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FALL AND WINTER MOVEMENTS, DISTRIBUTION, AND ANNUAL MORTALITY PATTERNS OF THE PORCUPINE CARIBOU HERD, 1984-1985

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Abstract: Weather conditions appeared to influence the 1984 fall movements of the Porcupine caribou (Rangifer tarandus) herd. Snow storms during late August stimulated strong southeasterly movements of caribou from Alaska, however, caribou drifted back north during mild weather in September. Some caribou returned to Alaska during late fall (October) movements. At the onset of winter conditions (November), large numbers of caribou were located in the northern Richardson Mountains in Canada where they remained during the winter of 1984-1985. Based on proportions of radio-collared caribou found, it is estimated that about 50,000 caribou wintered on traditional ranges in Alaska and about 90,000 caribou wintered in the northern Richardson Mountains and Yukon north slope in Canada. First year mortality (based on survival rates of radio-collared calves) was estimated at 38% for 1984-1985. Male calves had a higher first year mortality rate (53%) than female calves (23%). Annual mortality of (1-3 year old) radio-collared caribou (5%) was significantly lower than that for adults older than 3 years (32%). Following a brief period of higher mortality immediately after parturition, calves survived well until fall, when detected mortality again increased. Overwinter mortality of radio-collared calves was low. This pattern was similar to that identified for the 1983 calf cohort.

Fall and winter movements and distribution, and annual mortality patterns of the Porcupine caribou herd, 1984-1985.

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, and the Canadian Wildlife Service. 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 1984-1985.

Methods and Materials

Radio-collared caribou were relocated using fixed-wing aircraft and standard techniques and equipment from July 1984 through May 1985. Surveys in Alaska were flown once in August, September, and November 1984 and February and April 1985, and twice in May 1985. In Canada surveys were flown numerous days in July and once in August, September, November, and December 1984, and May 1985. 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.

Numbers of caribou involved in late summer and fall movements and numbers wintering in Alaska and Canada were determined through a combination of visual estimates of caribou and sign (tracks, trails, and cratering) and estimation based on distribution of collared animals. There were about 135 collared caribou in July 1984, when the population was estimated at approximately 150,000 (Whitten 1987 this volume). Loss of collared caribou through the winter was assumed to be proportional to overall herd mortality and the distribution of collared caribou was assumed to reflect the distribution of the herd with each collar representing about 1000 caribou. Thus numbers of caribou were generalized estimates, not precise figures.

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. 1985a) and from tracking flights and field necropsies conducted in Canada (Russell and Nixon 1986). Differences in distribution and mortality patterns among various subsections of the Porcupine herd were compared using chi-square contingency tables (Conover 1971).

Results and Discussions

Fall and Winter Movements and Distribution

Southward migration of Porcupine herd caribou through the Brooks Range occurred earlier in 1984 than in most previous years. Approximately 40,000

caribou moved southward through the Aichilik and upper Kongakut River valleys and crossed the continental divide into the upper Coleen River valley during the first week of July. By 6 July, they had continued down the Sheenjek River valley and were tightly aggregated in the vicinity of Lobo Lake. About 100,000 caribou aggregated in the British Mountains in the northern Yukon in early July (Russell and Nixon 1986). During mid-July, most of these caribou moved southwestward from the Firth River and joined the caribou in Alaska. Many caribou then moved westward across the southern foothills of the Brooks Range and reached the Arctic Village area between 15 and 20 July. By the end of the month, well over 100,000 caribou, including at least 104 with radio collars, were scattered across the foothills and mountains between Arctic Village and the Coleen River (Fig. 1). Only about 8,000 remained in the Yukon in the northern Richardson Mountains (Russell and Nixon 1986).

By late August, most of the caribou in Alaska had moved east into Canada, north of Old Crow (Russell and Nixon 1986). A major storm which deposited snow throughout eastern Alaska in late August stimulated a rapid southeasterly movement of caribou. Significant numbers of caribou crossed the Porcupine River near the international border. At the end August 33 radio collars remained in Alaska, mostly in the foothills between the Sheenjek River and the Canadian border (Fig. 2).

Eastward movements continued, and by mid-September essentially all of the Porcupine Herd (including all radio-collars) was in Canada (Fig. 3). Relatively mild weather prevailed during September and at the end of the month, caribou were moving northwestward. The head of the movement reached the Alaska border in the upper Firth River drainage about 26 September.

