100. Population density on the Nushagak Peninsula reached approximately 1.2 caribou per km^2 in 1997 and 1998.

Projected population estimates suggest the Nushagak Peninsula caribou herd peaked at 1,484 in 1998 and will decline to less than 1,000 by the end of 2001 (Fig. 4). It appears mortality has exceeded recruitment since 1998.

Distribution, Home Range and Movements

Telemetry data from 2 April 2000 to 27 March 2001 indicated 13 of 17 (76.5 %) radiocollared caribou were located off the Nushagak Peninsula proper. Most observations of caribou off the peninsula occurred in late October. A majority of locations obtained during the monitoring period were on the peninsula (Fig. 5).

During the 2000 monitoring period, annual home range sizes for all collared caribou (n = 15) averaged 395.4 km^2 (Table 7). Average annual home range sizes for adult females (409.3 km^2, n = 9) were similar (t = -0.45, df = 13, P = 0.66) to subadult females (374.5 km^2, n = 6).

Average annual home range size for both subadults and adults appears to have increased since 1995 (Table 8). While average annual home ranges prior to 1995 are generally smaller, so are the mean number of relocations per individual. One disadvantage of the MCP estimator is the size of the home range estimate increases indefinitely as the number of locations increases (Jennrich and Turner 1969). The largest average annual home range (1988) is likely the result of more relocations than in other years, however, as caribou were reintroduced in 1988 it is possible they were investigating their new home. Possible causes for increased home range size, from 1995 to 2000, include human activity, habitat quality/availability and competition. Heavy hunting pressure and snowmachine traffic could displace caribou from preferred foraging or resting areas. Hardness and depth of snow may preclude foraging. Likewise, declining habitat quality or competition could force caribou to expand their home ranges to meet foraging needs.

Average life home range size for 57 radiocollared caribou was 520.5 km^2 (range 201.7 - 867.8 km^2). Average life home range size increased as mean locations per female increased, especially for caribou with 50 or fewer locations (Table 9). Collins et al. (2000) reported home ranges averaged 674 km^2 for 48 caribou with $\geq$ 30 locations, however, all locations were included in their analysis. Using our methodology, caribou with $\geq$ 30 locations (n = 45) had home ranges averaging 562.5 km^2.

For the 2000 monitoring period, average distance moved between relocations was 16.8 km for subadults and 15.2 for adults (Table 10). For all caribou, distances moved between months were different (W = 20.15, 1 df, P < 0.005), as were distances moved between seasons (W = 6, 1 df, P < 0.025). Caribou moved most during the rut and least during calving. Average winter

movements were greater than during summer. There were no differences in distances moved by month between subadults and adults ($W = 1.33$, 11 df, $P > 0.995$). By month, both age classes moved most during October and November and least during June (adults) and December (subadults). Twelve of 17 radiocollared caribou left the peninsula in October and 10 had returned by late November (Figure 6). This was the second time since reintroduction when a majority of Nushagak Peninsula caribou were observed off the peninsula proper; the other occurring in February 2000. Valkenburg (pers. comm.) observed in some years caribou herds exhibit unusual movements, the cause of which is believed related to unusual weather - early heavy snow storms or late snow melt-off. This phenomenon may occur in several geographically isolated herds within a given year. A heavy snow storm that occurred in early October may have precipitated caribou moving off the Nushagak Peninsula. Likewise, the cold May temperatures and resultant late snow melt-off might explain the unusual movements of the Western Arctic Caribou herd in 2001.

Subsistence Harvest

A total of 126 caribou were reported harvested during the 2000 - 2001 Nushagak Peninsula caribou hunt (August 1 - September 30, 2000 and December 1, 2000 - March 31, 2001). This was the seventh year for the federal subsistence permit hunt for that portion of Game Management Units 17A and 17C consisting of the Nushagak Peninsula south of the Igushik River, Tuklung River and Tuklung Hills, west to Tvativak Bay. Participation in the caribou hunt is limited to residents from Togiak, Twin Hills, Manokotak, Aleknagik, Dillingham, Clark's Point and Ekuk (Fig. 1). Hunters were allowed to harvest two caribou.

A total of 300 permits were available of which 228 (76.0 %) were issued to 114 hunters (Table 11). Eighteen (15.8%) permit holders did not hunt and 10 (8.8%) have not reported. Of the remaining 86 (75.4%) permit holders that reported hunting, 14 (16.3%) were unsuccessful. Of the 72 (83.7%) successful hunters, 20 reported taking 1 caribou, 51 reported taking 2 caribou and 1 reported taking 4 caribou. Three hunters reporting 1 caribou did not report on the outcome of their second permit. Dillingham hunters harvested 107 caribou while Manokotak hunters reported 19 (Table 12). By month, most caribou were harvested during March, followed by February and September (Table 13). Of the 126 caribou harvested, 63 (50.0%) were males, 60 (47.6%) were females and 3 (2.4%) were unknown (Table 14).

Except for number of caribou harvested, demographics of the 2000 - 2001 Nushagak Peninsula caribou hunt were similar to past years. Hunters took almost two and one half times the average annual harvest reported during the previous five years. We excluded the first year hunting was allowed (1994 - 1995) as only 100 permits were available (Table 15). Fall hunting opportunities have increased over the last six years, however, reported fall harvest has not (Table 13). Two factors likely influenced reported harvest in 2000 - 2001: access and outreach. First, mild winter temperatures prevented Wood River from freezing adequately to cross with snowmachines. This in turn prevented or made difficult, access to traditional winter hunting areas for moose and/or Mulchatna caribou, especially for Dillingham residents. Dillingham hunters harvested more than twice the number of Nushagak Peninsula caribou than in any previous year (Table 12).

Secondly, at the recommendations of the Nushagak Caribou Planning Committee, Togiak National Wildlife Refuge staff worked with village Traditional Councils in developing an outreach strategy aimed at promoting better compliance with hunting regulations. Outreach efforts included presentations at Traditional Council and Nushagak Fish and Game Advisory Committee meetings and at local schools; public and VHF radio announcements; information handouts/posters for hunters (Appendix A); and a law enforcement presence during the hunt. Presentations involved nearly 70 adults and approximately 55 middle and high school students.

