ANWR Progress Report Number FY85-17

# FALL AND WINTER MOVEMENTS AND DISTRIBUTION, AND ANNUAL MORTALITY PATTERNS OF THE PORCUPINE CARIBOU HERD, 1983-1984

Kenneth R. Whitten
Francis J. Mauer
Gerald W. Garner
Don E. Russell

Key Words: Porcupine caribou herd, movement, mortality, predation, wintering areas, Arctic-Beaufort.

Alaska Department of Fish and Game
1300 College Road
Fairbanks, Alaska 99701

and

Arctic National Wildlife Refuge
U.S. Fish and Wildlife Service
101 12th Avenue
Fairbanks, Alaska 99701

and

Canadian Wildlife Service
202-204 Parry Road
Whitehorse, Yukon, Canada Y1A 3V1

7 February 1985

Fall and winter movements and distribution, and annual mortality patterns of the Porcupine Caribou Head, 1983-1984.

Kenneth R. Whitten, Francis J. Mauer, Gerald W. Garner, and Don E. Russell. Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge, Fairbanks, Alaska and Canadian Wildlife Service, Whitehorse, Yukon.

Abstract: Traditional winter ranges in Alaska (Chandalar Lake- Arctic Village) and in Cananda (Ogilvie basin, Hart basin and Eagle plains) were used by the Porcupine Caribou Herd in fall 1983-1984. Late winter shifts towards northern portions of the winter ranges occurred during February-March in Alaska and possibly earlier in Canada. One radio-collared caribou accompanied by up to 1000 other caribou wintered north of the Brooks Range in the Schrader Lake/Kikitak Mountain area. Based on proportions of radio-collared caribou found, it is estimated that about 40,000 caribou wintered in Alaska and about 100,000 (+) in Canada. First year mortality (based on survival rates of radio-collared calves) was estimated at about 43% for 1983-84. Mortality rates for radio-collared yearlings was slightly higher (11%) than (6%) for radio-collared adults. Most calf mortality occurred in the first 9 days after birth. More calves died during fall migration than during the entire mid-winter period. Adult mortality also was higher during the fall period. Higher densities of wolves in the fall and winter range may account for the increased mortality of caribou.

# Fall and winter movements and distribution, and annual mortality patterns of the Porcupine caribou herd, 1983-1984.

Intensive studies of the ecology of the Porcupine caribou herd are currently being conducted cooperatively by the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, Yukon Territory Government, Canadian Wildlife Service, and the University of Alaska. Primary emphasis has been on calving distribution, initial productivity, and neonatal calf survival in relation to petroleum exploration and potential development in the Arctic National Wildlife Refuge (ANWR). Numerous calf and adult caribou have been radio-collared in conjunction with these studies, providing a large sample of individually recognizable caribou. Relocating these marked caribou throughout the year yields valuable information on winter movements and annual mortality rates which can otherwise be gathered only with great expense and/or difficulty using conventional aerial survey and collection techniques. This report summarizes the results of radio-tracking surveys in Alaska during winter 1983-84.

## Methods and Materials

Radio-collared caribou were relocated using fixed-wing aircraft and standard techniques and equipment from October 1983 through May 1984. Surveys in Alaska were flown once in October, February, and March, and two surveys each were flown in November and May. In Canada surveys were flown once in October, December, February, April, and May. Movements and distribution were determined primarily from locations of radio-collared caribou, although observations of other caribou seen during tracking flights were also considered in making general conclusions.

Radio collars were equipped with motion-sensing mortality switches (Whitten et al. 1984). Suspected mortalities were investigated on the ground, using helicopters for easy access. Mortality rate calculations include data from summer studies (Whitten et al. 1984) and from tracking flights and field necropsies conducted in Canada.

## Results and Discussion

### Fall and Winter Movements and Distribution

Caribou of the Porcupine herd used all three primary traditional wintering areas (Whitten and Cameron 1982) during 1983-84: the Richardson and Ogilvie Mountains areas in Canada, and the Chandalar area in Alaska (Fig. 1). As in many past years, there was a mass movement by much of the herd through the Brooks Range toward the Chandalar area during late July and August 1983. Subsequently, most caribou moved to the eastermost Brooks Range in Alaska or to the British Mountains and Old Crow Flats in the Yukon Territory. Unfortunately, tracking and survey flights were insufficiently frequent to provide more details on these late summer movements. A migration into the Chandalar area occurred in October, probably just after the rut, and caribou then remained in Alaska for the duration of the winter.