By mid-November, Porcupine herd caribou were distributed throughout the hills and mountains in Alaska from the Middle Fork of the Chandalar River to the Canadian border, but primarily west of the Sheenjek River (Fig. 4). About 50,000 Porcupine herd caribou, including at least 47 radio collars, remained in Alaska throughout the winter. The remainder of the herd wintered primarily in the northern Richardson Mountains in the Yukon and Northwest Territories (Russell and Nixon 1986). Some caribou also wintered on the Eagle Plains, east of Old Crow, and in the Ogilvie Basin.

Spring migration was underway by mid-April (Fig. 5). Long lines of caribou moved up the Sheenjek River and then east along either side of the crest of the Brooks Range though the upper Kongakut and Coleen Rivers. A few caribou remained southwest of Arctic Village until early May, and some moved eastward across the southern foothills of the Brooks Range before heading north along the Coleen and/or Firth River drainages (Fig. 6). Spring migration was not monitored in Canada, but presumably proceeded through the Richardson Mountains, around the Old Crow Flats, and along the north slope.

Winter distribution was determined for 108 radio collared caribou, including 37 calves and 71 adults. More collared caribou wintered in Canada (56%) than in Alaska (44%). Calves and adult cows were distributed similarly between the two areas (x^2=1.92, df=1, P 0.05). All radio-collared adult males (6) started the mid-winter period in Canada, although only 2 were still transmitting by spring. Two yearling males wintered in Alaska. These data indicate that proportions of maternal versus barren cows were similar between the 2 broad wintering areas, but that the majority of males possibly wintered in Canada. The sample size of radio collared males was too small to be conclusive; however, extensive surveys during radio-tracking and collaring in Alaska in April 1985 suggested that there were, in fact, few adult males in