Management Implications

The Nushagak Peninsula caribou herd has declined in number on and apparently off the peninsula. Mortalities of radiocollared caribou have increased since 1994 while recruitment of calves shows a declining trend. Based on modeling, unreported harvest may equal that what was reported. Reported caribou harvest averaged 4.1 % of the peninsula population each year from 1995 - 2000. During the same time period, 4.8% of radiocollared caribou died each year due to hunting. We speculate most hunters avoid shooting radiocollared caribou, which if true, would further increase total harvest. Never the less, if we censor known hunting mortalities, average mortality rates during 1988 - 1993 (0.025) and 1994 - 2000 (0.152) are still significantly different ($\chi^2 = 10.08$, $P<0.005$). Likely causes for increased mortalities since 1994 include predation, disease and losses due to wounding. Incidental observations suggest coyotes, wolves and brown bears have increased on the Nushagak Peninsula since caribou were reintroduced. Five of 19 (26.3%) Nushagak Peninsula and 3 of 29 (10.3%) North Alaska Peninsula caribou captured in 1997 tested positive for exposure to parainfluenza 3 virus (R. Zarnke pers. comm.). Antibody prevalence in herds south of the Brooks Range has historically been near 0%. Additionally, evidence of bacterial and parasitic pneumonia have been found in the North Alaska Peninsula caribou herd, the parent herd for Nushagak Peninsula caribou. Evidence of wounding loss has been observed during the course of our work and by personal snowmachine trips made by the principal author. Dispersal off the peninsula, while possible, is not believed to be occurring. Of 13 missing radiocollared caribou, only 3 have "disappeared" before the 3-year life of the collar batteries had expired. Percentage of males during fall composition surveys has been fairly stable since 1992. Incidental spring and summer sightings of caribou elsewhere in Units 17A, 17C and southern Unit 18 are becoming more common. Most of these caribou are males, however, some females with newborn calves have been observed. We speculate the majority of these "other" caribou are descendants from the Mulchatna Herd.

While the goal of reestablishing a caribou population large enough to allow hunting was achieved, growth and expansion of (Nushagak Peninsula) caribou beyond the Nushagak Peninsula appears temporary and has not occurred to any degree of certainty. Population goals for areas off the Nushagak Peninsula were not quantified in the Nushagak Peninsula Caribou Management Plan. Beginning in the 2001 - 2002 regulatory year, Alaska residents can hunt caribou in Unit 17A drainages west of Right Hand Point from August 1 - March 31 with a harvest limit of 5 caribou. Previously, this and other areas could be (and were) opened for caribou hunting by emergency order authority of the Unit 17 Area Wildlife Biologist - Alaska Department of Fish and Game and the Togiak National Wildlife Refuge Manager when

substantial numbers of Mulchatna caribou were present. This management strategy attempted to balance protection of the small group (<150) of Nushagak Peninsula caribou found in the area and allowing hunting opportunities when conditions warranted. Promoting better hunter compliance along with continued population and range monitoring will be necessary to ensure a healthy population and continued opportunity for subsistence are maintained.

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Table 1. Condition scores, body measurements and weights of 10-month old Nushagak Peninsula female caribou (n = 10) captured 2 - 3 April 2000.

Caribou ID	Condition Score			Measurements (cm)						Weight (kg)
	Ribs	Rump	Withers	Neck	Total Length	Heart Girth	Meta-tarsus	Hind Foot	Jaw	
00-12	2	2	2	39.5	163.0	98.0	36.0	55.0	21.4	50.2
00-13	2	2	2	43.0	167.0	99.0	34.0	49.0	21.8	52.0
00-14	2	2	2	37.0	163.0	95.0	35.5	52.0	23.2	51.1
00-15	3	3	3	38.0	163.0	94.0	35.7	54.5	21.8	51.5
00-16	2	2	2	35.0	181.0	94.0	36.0	52.0	22.5	49.5
00-17	2	2	2	38.0	162.0	95.0	35.4	53.5	22.5	47.0
00-18	2	2	2	43.0	162.5	94.0	36.3	51.0	23.2	46.1
00-19	2	2	2	35.0	158.0	90.0	35.1	51.0	22.0	47.0
00-20	3	3	3	42.0	172.0	98.0	34.6	44.0	22.7	50.2
00-21	2	2	2	33.0	166.0	93.0	34.7	52.0	24.1	47.4
average	2.2	2.2	2.2	38.4	165.8	95.0	35.3	51.4	22.5	49.2

Table 2. Average condition scores, body measurements and weights of 10-month old Nushagak Peninsula female caribou, 1995 - 2000 (n = 10 for 1997 weight).

Year	n	Condition Score	Measurements (cm)						Weight (kg)
			Neck	Total Length	Heart Girth	Meta-tarsus	Hind Foot	Jaw	
1995	15	3.3	39.9	167.5	98.3	36.9	52.3	23.4	57.1
1997	13	3.7	40.2	151.9	96.5	37.5	53.6	22.8	50.9
2000	10	2.2	38.4	165.8	95.0	35.3	51.4	22.5	49.2

Table 3. Production, survival and fall recruitment of calves associated with radiocollared subadult and adult Nushagak Peninsula caribou, 1990 - 2000.

	Calf Production calves/female (calves/100 females)			Calf Survival to Fall calves alive/calves produced (rate)			Fall Calf Recruitment calves/female (calves/100 females)		
Year	subadults	adults	all	subadults	adults	all	subadults	adults	all
1990		15/15 (100.0)	15/15 (100.0)		8/13 (0.615)	8/13 (0.615)		8/13 (61.5)	8/13 (61.5)
1992	5/5 (100.0)	22/22 (100.0)	27/27 (100.0)	4/5 (0.800)	14/22 (0.636)	18/27 (0.667)	4/5 (80.0)	14/22 (63.6)	18/27 (66.7)
1993		28/28 (100.0)	28/28 (100.0)		15/28 (0.536)	15/28 (0.536)		15/28 (53.6)	15/28 (53.6)
1994		25/26 (96.2)	25/26 (96.2)		15/20 (0.750)	15/20 (0.750)		15/20 (75.0)	15/20 (75.0)
1995		20/20 (100.0)	20/20 (100.0)		14/19 (0.737)	14/19 (0.737)		14/18 (77.8)	14/18 (77.8)
1996	0/8 (0.0)	12/14 (85.7)	12/22 (54.5)	---	8/11 (0.727)	8/11 (0.727)	0/8 (0.0)	8/12 (66.7)	8/20 (40.0)
1997		19/25 (76.0)	19/25 (76.0)		12/19 (0.632)	12/19 (0.632)		12/23 (52.2)	12/23 (52.2)
1998	3/12 (25.0)	12/15 (80.0)	15/27 (55.6)	1/3 (0.333)	7/12 (0.583)	8/15 (0.533)	1/11 (9.1)	7/13 (53.8)	8/24 (33.3)
1999		19/24 (79.2)	19/24 (79.2)		9/15 (0.600)	9/15 (0.600)		9/17 (52.9)	9/17 (52.9)
2000		10/11 (90.9)	10/11 (90.9)		3/10 (0.300)	3/10 (0.300)		3/10 (30.0)	3/10 (30.0)
ave	8/25 (32.0)	182/200 (91.0)	190/225 (84.4)	5/8 (0.625)	105/169 (0.621)	10/177 (0.621)	5/24 (20.8)	105/176 (59.7)	110/200 (55.0)

subadults=2 year olds
adults=3 or more years old
fall=September (1992), October (1990, 1994-2000), November (1993)
ave=average

Table 4. Calving chronology of radiocollared Nushagak Peninsula caribou (n = 11), southwest Alaska, 2000.

