

# The Recent Decline of Peary Caribou on Western Queen Elizabeth Islands of Arctic Canada

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**Abstract:** The numbers and distributions of Peary caribou (*Rangifer tarandus pearyi*) on western Queen Elizabeth Islands, Northwest Territories, were determined by aerial surveys based on a standard census strip method. Surveys were flown in March-April and July-August periods in 1972, 1973, and 1974. Comparison of the 1973 and 1974 surveys with those results of a comparable survey in 1961 showed an overall decline of 89% in numbers of caribou between 1961 and 1974. Percentage reduction of caribou numbers from 1961 to 1974 followed a west-east gradient on the three major islands: Prince Patrick 72%, Melville 87%, and Bathurst 92%. The marked decrease in numbers of caribou is attributed to a combination of high winter mortality in some years and an overall low rate of births and recruitment from 1961 to 1974.

**Zusammenfassung:** Bestandsgröße und Verbreitung des Peary-Karibus (*Rangifer tarandus pearyi*) auf den westlichen Queen Elizabeth Islands, Northwest Territories, wurden in den Jahren 1972, 1973 und 1974 während der Monate März-April und Juli-August durch Reihen-Bildmeßflug ermittelt. Eine Gegenüberstellung der Ergebnisse der Jahre 1973 und 1974 mit denen einer vergleichbaren Aufnahme von 1961 zeigt einen Gesamtrückgang in der Zahl der Karibus von 89% zwischen 1961 und 1974; die prozentuale Verringerung folgt dabei auf den drei Hauptinseln in einem W-E-Gefälle: Prince Patrick 72%, Melville 87% und Bathurst 92%. Diese auffallende Bestandsabnahme wird einer Verbindung von hoher Wintersterblichkeit in einzelnen Jahren und einer insgesamt niedrigen Geburten- und Zuwachsrate zwischen 1961 und 1974 zugeschrieben.

## Introduction

The Peary caribou (*Rangifer tarandus pearyi* J. A. Allen) of the Canadian Arctic Archipelago is a unique form of the genus *Rangifer* that warrants the consideration of conservationists. It is thought to be the only form of North American *Rangifer* that survived

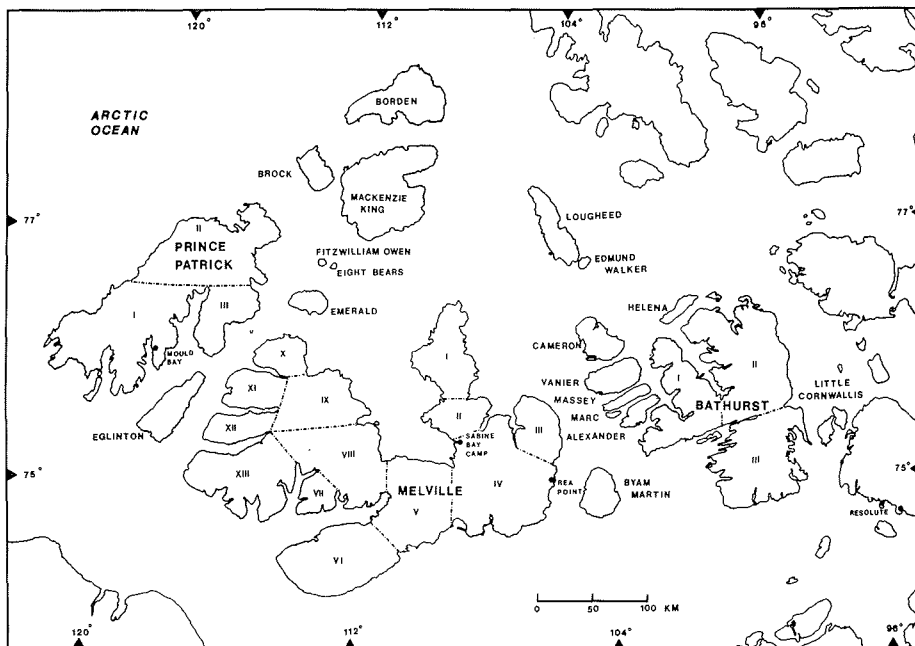


Fig. 1: Western Queen Elizabeth Islands, Northwest Territories, surveyed by air between March 1972 and August 1974.