By late October, caribou in the Chandalar wintering area had reached as far southwest as Chandalar Lake, although most remained farther north between Ackerman Lake and Arctic Village. A few remained scattered through the southern foothills of the Brooks Range east to the international border (Fig. 2). During 24-27 October, 63 radio-collared caribou were found in Canada (56 in the Ogilvie River basin- west of the Dempster Highway, 6 in the Hart River basin and 1 in the Keele Range-Bluefish River). No radio-collared caribou were found in the Richardson Mtns.

By February and March 1984, caribou had moved north and east from Chandalar Lake. Most Porcupine caribou in Alaska were in the East Fork Chandalar River valley in the vicinity of Arctic Village. A few were still in the Brooks Range toward the border. Small bands were also in the low mountains between the Coleen River and Old Crow Flats, south of Bilwaddy Creek (Fig. 3). In Canada a majority of caribou continued to inhabit the Ogilvie Basin area, however, by 10 February 1984 at least 10 radio-collared caribou had moved north to the Eagle Plains area.

A small portion of the Porcupine herd (less than 1,000 animals) did not leave the north slope during winter 1983-84, but wintered in the Schrader Lake/Kikiktat Mountain area. Subsequent surveys and radio-collaring during spring indicated that these Porcupine caribou had little or no contact with Central Arctic herd caribou wintering west of Sunset Pass in the Sadlerochit Mountains and along the Canning River.

Unusually deep snow throughout the southern foothills of the Brooks Range resulted in delayed spring migration. Distribution changed little between March and mid-April. In early May caribou began moving northeast from the Arctic Village area, but many still remained where they had spent most of the winter (Fig. 4). When snow and travel conditions improved in mid- to late May, long lines of hundreds to thousands of caribou began moving along the southern flanks of the Brooks Range across the Sheenjek and Coleen valleys toward the headwaters of the Firth River. There they joined with caribou from Canadian wintering grounds, also moving down the Firth River towards calving grounds on the north slope.

Throughout the winter, calf collars proved much more difficult to track than adult collars. All of 73 functional radio collars on 2+ year old Porcupine caribou were located at least once between 1 October 1983 and 15 May 1984, whereas 6 of 50 calf transmitters were never heard during this period (1 of these was subsequently located, transmitting on mortality mode and at very low output, during June 1984). Retrieval of shed collars and of collars from dead or recaptured calves indicated that most calf collars had broken antennas. This severely reduced transmission range, often to less than 2 km. The problem became progressively worse during the winter, presumably as more antennas broke off. In April and May, only 4 of 68 potentially active adult collars were not located, versus 19 of 37 among calves (note: total numbers reduced by mortality and shedding).

Radio-collared bulls were definitely more prevalent in Canada than Alaska. All of 10 radio-collared 2+ year old males wintered in Canada, whereas about 30% of the 63 radio-collared females wintered in Alaska. No winter composition counts were conducted in either area, but in previous years composition counts have occasionally yielded geographically skewed sex ratios, with more bulls in Canada (Whitten and Cameron, 1980). Thus, it seems