Caribou ID	Observation Date				
	15 May	22 May	30 May	8 Jun	19 Jun
92-23	0	0	1	---	---
95-2	0	0	0	0	1
95-5	0	0	1	---	---
95-7	0	0	1	---	---
97-1	0	0	1	---	---
97-4	0	0	1	---	---
97-5	0	0	1	---	---
97-6	0	0	1	---	---
97-16	0	0	0	0	0
97-17	0	0	0	1	---
97-19	0	0	1	---	---
calves/female	0/11	0/11	8/11	9/11	10/11

--- = not monitored

Table 5. Sex and age composition of Nushagak Peninsula caribou, southwest Alaska, 1988 - 2000.

Date	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Small bulls (% of bulls)	Medium bulls (% of bulls)	Large bulls (% of bulls)	Total bulls (%)	Composition sample size	Estimate of herd size
Feb 1988	11.7	10.0	8.2	82.2	---	---	---	9.6	146	146
1989	---	---	---	---	---	---	---	---	---	268
1990	---	---	---	---	---	---	---	---	---	383
1991	---	---	---	---	---	---	---	---	---	561
29 Oct 1992	59.8	71.6	30.9	43.2	---	---	---	25.9	611	734
1993	---	---	---	---	---	---	---	---	---	1007
30 Oct 1994	71.3	64.6	27.4	42.4	---	---	---	30.2	986	1106
1995	---	---	---	---	---	---	---	---	---	1214
1996	---	---	---	---	---	---	---	---	---	1255
10 Oct 1997	63.7	62.0	27.5	44.3	---	---	---	28.2	641	1273
12 Oct 1998	57.4	62.6	28.4	45.5	29.5	37.5	33.0	26.1	429	1281
19 Oct 1999	48.1	52.5	26.2	49.9	29.2	45.3	25.5	24.0	672	1159
8 Oct 2000	51.5	38.1	20.1	52.8	45.3	30.7	24.0	27.1	707	1037

estimate of herd size=population count or projection for Nushagak Peninsula proper

Table 6. Annual (April - March) and average annual mortality rates of radiocollared female Nushagak Peninsula caribou, southwest Alaska, 1988 - 2000.

Monitoring Period	Number of Radiocollars	Total Mortalities	Capture Mortalities	Number Missing	Annual Mortality Rate	Average Annual Mortality Rate
1988	18	1	1	0	0.000	0.000
1989	17	0	0	1	0.000	0.000
1990	16	1	0	1	0.067	0.021
1991	14	1	0	0	0.071	0.032
1992	29	1	0	0	0.034	0.033
1993	28	0	0	0	0.000	0.025
1994	28	3	0	0	0.107	0.041
1995	35	8	0	3	0.250	0.078
1996	24	1	0	2	0.045	0.075
1997	40	9	1	1	0.211	0.096
1998	30	4	0	1	0.138	0.101
1999	25	9	0	3	0.409	0.124
2000	23	4	1	1	0.143	0.125

Table 7. Annual home range sizes (Minimum Convex Polygon) of radiocollared female Nushagak Peninsula caribou (n = 15), southwest Alaska, April 2000 - March 2001.

Caribou	Age	Annual			Annual excluding 31 Oct*		
ID	(years)	n	sq km	sq mi	n	sq km	sq mi
00-12	1.83	16	877.44	338.78	15	541.55	209.09
00-14	1.83	15	328.28	126.75	14	328.28	126.75
00-16	1.83	15	783.64	302.56	14	473.49	182.81
00-17	1.83	15	622.97	240.53	14	218.84	84.49
00-18	1.83	14	689.26	266.12	13	300.28	115.94
00-19	1.83	15	647.19	249.88	14	384.32	148.39
97-1	3.83	16	615.82	237.77	15	339.78	131.19
97-16	3.83	17	412.70	159.34	16	412.70	159.34
97-19	3.83	17	823.65	318.01	16	561.59	216.83
97-4	3.83	15	367.42	141.86	14	367.42	141.86
97-5	3.83	15	181.20	69.96	14	181.20	69.96
97-6	3.83	16	763.42	294.76	15	491.10	189.61
95-2	5.83	16	765.17	295.43	15	311.87	120.41
95-5	5.83	16	553.93	213.87	15	293.70	113.40
95-7	5.83	15	983.17	379.60	14	724.13	279.59
ave	3.43	15.5	627.68	242.35	14.5	395.35	152.64

Age = age at end of monitoring period
n = number of relocations
*31 Oct excluded as most caribou had moved off the Nushagak Peninsula
ave = average

Table 8. Average annual (April - March) home range sizes (square kilometers) of subadult (10 - 22 months old) and adult (>22 months old) female Nushagak Peninsula caribou, southwest Alaska, April 1988 - March 2001.

	Subadults			Adults			All Ages		
Monitoring Period	home range	number of caribou	mean re-locations	home range	number of caribou	mean re-locations	home range	number of caribou	mean re-locations
1988	-	-	-	446.17	15	22.3	446.17	15	22.3
1989	-	-	-	278.38	14	10.9	278.38	14	10.9
1990	-	-	-	223.99	12	7.6	223.99	12	7.6
1991	-	-	-	192.26	11	8.9	192.26	11	8.9
1992	-	-	-	215.82	24	10.7	215.82	24	10.7
1993	-	-	-	157.10	26	8.5	157.10	26	8.5
1994	-	-	-	264.56	22	12.1	264.56	22	12.1
1995	257.86	10	17.0	236.92	16	14.1	244.97	26	15.2
1996	-	-	-	297.25	20	14.8	297.25	20	14.8
1997	364.31	12	11.4	425.01	19	13.9	401.51	31	12.9
1998	-	-	-	369.35	22	12.7	369.35	22	12.7
1999*	-	-	-	393.33	10	12.6	393.33	10	12.6
2000**	374.46	6	14.0	409.28	9	14.9	395.35	15	14.5
ave	328.46	9.3	14.0	291.05	16.9	12.5	295.27	19.1	12.6
ave***	328.46	9.3	14.0	353.40	14.7	14.2	343.70	24.0	14.1

1999* = excludes 4 Feb 2000 relocations
2000** = excludes 31 Oct 2000 relocations
ave***= average of 1995, 1997 and 2000

Table 9. Average life home ranges (95% Minimum Convex Polygon) of radiocollared female Nushagak Peninsula caribou, southwest Alaska.