Abb. 1: Westliche Queen Elizabeth Islands, Northwest Territories, durch Luftaufnahme zwischen März 1972 und August 1974 erfaßt.

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the Wisconsin glaciation in the refugium of Pearyland (Macpherson 1965). Barren-ground caribou (*R. t. groenlandicus*) survived in the Beringian refugium, and the woodland caribou (*R. t. caribou*) south of the Wisconsin ice-sheet (Macpherson 1965). Isolation of Peary caribou has resulted in development of a form which has adapted to the extreme severity of the environment of the Queen Elizabeth Islands. It is unlikely that without first undergoing evolutionary adaptations the mainland caribou could replace Peary caribou on those islands.

Peary caribou were first described by Allen (1902) based on specimens brought back from Ellesmere Island by Commander R. E. Peary. It was, however, recognized as a distinct form of *Rangifer* as early as 1787 by Thomas Pennant (in Glover 1960), who described pelts probably from Victoria Island, traded by Indians.

The first recorded observation of Peary caribou on the western islands of the Queen Elizabeth Group was by Parry (1821) who noted traces of "reindeer" on Bathurst Island. Parry's observations, like those of later expeditions, give some indication of group sizes and locality of sightings, but reference to numbers is often vague. Parry (1821:203—204) noted that both caribou and muskoxen were abundant on some areas of Melville. M'Dougall (1857:277) described Melville as having more game than Cornwallis, Bathurst and north Devon islands. About 50 years later Melville was again described as having abundant caribou and muskoxen (Henessey in Bernier 1910:511—512). Stefansson (1921), who depended almost solely on game during his expeditions, gave the first estimates and comparisons for some of the western Queen Elizabeth Group. On Mackenzie King Island Stefansson (1921:331) noted that the traces of caribou suggested that they were more numerous than on Banks Island where he had estimated 2000 to 3000 (p. 399). On Prince Patrick Island (p. 301) he agreed with Mecham's (in Stefansson 1921:301) impression of absence of game in 1853, and noted (p. 344) that caribou on Melville were "... not numerous". On Lougheed Island Stefansson (1921:542) estimated 300 caribou. No other estimates were obtained until Macpherson (1961) collated data from aerial surveys and ground observations made by geologists in 1958—59. Differences in the transect width, aircraft altitude and percentage cover limit the comparative value of the estimates (Macpherson 1961:31).

The first systematic aerial survey of caribou on the Queen Elizabeth Islands was in summer, 1961 (Tener 1961, 1963). A series of aerial surveys of the western islands of the group were flown from 1972 to 1974. This paper will report on the observed decline from 1961 to 1973 and the crash in numbers between 1973 and 1974.

#### Survey Area

The islands that were surveyed in 1961 Tener (1963), 1973 and 1974 are given in Table 1. They lie between latitudes 74° and 78° North and longitudes 95° and 124° West (Figure 1). Geographical descriptions of the islands are given by Dunbar and Greenaway (1956). Thorsteinsson and Tozer (1960) summarize the structural history of the Queen Elizabeth Islands since Precambrian times. The geology of the western Queen Elizabeth Islands has been studied by Fortier et al. (1963) and Tozer and Thorsteinsson (1964). Savile (1961) has reported botanical information for northwestern Queen Elizabeth Islands. All of the islands surveyed for caribou except western Melville are low-lying and mainly below 150 m elevation. Western Melville is mostly mountainous terrain with many sites from 300 m to 1,000 m above sea level.

#### Methods

The islands were surveyed by use of a standard census strip method. Transects of most islands were at 6.4 km intervals (Miller, Russell and Urquhart 1973, Miller and Russell 1974). Melville, Bathurst and Prince Patrick were divided into major land units, which

provided convenient strata for surveying. The flight lines were oriented either east-west or north-south in each stratum to provide maximum contact with the coast for accurate navigation. Flight lines were oriented east-west on all other islands. A Helio-Courier fixed wing aircraft was used in all surveys, except in August 1972 when a Bell 206 turbo-helicopter was used. Surveys were flown in March-April 1972, 1973, and 1974; August 1972; and July-August 1973 and 1974 (Miller et al. 1973, Miller and Russell 1974, Miller and Russell 1975, Miller and Russell unpubl. data in prep.). A 1.6 km strip was surveyed: 0.8 km on each side of the aircraft. Sightings were recorded as being within the 1.6 km strip or outside the strip (off transect). All survey flights were flown 150 m above ground level at speeds ranging from 110 to 190 kmph, depending on the number of animals encountered. Calves of the year were recorded during summer surveys. Attempts to identify short yearling caribou in March-April were abandoned as there did not appear to be an easily discernible difference in size or behaviour. The population of each geographic unit was estimated by extrapolating from the number of animals tallied within the survey strips in that unit.