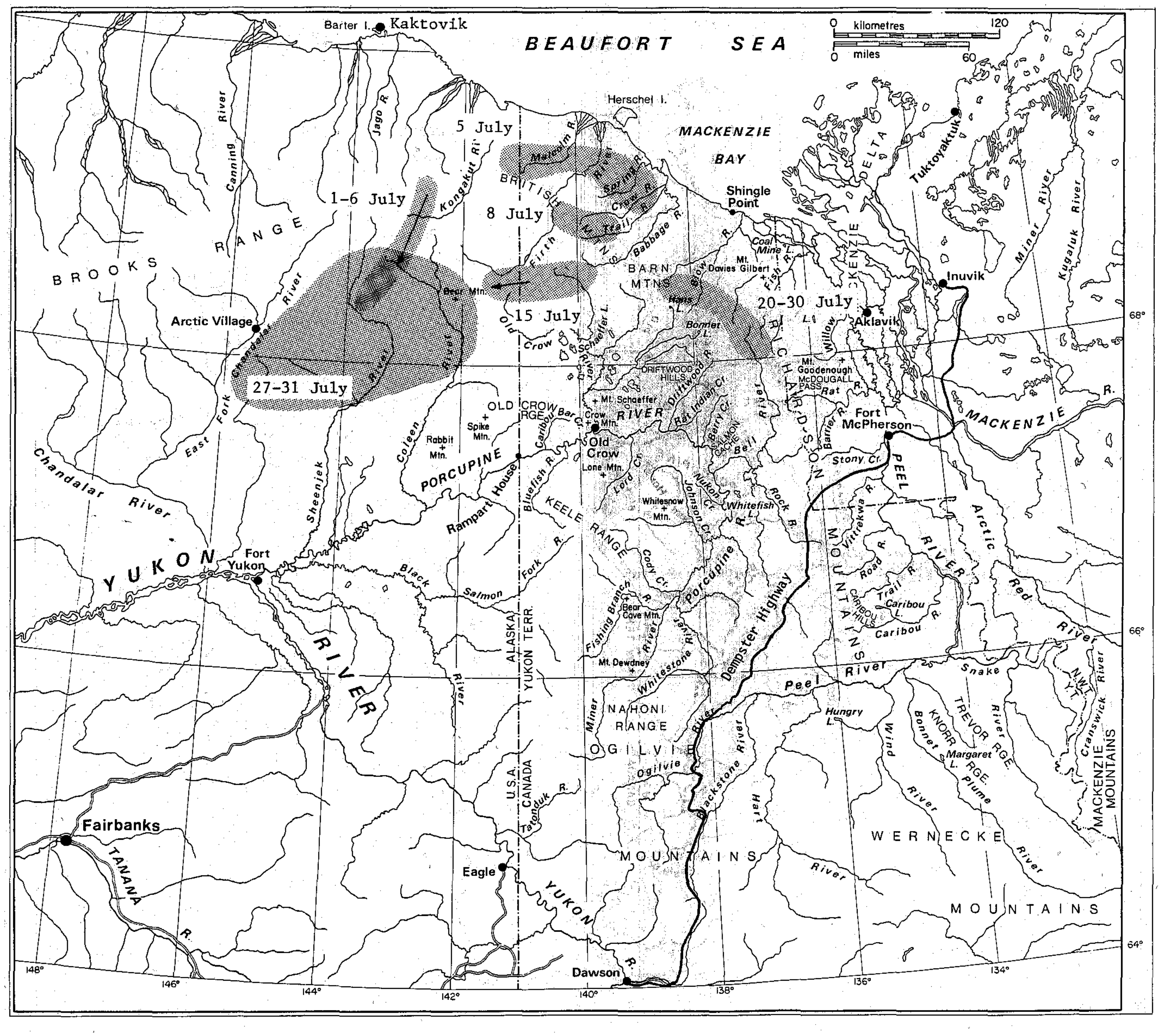

Fig. 1. Porcupine caribou herd distribution 1-31 July, 1984.