Range of Locations	Mean Locations/ Female	Life Home Range (sq km)	Number of Females
13 - 30	17.2	362.93	12
31 - 50	38.5	477.72	10
51 - 70	57.8	580.44	15
71 - 90	82.1	585.49	12
91 - 126	105.0	600.43	8
13 - 126	57.6	520.49	57
31 - 126	68.4	562.51	45
51 - 126	76.9	586.74	35
71 - 126	91.3	591.46	20

Table 10. Average monthly and seasonal movements of radiocollared female Nushagak Peninsula caribou, April 2000 - March 2001.

	Average Distance Moved (km)	
Month/Season	Subadults (n=7)	Adults (n=10)
May	12.52	11.2
Jun/Spring	9.96/11.67	9.61/10.72
Jul	13.51	11.33
Aug/Summer	10.14/11.83	12.17/11.75
Sep	15.94	17.66
Oct/Fall	40.03/21.03	33.75/20.69
Nov	38.73	26.16
Dec	7.03	12.45
Jan	15.54	15.09
Feb	16.7	15.78
Mar	17.87	19.4
Apr/Winter	19.36/19.40	13.27/17.12
Average	16.84	15.23

Season: Spring = May-Jun, Summer=Jul-Aug, Fall=Sep-Oct, Winter=Nov-Apr

Table 11. Permit availability, distribution, and hunter success for the 2000 - 2001 Nushagak Peninsula caribou hunt.

Community	Number of Permits: Available	Number of Permits: Issued	Permit Holders	Permit Holders: Didn't Hunt	Permit Holders: Unsuccessful	Permit Holders: Successful	Permit Holders: Didn't Report	Reported Caribou Harvest
Dillingham	138	188	94	18	13	60	3	107
Manokotak	40	40	20	0	1	12	7	19
Aleknagik	28	0	---	---	---	---	---	---
Togiak	54	0	---	---	---	---	---	---
Twin Hills	20	0	---	---	---	---	---	---
Clark's Pt/Ekuk	20	0	---	---	---	---	---	---
Total	300	228	114	18	14	72	10	126

Note: Togiak, Clarks Pt/Ekuk and Aleknagik transferred permits to Dillingham and Manokotak

Table 12. Nushagak Peninsula caribou harvest by community, regulatory years 1994-95 to 2000-01.

Regulatory Year	Community						
	Aleknagik	Clark's Pt/ Ekuk	Twin Hills	Togiak	Dillingham	Manokotak	Total
1994-95	3	0	1	1	5	25	35
1995-96	0	0	0	0	2	50	52
1996-97	1	0	0	0	10	9	20
1997-98	4	0	0	0	38	25	67
1998-99	0	0	0	0	45	10	55
1999-00	1	0	0	6	40	16	63
2000-01	0	0	0	0	107	19	126
Total	9	0	1	7	247	154	418
%	2.2	0.0	0.2	1.7	59.1	36.8	100.0

Table 13. Chronology of reported caribou harvest on the Nushagak Peninsula, regulatory years 1994-95 to 2000-01.

Regulatory Year	Month							
	Aug	Sep	Dec	Jan	Feb	Mar	Unknown	Total
1994-95	NS	NS	NS	3	1	25	6	35
1995-96	NS	NS	3	0	5	43	1	52
1996-97	5	NS	0	0	2	13	0	20
1997-98	5	NS	0	2	25	35	0	67
1998-99	0	2	0	0	0	50	3	55
1999-00	0	0	0	2	7	54	0	63
2000-01	0	6	0	0	22	98	0	126
Total	10	8	3	7	62	318	10	418
%	2.4	1.9	0.7	1.7	14.8	76.1	2.4	100.0

NS = No Season

Table 14. Reported sex of caribou harvested on the Nushagak Peninsula, regulatory years 1994-95 to 2000-01.

Regulatory Year	Sex			Total
	Male	Female	Unknown	
1994-95	19	10	6	35
1995-96	25	20	7	52
1996-97	8	3	9	20
1997-98	32	33	2	67
1998-99	30	22	3	55
1999-00	27	36	0	63
2000-01	63	60	3	126
Total	204	184	30	418
%	48.8	44.0	7.2	100.0

Table 15. Regulatory history for caribou hunting on the Nushagak Peninsula, 1987-88 to 2000-2001.

Regulatory Year	Open Season(s)	Harvest Limit	Permits Available	Reported Harvest
1987-88 to 1993-94	No Open Season	---	---	---
1994-95	Jan 1 - Mar 31	1 caribou	100	35
1995-96	Dec 1 - Mar 31	1 caribou	300	52
1996-97	Aug 1- Aug 31	1 caribou	100	5
	Dec 1 - Mar 31	1 caribou	200	15
1997-98	Aug 1 - Aug 31	2 caribou	104	5
	Dec 1 - Mar 31	2 caribou	196	62
1998-99	Aug 1 - Sep 30	2 caribou	104	2
	Dec 1 - Mar 31	2 caribou	196	53
1999-00	Aug 1 - Sep 30	2 caribou	104	0
	Dec 1 - Mar 31	2 caribou	196	63
2000-01	Aug 1 - Sep 30	2 caribou	104	6
	Dec 1 - Mar 31	2 caribou	196	120