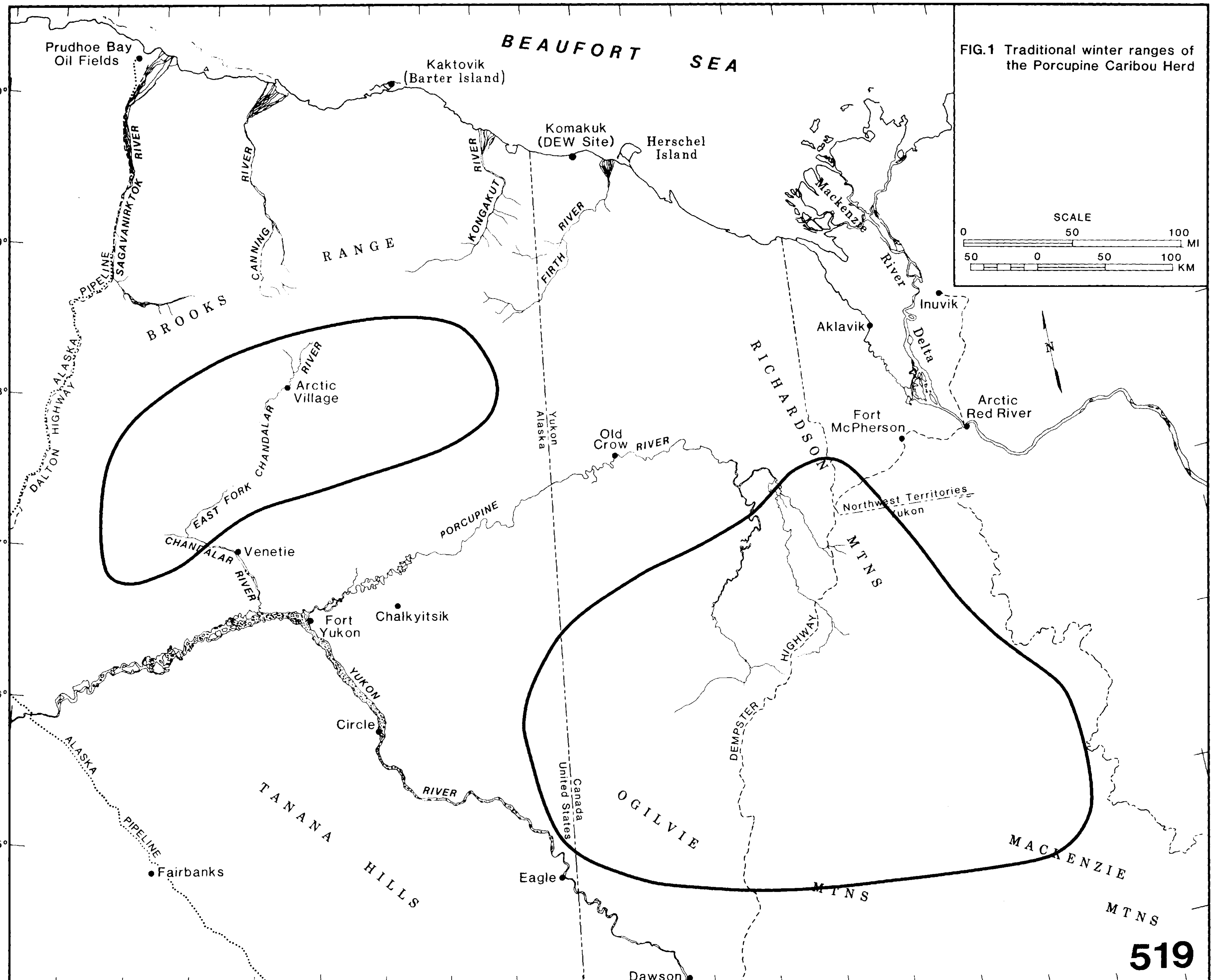

FIG.1 Traditional winter ranges of the Porcupine Caribou Herd

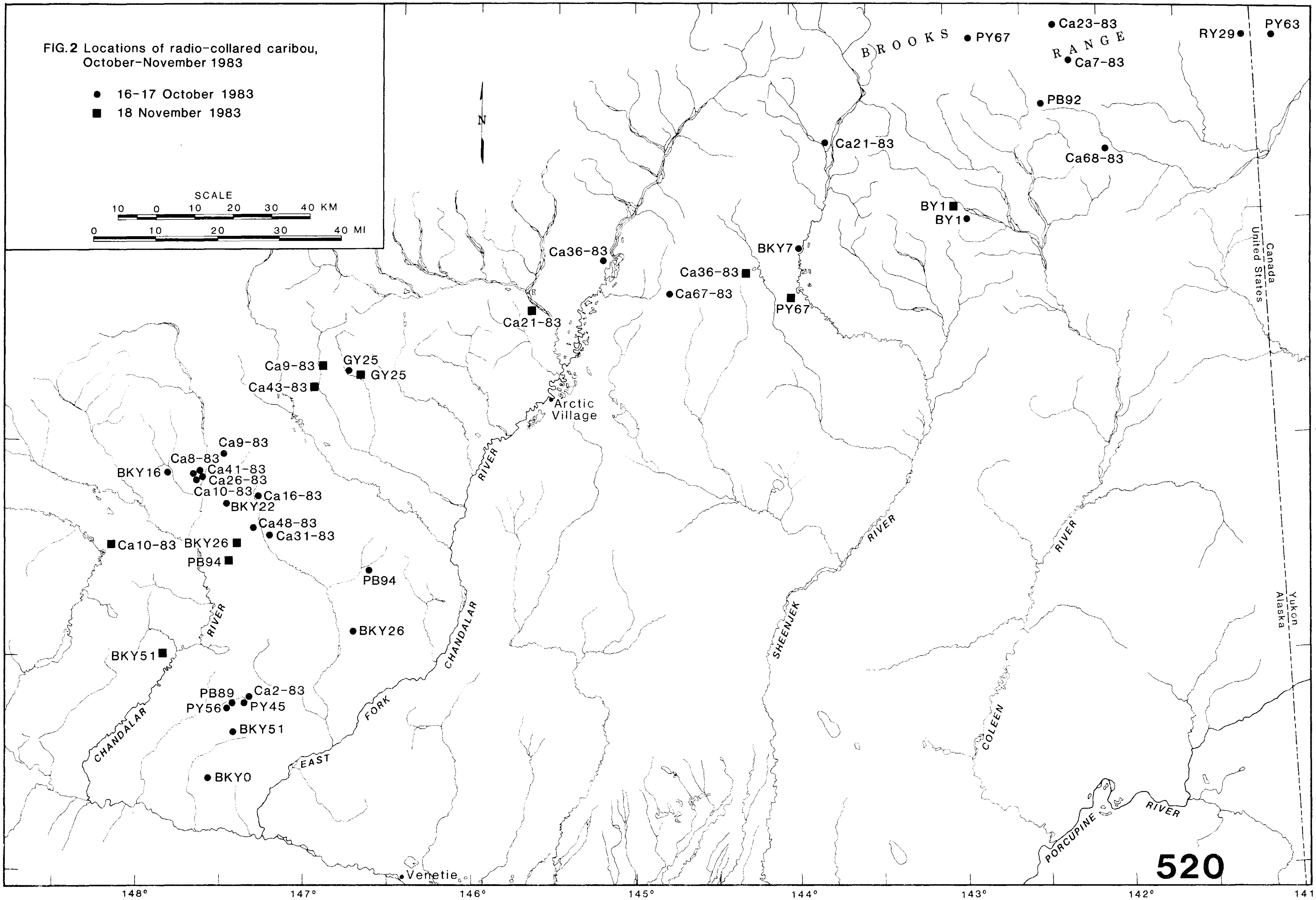


FIG. 2 Locations of radio-collared caribou, October-November 1983

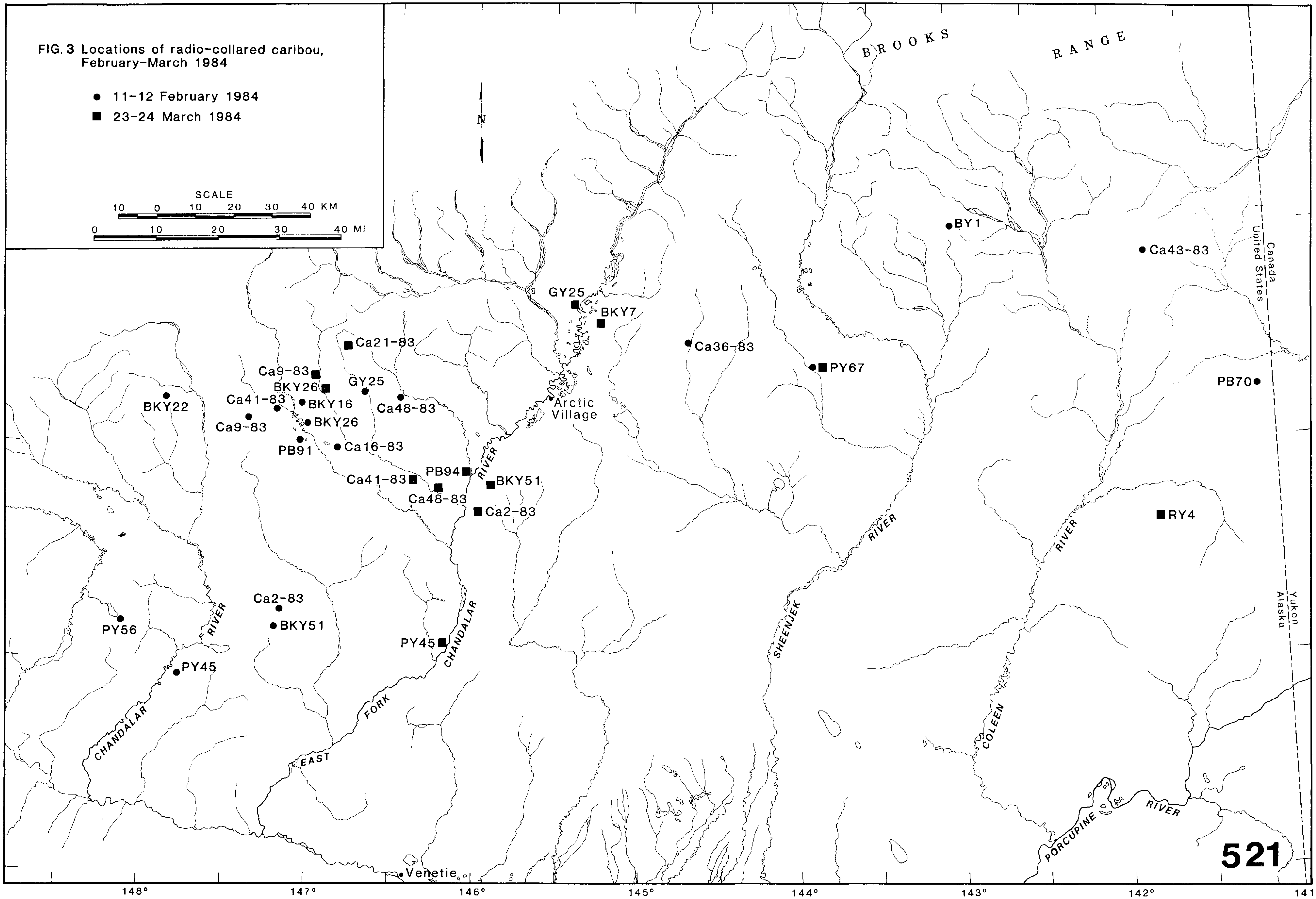


FIG. 3 Locations of radio-collared caribou, February-March 1984

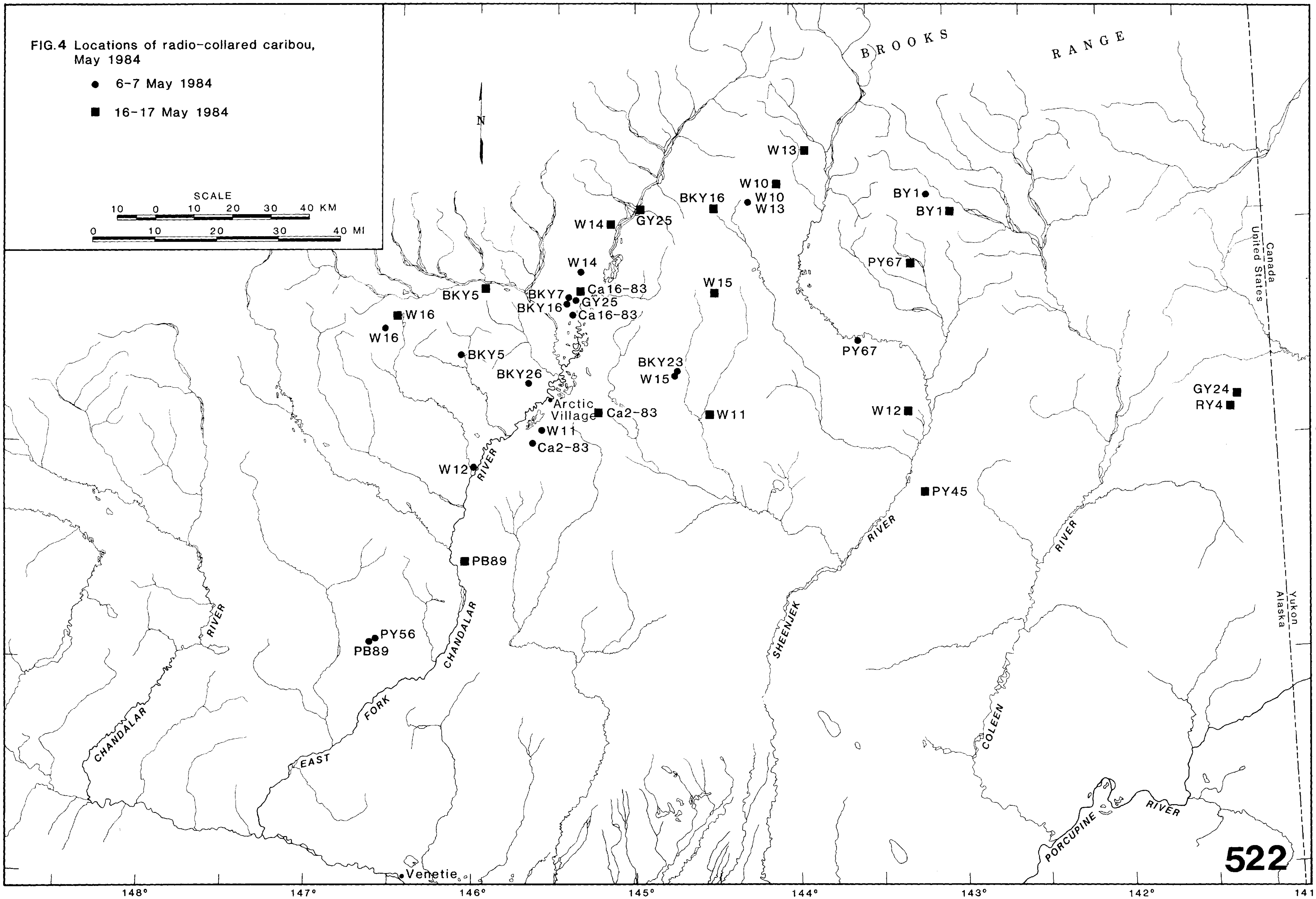


FIG.4 Locations of radio-collared caribou, May 1984

reasonable that more bulls wintered in Canada, and that the caribou wintering in Alaska were predominantly cows and calves.

Among all collared caribou located during the winter (10 Oct - 15 May), a significantly higher proportion of calves than adults was found in Alaska (Table 1). Even after subtracting the 10 adult bulls in Canada, the difference in distribution of calves versus cows was still significant (P 0.05). However, many of the calf relocations in Alaska were from shed collars or mortalities which were detected in October, but probably actually occurred during the July-August migration through the Brooks Range. Caribou in Alaska at that time could have potentially wintered in Canada. Using only relocations after 1 November, when winter distributions were finally established, the proportions of calves versus cows wintering in Alaska and Canada did not differ significantly (P 0.05, $X^2$ = 1.82). Thus, collared cows and calves were dispersed similarly relative to each other in Alaska and Canada. Overall, the distribution of radio-collared caribou appeared to adequately reflect the distribution of the entire population, except that perhaps the sample size of collared males was too small to reflect the small numbers of bulls which probably did winter in Alaska.