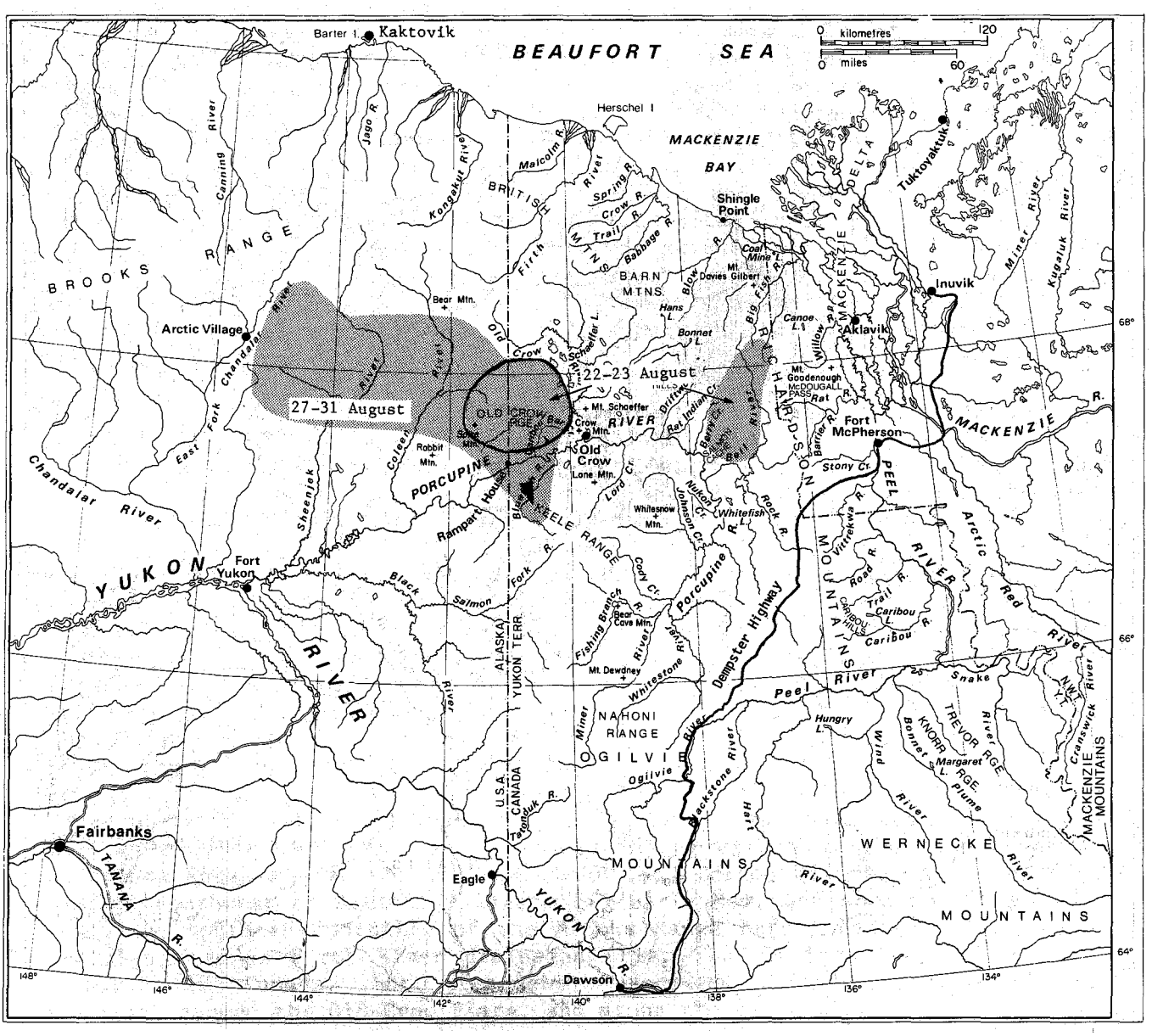

Fig. 2. Porcupine caribou herd distribution 22-31 August, 1984.