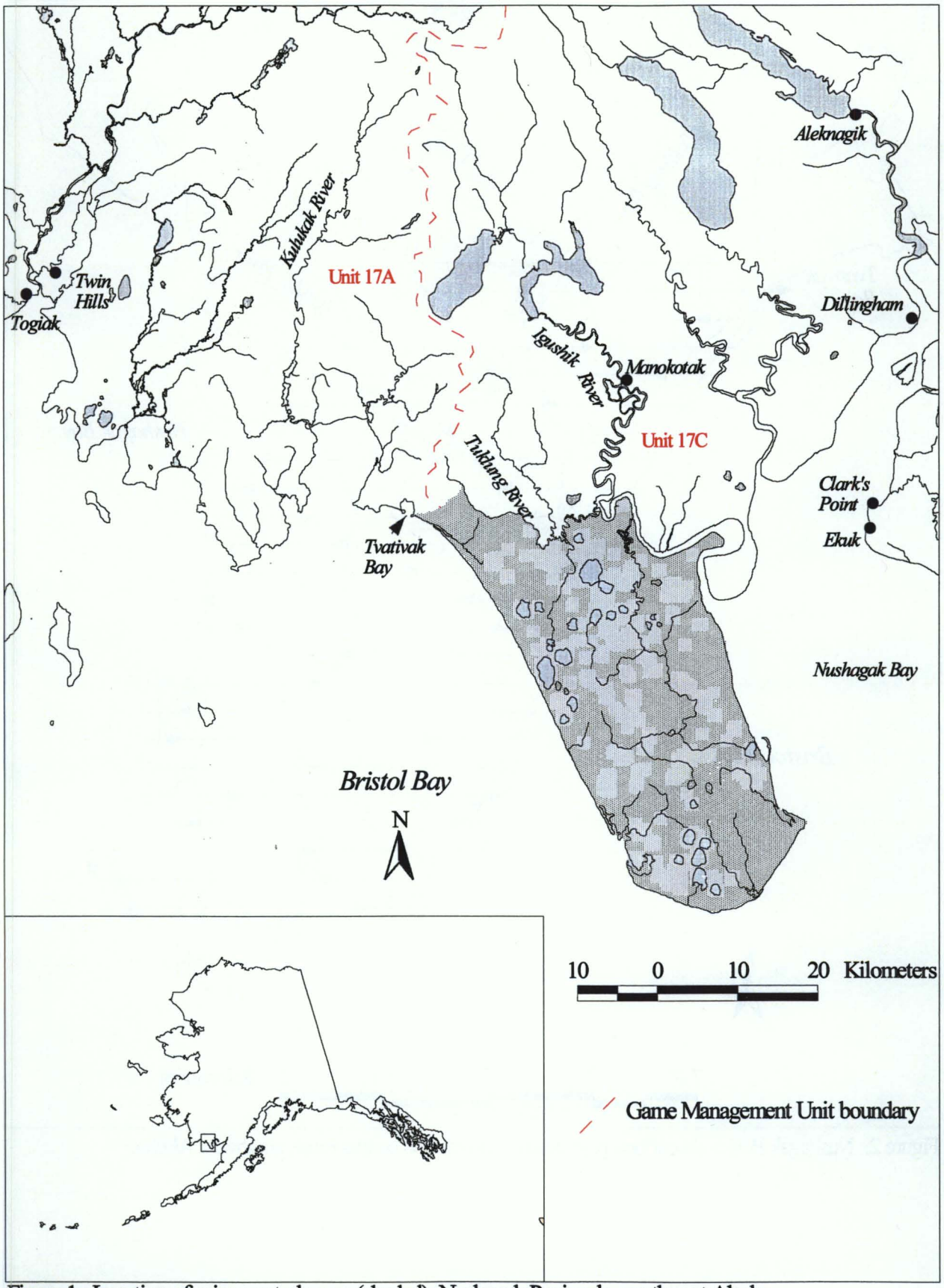

Figure 1. Location of primary study area (shaded), Nushagak Peninsula, southwest Alaska.

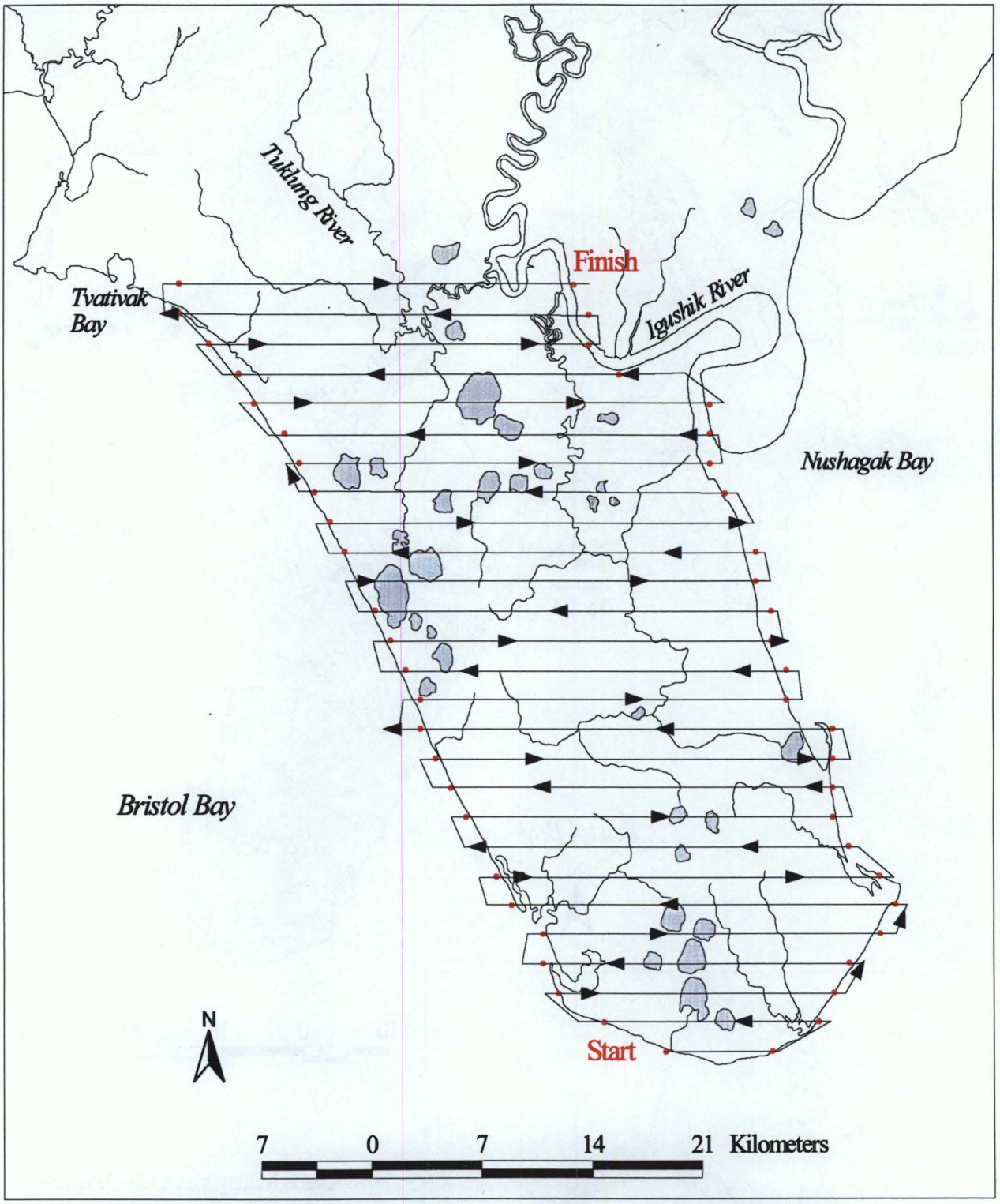

Figure 2. Nushagak Peninsula caribou population transects and census route, southwest Alaska.