Table 1. Distribution of collared calves and adults in Alaska and Canada during winter 1983-1984.

| | 1 Oct - 15 May | | 1 Nov - 15 May | |
|---|---|---|---|---|
| Category | Alaska | Canada | Alaska | Canada |
| 2+ Adults | 18 (0 bulls) | 55 (10 bulls) | 17 (0 bulls) | 55 (10 bulls) |
| Calves | 21 | 23 | 15 | 22 |

Assuming that the 29% of the radio-collared caribou wintering in Alaska represented 29% of the entire herd, there were roughly 40,000 Porcupine caribou wintering in Alaska. No attempts were made to accurately estimate numbers of caribou on winter range. Casual observations during radio-tracking flights suggested 20-30,000 caribou in Alaska. However, past attempts at gross, nonsystematic estimation of the Porcupine herd on winter range have consistently yielded numbers much lower than the known herd size (LeResche 1975, Whitten and Cameron 1981). Thus, an Alaskan overwintering population of 40,000 caribou is not unreasonable.

## Mortality Patterns

At least 20 of the 63 calves radio-collared in 1983 died during their first year of life (i.e., mortality sites were visited and signs of a carcass were found) and at least 23 survived (i.e., were successfully tracked through May 1984). Precise overwinter mortality rates could not be determined, however, due to failure of a number of collars over the winter and also because some mortality signals were not investigated to determine if the signal was emanating from a shed collar or a dead calf. Five collars failed during late summer and were not located after 1 October, eight failed during mid- to late winter, four were shed (i.e., collars with broken elastic bands were retrieved with no sign of a carcass nearby), and three mortality signals were not investigated from the ground (Table 2).

Table 2. Chronology of mortality among radiocollared calves and adults 1983-1984.

| | Percent of annual mortality (N) | | | |
|---|---|---|---|---|
| Category | Summer (Jun-Aug) | Fall (Sep-Oct) | Winter (Nov-Mar) | Spring (Apr-May) |
| Calves | 52 (12) | 26 (6) | 22 (5) | 0 |
| Adults | 0 | 50 (3) | 33 (2) | 17 (1) |

A minimum first year mortality rate was calculated from the following assumptions: (1) calves whose collars failed during late summer were eliminated from the sample, (2) calves whose collars failed during the winter all survived, (3) calves which shed collars were eliminated from the sample, and (4) the three unverified mortality signals were actually shed collars and were also eliminated from the sample. Thus minimum mortality was 20 dead out of a sample of 51 calves, or 39%. Maximum mortality was calculated similarly, except that all calves whose collars failed during the winter were assumed to have died, and the unverified mortality signals were considered true mortalities. Maximum mortality was thus 31 dead out of a sample of 54, or 57%. Perhaps the most reasonable estimate of mortality, however, would result from assuming that the calves whose collars failed during the winter survived, but that the unverified mortalities were actually dead; 23 of 54 died, or 43%.

Among caribou older than calves, 64 of 73 with active collars in June 1983 lived through May 1984; 6 definitely died and 3 had collars which apparently failed during the winter. Minimum mortality was 8% if the caribou with failed collars survived, and maximum mortality was 12% if those with failed collars died. Omitting those caribou whose collars failed, there were equal numbers of yearlings and adults. Mortality rates did not differ significantly, although the yearling rate was slightly higher (11% versus 6%). All mortalities were among females, which made up most of the sample (60 of 70 collared animals).

Most of the calf mortality occurred during summer (Table 2), especially during the first nine days after birth (Whitten et al. 1984). No adults died during summer 1983. More calves died during fall migration than during the entire mid-winter period and most of the adult mortality also occurred during fall (Table 2). Causes of fall and winter mortality are unknown, as all carcasses had been consumed and/or scattered by predators or scavengers before the mortality sites could be examined. Encounters with assumed higher densities of wolves within and south of the Brooks Range is the most likely explanation for the high mortality during fall. One adult cow was shot by hunters from Ft McPherson, Northwest Territories in April 1984.