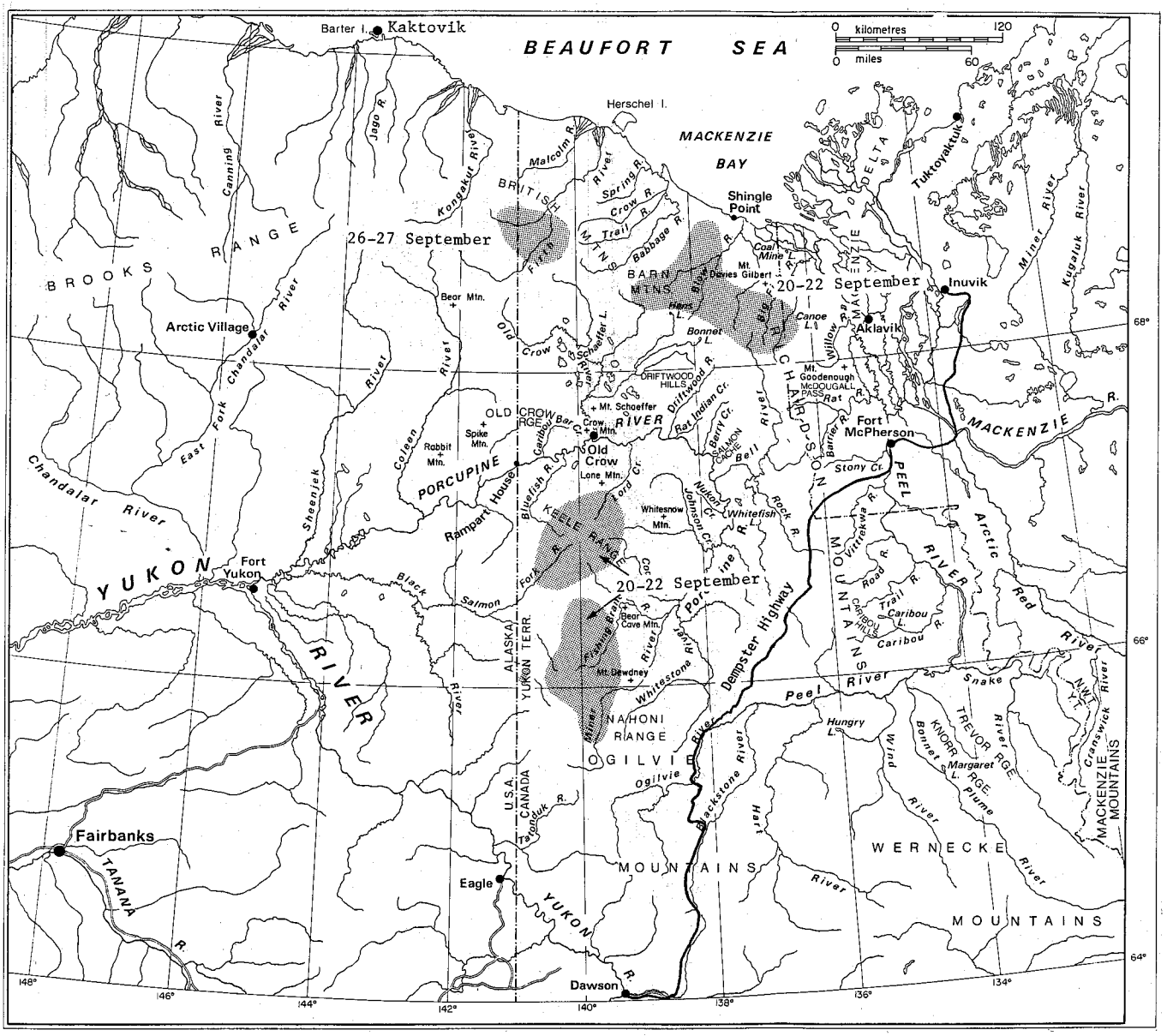

Fig. 3. Porcupine caribou herd distribution 20-27 September, 1984.