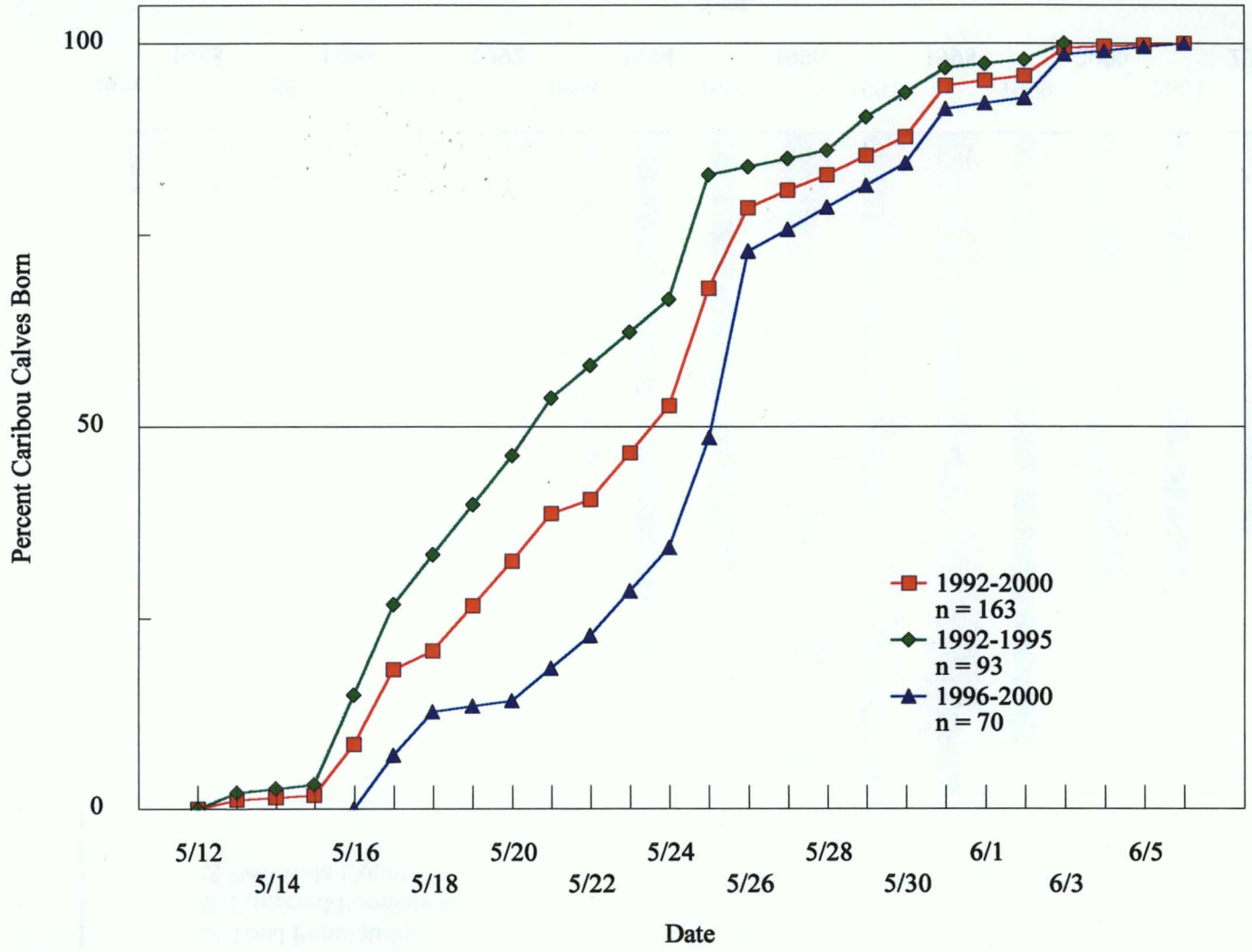

Figure 3. Calving chronology of radiocollared Nushagak Peninsula caribou, southwest Alaska, 1992 - 2000.