#### Results and Discussion

Preliminary surveys of Melville were flown in 1972, but the results were incomplete. In 1973 and 1974 the survey area was expanded to include 13 islands that had been surveyed in 1961 (Tener 1963). It was determined that there was an observational error of about 15% in late winter surveys. Therefore summer results are given unless the

Islands	Caribou observed on transect			Estimated caribou		
	1961 <sup>1)</sup>	1973	1974	1961 <sup>1)</sup>	1973	1974
Melville	769	864	356	12,799	3,425	1,678 <sup>2)</sup>
Bathurst	225	134	41	2,723	527 <sup>3)</sup>	231
Prince Patrick	138	205	163	2,254	807	621
Mackenzie King	111	0	15	2,192	0 <sup>3)</sup>	59 <sup>3)</sup>
Borden	100	2	— <sup>4)</sup>	1,630	16 <sup>3)</sup>	9 <sup>4)</sup>
Eglinton	13	6	9	204	12	18
Lougheed	86	14	0	1,325	56 <sup>3)</sup>	0 <sup>3)</sup>
Vanier	26	5	4	396	20 <sup>3)</sup>	16 <sup>3)</sup>
Cameron	21	2	5	235	7 <sup>3)</sup>	19 <sup>3)</sup>
Emerald	5	3	— <sup>4)</sup>	190	24 <sup>3)</sup>	13 <sup>4)</sup>
Brock	11	10	— <sup>4)</sup>	161	39	20 <sup>4)</sup>
Alexander	15	0	0	198	0 <sup>3)</sup>	0 <sup>3)</sup>
Massey	1	11	0	13	47 <sup>3)</sup>	0 <sup>3)</sup>

<sup>1)</sup> From Tener (1963).

<sup>2)</sup> About 22% of Melville was missed in summer 1974 because of delays caused by bad weather. Estimates for areas missed were obtained from 1973 distribution and 1974 estimate for area surveyed on Melville (1,408).

<sup>3)</sup> Surveyed only in winter during that year.

<sup>4)</sup> Not surveyed in 1974: estimates extrapolated from 1973 counts and decline from 1973 to 1974 on other islands.

**Tab. 1:** Observed and estimated numbers of Peary caribou on western Queen Elizabeth Islands, Northwest Territories, 1961, 1973, and 1974. Estimates based on summer surveys except where otherwise noted.

**Tab. 1:** Beobachtete und geschätzte Zahl der Peary-Karibus auf den westlichen Queen Elizabeth Islands, 1961, 1973 und 1974. Sofern nicht anders angegeben, gehen die Schätzungen auf die Sommer-Erhebungen zurück.

island was surveyed only in late winter. For 1973 estimates of caribou on Melville, Prince Patrick, Eglinton and Emerald are from the summer (July-August) survey, and estimates for the other islands (Table 1) are from the late winter (March-April) survey. For 1974 summer survey results are given for Melville, Prince Patrick and Eglinton, and late winter survey results for the other islands (Table 1). Caribou distribution among islands was determined for 1961, 1973 and 1974 (Table 2). In summer 1961 Tener (1963) estimated that there were 25,845 caribou on the Queen Elizabeth Islands. A total of 24,320 (94%) were on the 13 islands that were surveyed in 1973 and 1974. By 1973 the 24,320 caribou estimated by Tener (1963) had declined 80% to an estimated 4,980. Between 1973 and 1974 the numbers dropped a further 46% to an estimated 2,684, representing an overall decrease of 89% from 1961 to 1974.