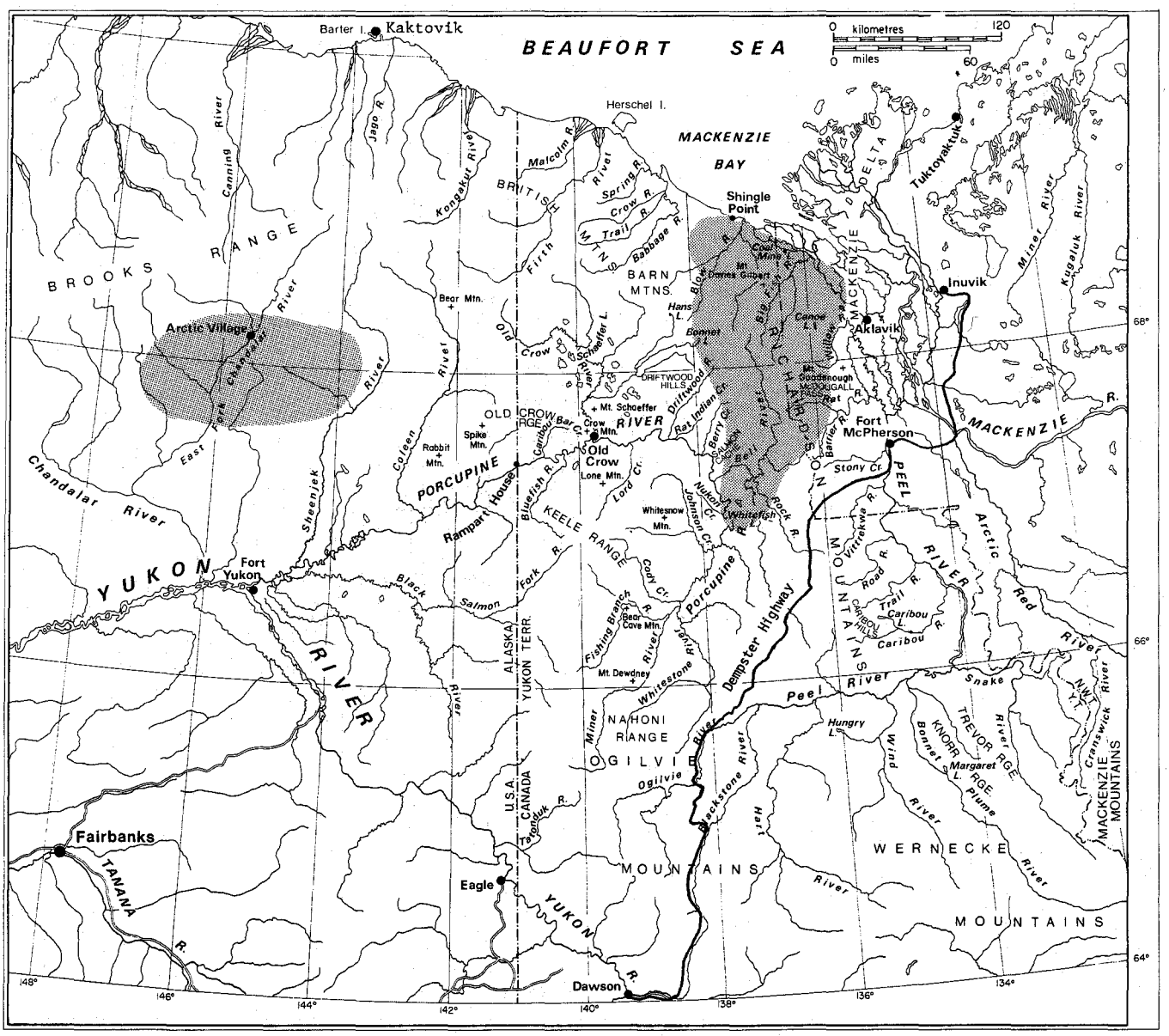

Fig. 4. Porcupine caribou herd distribution 13-17 November, 1984.

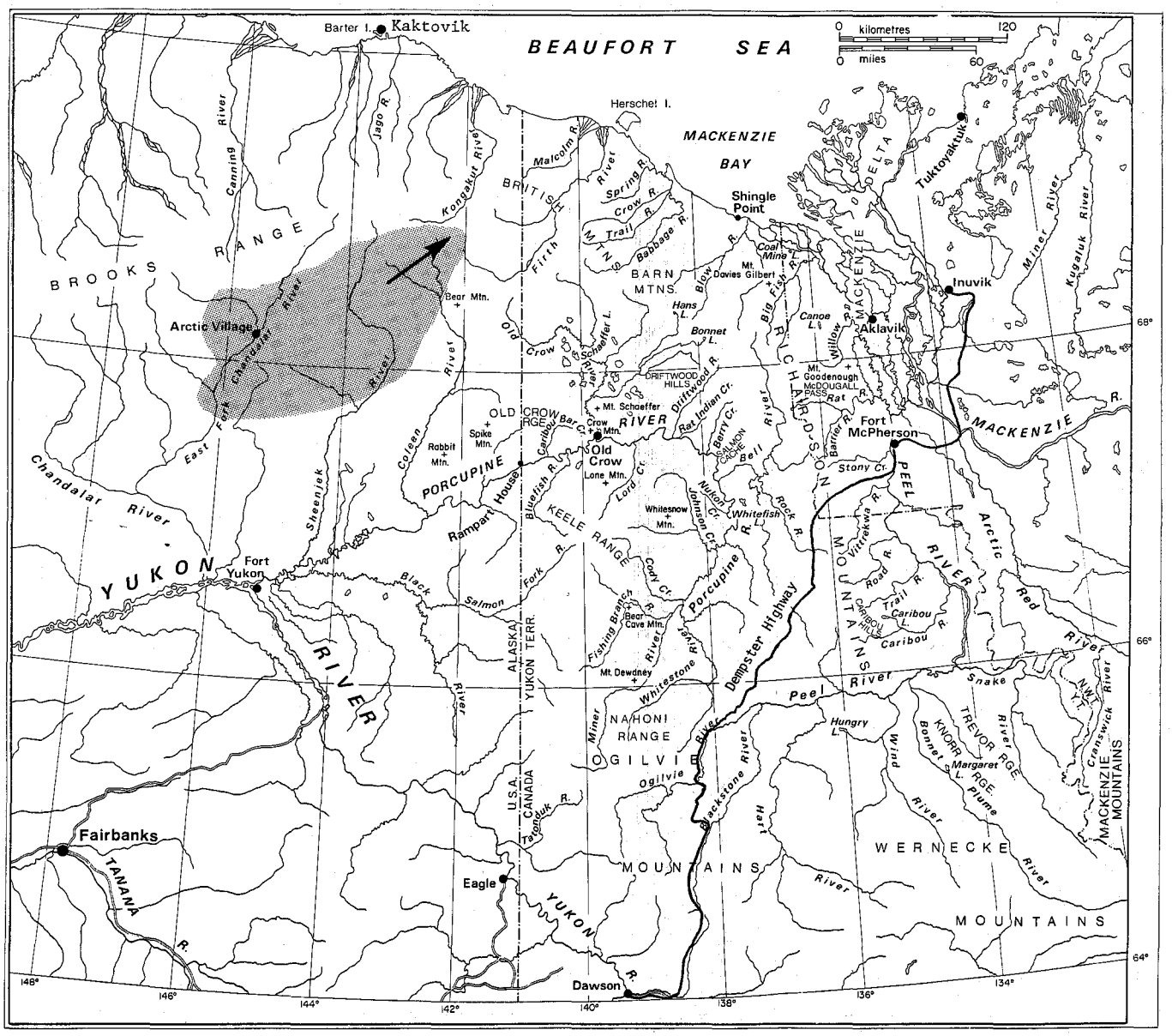

Fig. 5. Porcupine caribou herd distrubtion 13-15 April, 1985 (Alaska only).