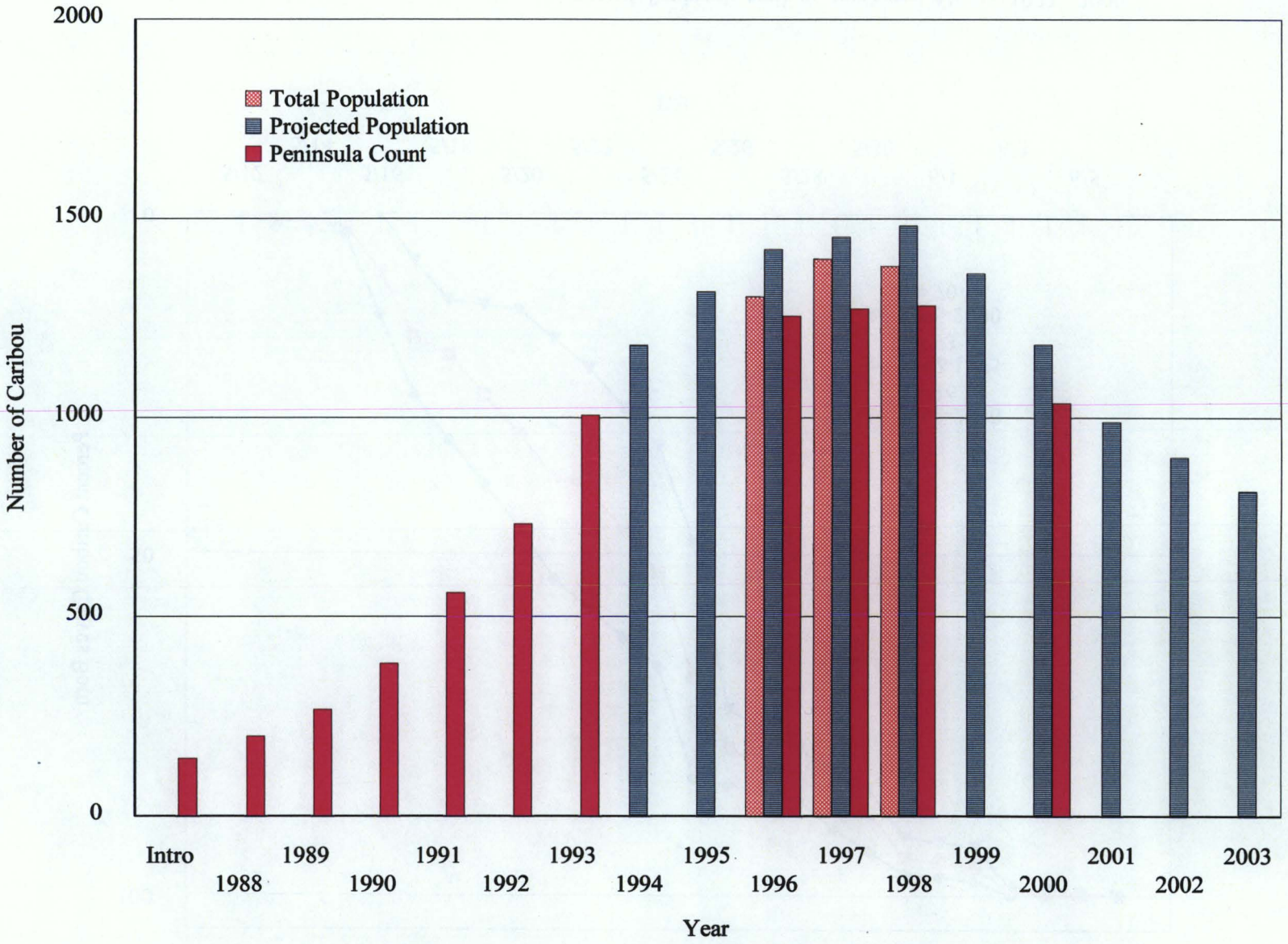

Figure 4. Population growth and projection of the Nushagak Peninsula Caribou Herd, 1988 - 2003

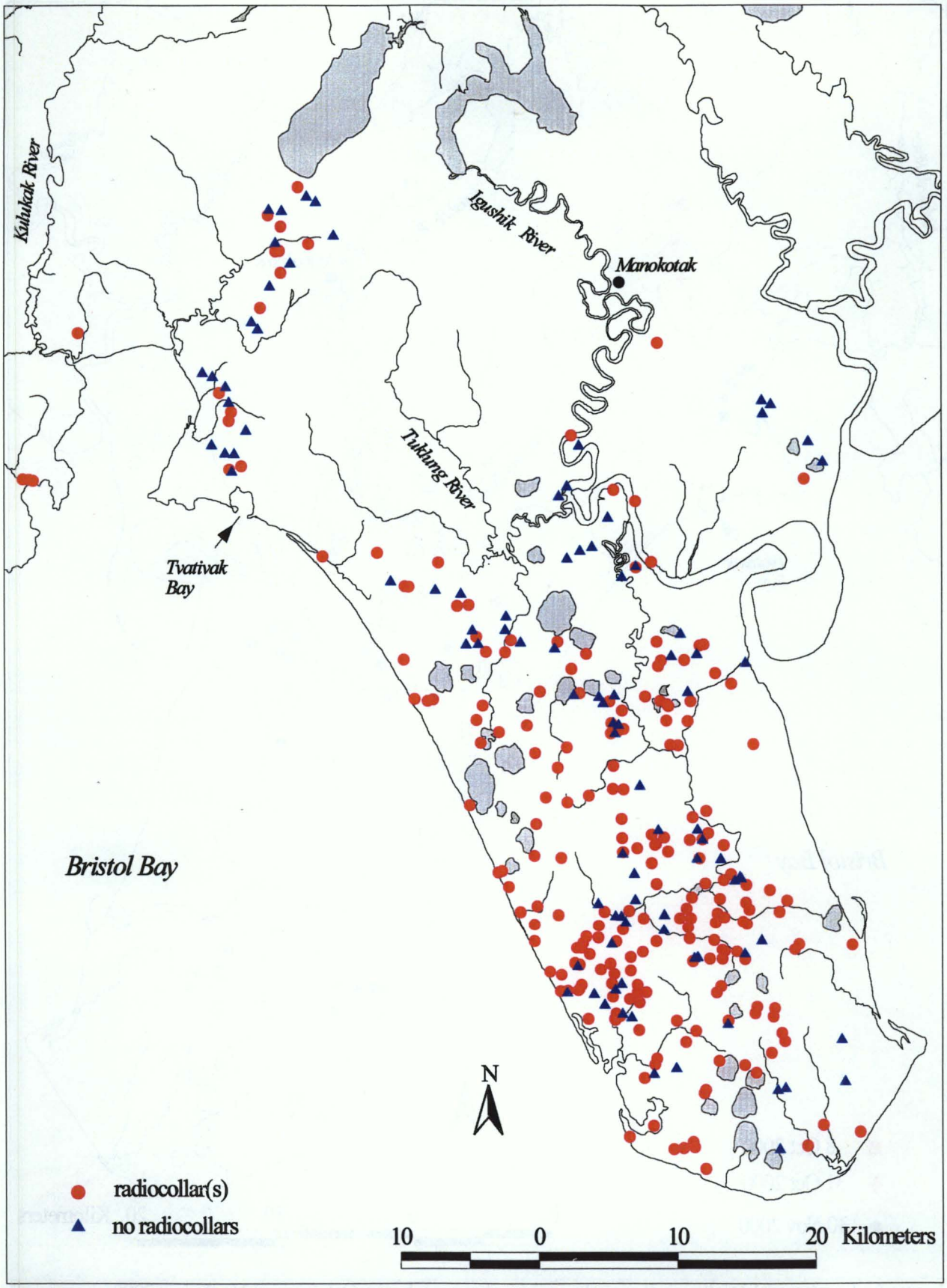

Figure 5. Locations of Nushagak Peninsula caribou observed during April 2000 - March 2001.