Islands	Percentage of total survey area	Percentage of total estimated caribou			Estimated caribou/100 km <sup>2</sup>		
		1961 <sup>1)</sup>	1973	1974	1961 <sup>1)</sup>	1973	1974
Melville	47.3	52.6	68.8	62.5	30.3	8.1	4.7
Bathurst	18.0	11.2	10.6	8.6	16.9	3.3	1.4
Prince Patrick	17.7	9.2	16.2	23.1	14.2	5.1	3.9
Mackenzie King	5.7	9.0	0.0	2.2	43.0	0.0	1.2
Borden	3.1	6.7	0.3	0.3	58.4	0.6	0.3
Eglinton	1.7	0.8	0.3	0.7	13.2	0.8	1.2
Lougheed	1.5	5.4	1.1	0.0	101.9	4.3	0.0
Vanier	1.3	1.6	0.4	0.6	35.0	1.8	1.4
Cameron	1.2	0.9	0.1	0.7	22.2	0.7	1.8
Brock	0.9	1.1	0.5	0.5	36.7	3.0	1.6
Emerald	0.6	0.6	0.8	0.8	29.3	7.0	3.6
Alexander	0.5	0.8	0.0	0.0	40.4	0.0	0.0
Massey	0.5	0.1	0.9	0.0	3.0	10.6	0.0

<sup>1)</sup> From Tener, 1961.

Tab. 2: Distribution of Peary caribou on western Queen Elizabeth Islands, Northwest Territories, 1961, 1973, and 1974.

Tab. 2: Verteilung der Peary-Karibus auf den westlichen Queen Elizabeth Islands, Northwest Territories, 1961, 1973 und 1974.

The rates of decline from 1961 to 1973 were dissimilar between islands and were most marked on northwestern islands: 100% on Mackenzie King, 99% on Borden, 87% on Brock, and 96% on Lougheed. On the larger southwestern islands the decline was severe but less marked; from west to east it was 64% on Prince Patrick, 73% on Melville and 81% on Bathurst. The decline between 1961 and 1973 suggests that environmental conditions were more favourable for survival on the western part of the survey area. The regional differential in the loss of caribou from 1973 to 1974 is especially evident between Prince Patrick and Bathurst (Tables 1 and 2). The islands with the highest densities of caribou in 1961 showed the sharpest decreases in 1973 and 1974 (Table 2). Many of the changes are probably confounded by seasonal migrations of unknown and varying magnitudes between islands. The densities of caribou on Lougheed, Borden and Mackenzie King in 1961 were probably greater than those islands could sustain.

An important cause of the decline in caribou numbers, perhaps the most important, is that rates of births and survival of calves have been low. In 1961 Tener (1963) estimated that calf crops were 20% on Prince Patrick and Bathurst and 19% on Melville. In 1972 not a single calf was seen among the 1,481 caribou observed during the summer survey (Miller et al. 1973). In 1973 the percentages of calves in singles and groups of caribou in which age classes were identified on Melville and Prince Patrick were 17.0% and 10.7% respectively. Subsequent surveys indicated that few of the 1973 calves survived their first winter. No calves were seen on Eglinton or Emerald in 1973. In 1974 the percentages of calves were considerably lower: 1% on Melville, 7% on Prince Patrick and none on the other islands surveyed.

A second reason for the decline of caribou is that in some winters high mortality occurred among both sexes and all age classes as a result of forage unavailability. The densities of carcasses seen in July-August divided by the densities of caribou estimated from the previous March-April survey provide approximations of the relative severity of losses. The above calculations suggest that in 1973 mortality was about 24% on Prince Patrick and 11% on Melville. In 1974 mortality was more severe: 7% on Prince Patrick, 20% on Melville and 65% on Bathurst. The poor condition of caribou on Bathurst in winter 1973-74 was reported by Freeman (1974) and Parker et al. (in press).

Caribou numbers on the Arctic Islands are known to fluctuate considerably (Macpherson 1960, Macpherson 1961, Manning and Macpherson 1961). Vibe (1967) related changes in *Rangifer* numbers in Greenland over two centuries to climatic changes. On Banks McEwen (1955) described an increased mortality of cows, yearlings and calves, and

reduced pregnancy rates from starvation when hard-crusting snow prevented the caribou foraging in the three winters of 1952 to 1955.

We believe that the decline in Peary caribou numbers occurred through the combined effects of low birth-rates, poor recruitment, and high mortality. Furthermore we think that the cause of the reproductive failure and mortality was reduced availability of forage due to early snowfalls, deep and prolonged snow cover and ground-fast ice.

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