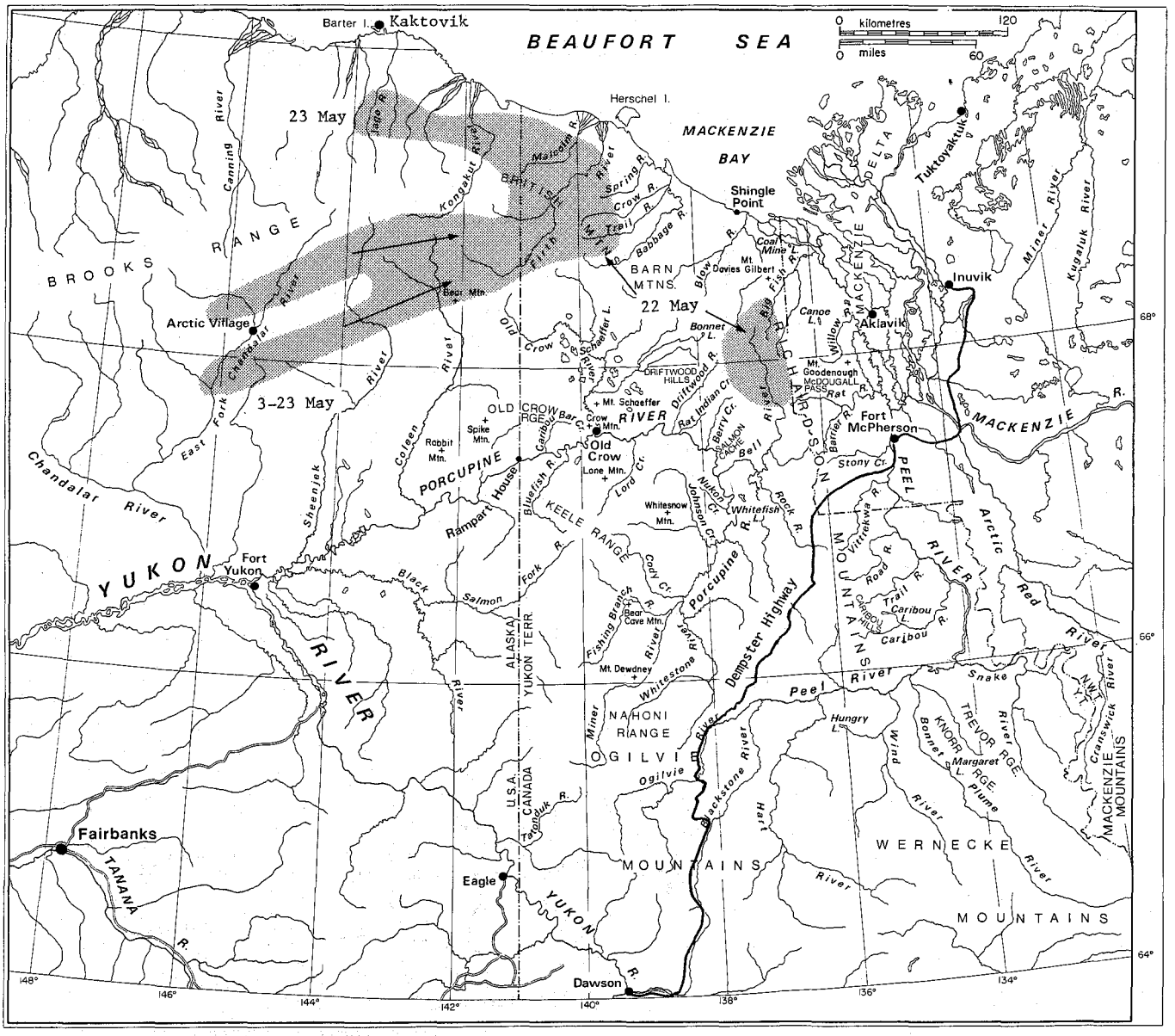

Fig. 6. Porcupine caribou herd distribution 3-23 May, 1985.