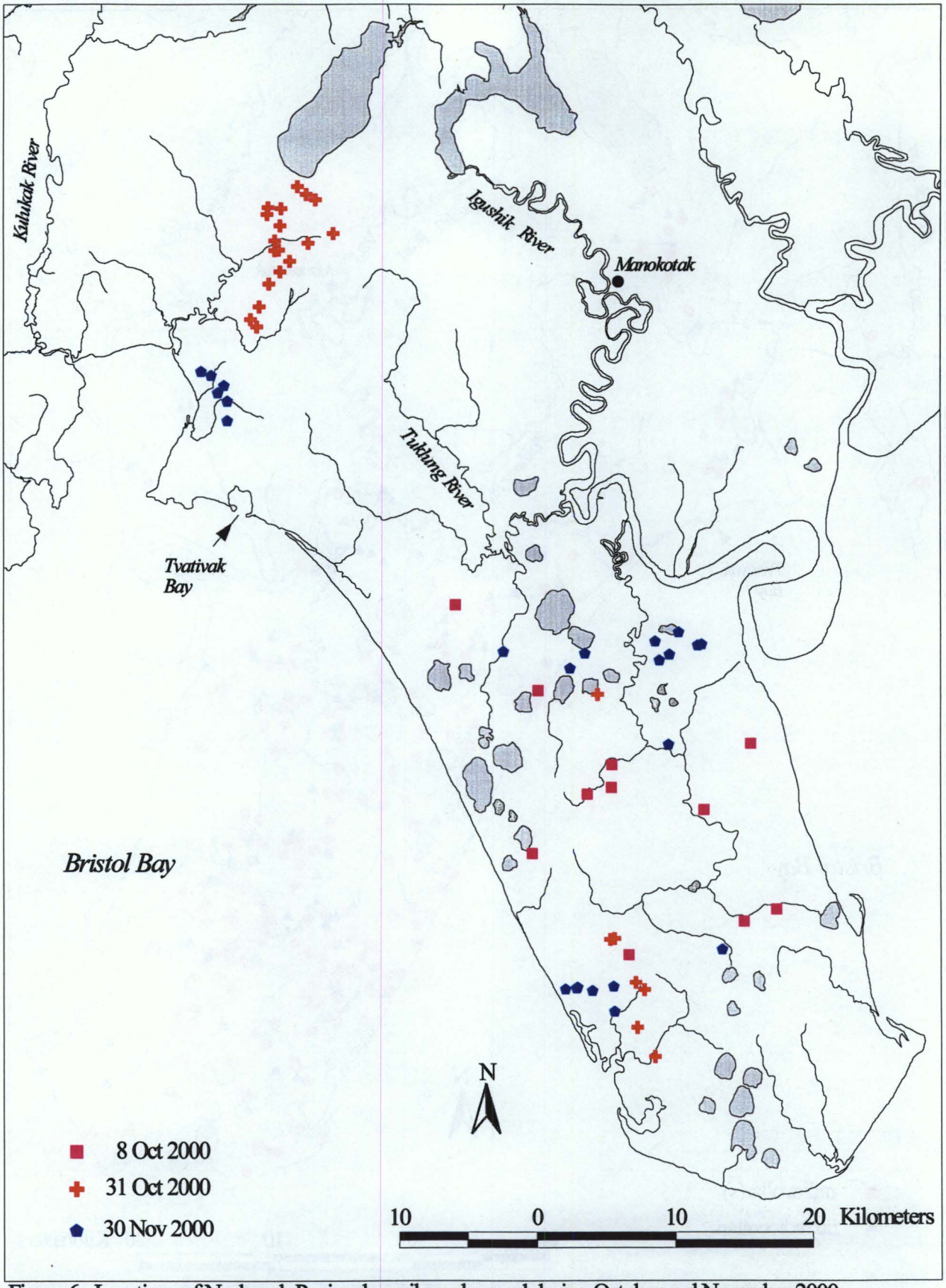

Figure 6. Locations of Nushagak Peninsula caribou observed during October and November 2000.

Appendix A. Information handout/poster to promote compliance with hunting regulations for Nushagak Peninsula caribou.

ATTENTION
NUSHAGAK PENINSULA (CAPE CONSTANTINE) CARIBOU HUNTERS

At its November 18, 2000 meeting, the Nushagak Peninsula Caribou Planning Committee discussed the need for caribou hunters to comply with the regulations. Specifically, the Committee identified four areas for improvement. They are: obtaining a current State of Alaska **hunting license**; obtaining current Nushagak Peninsula Federal **caribou permits**; accurate and timely **reporting on the outcome of your hunt**; and, **not harassing (chasing) caribou with snow-go's.** The Committee recommends that law enforcement officials with Togiak National Wildlife Refuge increase their efforts in monitoring the hunt. Below is information on the four main topics.

Hunting License: All Alaska residents **16 years or older must possess a valid license to hunt**. Alaska residents 15 years of age or younger are not required to possess a license to hunt. Residents 60 years of older may apply for a **permanent identification card** in lieu of a license. Hunting licenses are **valid** from the date of purchase **through December 31** of that year. You can buy a **low income license** for $5 if your family earned less than $8,200 (before taxes) for the preceding year or you obtained assistance during the preceding six months under any state or federal welfare program. Hunting licenses are available from most license vendors, on the internet at www.admin.adfg.state.ak.us/license, by calling (800) 478-2376, or by mail from ADF&G Licensing Section, P. O. Box 25525, Juneau, AK 99802.

Caribou Permits: Federal Permits for hunting Nushagak Peninsula caribou can be obtained from your Traditional/Tribal Council. Permits are **free** and can be used only for the regulatory year they were issued. All hunters, regardless of age, must possess valid permit(s) while hunting. Upon taking a caribou a hunter must immediately validate the permit by removing the day and month of take (on permit).

Reporting on the outcome of your hunt: When you receive Federal Permits for hunting Nushagak Peninsula caribou you will also receive Federal Subsistence Hunt Reports. Successful hunters **must return** their completed hunt report within 5 days after taking a caribou. Unsuccessful hunters and those who did not hunt must return their hunt report within 15 days after the close of the season. No postage is required. Information about individual hunters is confidential. Accurate harvest reporting is **essential to good management** of the Nushagak Peninsula caribou herd **AND documents a village's use of the resource**. Failure to report your harvest is **illegal** and could hurt you and your village in the future.

Chasing caribou with snow-go's: It is **illegal** to drive (chase), herd, or molest caribou with the use of a motorized vehicle. It is **also illegal** to take caribou from a motorized vehicle in motion. Chasing stresses caribou, lowers the quality of meat and increases the chance for wounding.

FAILURE TO OBEY THE REGULATIONS COULD MEAN LOSING YOUR HUNTING PRIVILEGES, PAYING FINES, LOSING YOUR CARIBOU, LOSING YOUR GUN, AND POSSIBLY LOSING YOUR SNOW-GO. LETS WORK TOGETHER TO PROTECT THIS IMPORTANT SUBSISTENCE RESOURCE AND OPPORTUNITY!