Recruitment in spring 1984 can be roughly calculated. To be meaningful, recruitment should be expressed as a proportion of the previous year adult population base. Given 74 calves/100 cows in 1983 (Whitten et al. 1984) and a first year mortality range of 43-57% (probable to maximum), recruitment would be 36-47 yearlings in 1984/100 cows in 1983. This estimate can be converted to a percent recruitment figure if the 1983 bull and yearlings cow ratios are also known. The bull:cow ratio in the Porcupine herd was 60 bulls:100 cows in

1980 (Whitten and Cameron 1981), and has presumably remained the same since then. The yearling:cow ratio in 1983 was not estimated, but early calf survival in 1982 was lower than in 1983, and if overwinter mortality was approximately the same as in the 1983 calf cohort, a conservative 1983 yearling:cow estimate would have been 30 yearlings/100 cows. Potential recruitment in 1984 would then be 36-47 yearlings/100 cows, 60 bulls, and 30 yearlings in 1983, or 19-25%.

The Porcupine herd has been growing at about 6-8% annually in recent years. Assuming no immigration or emigration, adult mortality is the difference between recruitment and actual growth, in this case 11-19%. This estimate is slightly higher than the range of 8-12% observed among collared adults in this study. The Porcupine herd may now be increasing more rapidly in response to lower initial calf mortality in the past two years (Whitten el al. 1984 and this report). If so, the calculated mortality rate would be closer to the range observed among collared animals.


## Acknowledgements

D. Russell and W. Nixon (CWS-Whitehorse) radio-tracked the Porcupine herd during fall/winter 1983 and winter/spring 1984 and provided distribution and morality data for the Canadian winter ranges. Pilots D. Ross, B. Lentsch, K. Sibbetts, and D. Miller assisted with fixed-wing airsupport for radio-tracking surveys in Alaska. B. Merkley and F. Fredericks flew helicopter support for morality investigations. G. Weiler, L. Martin, and D. LaPlant assisted with radio-tracking surveys in Alaska. D. Coccia drafted the basemaps/figures.


## Literature Cited


Le Resche, R.E. 1975. Porcupine caribou herd studies. Alaska Dept. Fish and Game, Fed. Aid Wildl. Rest. Prog. Rept. W-17-5. Juneau. 21pp.

Whitten, K.R. and R.D. Cameron 1980. Composition and harvest of the Porcupine caribou herd. Alaska Dept. Fish and Game, Fed. Aid Wildl. Rest. Prog. Rept. W-17-11, Job 3.23 R. Juneau. 8pp.

Whitten, K.R. and R.D. Cameron. 1981. Caribou survey- inventory report. Pages in R.A. Hinman, ed. Annual Report of Survey- inventory Activities. Alaska Dept. Fish and Game. Fed. Aid in Wildl. Rest. Rep. Proj. W-9-1 and W-19-2, Job No. 3.0, 1.0 and 12.0 Juneau.

Whitten, K.R., and R.D. Cameron. 1982. Fall, winter, and spring distribution of the Porcupine caribou herd, 1981-82. Alaska Dept. of Fish and Game. Interim Rept. to U.S. Fish and Wildl. Serv. Fairbanks, AK. 8pp.

Whitten, K.R., G.W. Garner, and F.J. Mauer. 1984. Calving distribution, initial productivity and neonatal mortality of the Porcupine caribou herd, 1983. Pages 359-420 in G.W. Garner and P.E. Reynolds, eds. 1983 update report baseline study of fish, wildlife, and their habitats. U.S. Fish and Wildlife Service, Anchorage, Ak. 614pp.

Prepared by: *Gerald W. Garner* Date: *30 March 1985*

Kenneth R. Whitten, Francis J. Mauer, Gerald W. Garner, Don E. Russell
Wildlife Biologists, Alaska Department of Fish and Game,
Arctic National Wildlife Refuge, and Canadian Wildlife Service

Approved by: *Gerald W. Garner* Date: *30 March 1985*

Gerald W. Garner
Supervisory Wildlife Biologist, Arctic National Wildlife Refuge

ARCTIC NATIONAL WILDLIFE REFUGE COASTAL PLAIN
RESOURCE ASSESSMENT

# 1984 UPDATE REPORT BASELINE STUDY OF THE FISH, WILDLIFE, AND THEIR HABITATS

Section 1002C
Alaska National Interest Lands Conservation Act

Edited by
Gerald W. Garner and Patricia E. Reynolds

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Region 7
Anchorage, Alaska
March 1985