Alaska. A similar situation was noted during winter 1983-1984 (Whitten et al. 1985b). Most females wintering in Alaska presumably bred in the British Mountains or along the border before moving on to their final winter ranges. Eight additional adult males were collared in Alaska in April 1985, and 13 males from the 1984 calf cohort were recollared with longer lasting (3.3 year) transmitters. This increased sample size of collared males in future years will provide additional data to more accurately describe the overwinter distribution of males.

Mortality Patterns

The redesigned calf radio collars used in 1984 functioned considerably better than those used in 1983 (Whitten et al. 1985b). Reflector antennas still tended to break, but sender antennas remained intact, providing adequate range for tracking. Only 2 calf collars failed, or at least were never heard after September. Four more collared calves were never located during the winter, but were found alive and well with functioning collars on summer range in 1985. Thus the fate of 58 of 60 collared calves (97%) was known for first year mortality calculations. This was in contrast to the 43 of 63 collared calves (68%) in the 1983 cohort whose fate during the first year of life was definitely known, the remainder presumably having failed collars (Whitten et al. 1985b). Eleven of 81 adult radio collars (14%) apparently failed during the winter of 1984-1985; 3 of these functioned for 3.1 years and the other 8 for 2.4-2.6 years of a projected 3.3 year battery life.

Annual mortality was 40% among the 58 calves whose fates were known. One calf was killed by a wolverine within 24 h of being recollared in April, however, and its death may have been attributable to capture. Thus natural calf mortality may have been only 38%. Mortality was significantly lower (11%; $x^2=13.77$, df=1, $P < 0.01$) among the 70 collared caribou older than calves which were tracked throughout the entire winter. Calf mortality was particularly high during summer and fall (Table 1), a pattern which also occurred in 1983 (Whitten et al. 1985b). During mid-winter and spring, calf and adult mortality did not differ significantly ($x^2=1.44$, df=1, $P > 0.05$).

Table 1. Chronology of mortality among radio-collared calves and adults 1984-1985.

	Percent of annual mortality (N)				
Category	Summer (June-Jul)1984	Fall (Aug-Oct)1984	Winter (Nov-Mar)1984	Spring (Apr-May)1985	Total
Calves	23(5)	55(12)	9(2)	14(3)	38 (22)
Adults	22(2)	22(2)	56(5)	0(0)	13 (09)

Among those collared caribou older than calves, mortality was lower among young animals. Combined mortality among 1-, 2-, and 3-year olds (5%) was significantly lower than among adults older than 3 years (32%; $x^2=6.07$, df=1, $P < 0.05$). Cementum annuli ages of adults older than 3 years are not vet available. However, most were adults when captured, and many have been collared 2 or 3 years. Thus it is likely that many are 6-10 years old and past their prime, and as such would be expected to undergo higher mortality than younger adults.

First year mortality was significantly higher among male calves (53%) than among females (23%; $x^2=4.86$, df=1, $P < 0.05$). Too few males were tracked through the winter to determine whether adult mortality also differed between sexes.

Causes of calf mortality through November 1984 were reported previously (Whitten et al. 1985a). With the exception of the wolverine kill in April which was possibly capture-related, mortalities during the rest of the winter were not investigated quickly enough to determine cause of death. Predation/scavenging was involved in all cases, however, and wolves were the suspected predator.

Two adult cows were apparently killed by brown bears during summer, as were a yearling male and an adult female that died during fall migration. During mid-winter, 2 adult female mortality sites showed signs that predation/scavenging was involved (likely wolves), 2 other sites could not be investigated, and 1 cow was shot near Arctic Village.

Predation/scavenging was thus the major cause of mortality of both calves and adults on a year round basis. Hunting accounted for 11% of the adult mortality, but only 1% of the adults. Two percent of the calves were shot, accounting for 5% of the calf mortality.

The relatively high calf survival and yearling recruitment, combined with low to moderate adult mortality and low hunting pressure, strongly indicate the Porcupine caribou herd is growing.

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