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Further studies of two populations of Peary caribou in the Canadian Arctic

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Abstract

In the third year of an ecological study emphasizing relationships among forage availability, condition and productivity we collected 88 caribou (*Rangifer tarandus*) on four Canadian Arctic islands and on Boothia Peninsula in March–April 1976. Only 1 of 18 adult females collected on Melville and Prince Patrick was pregnant compared with 19 of 26 from Somerset and Prince of Wales. Mean percentage fat in the femur marrows of adults from Melville and Prince Patrick islands was 21 and 51% compared with 79 and 73% for adults from Somerset and Prince of Wales respectively. Average age of the caribou obtained on Melville and Prince Patrick was 8.2 years compared with 4.4 years for the collection from Somerset and Prince of Wales.

Diet of the caribou, as inferred from rumen contents, was highly variable among islands and Boothia Peninsula. *Luzula* spp., mosses, *Saxifraga oppositifolia, Dryas integrifolia, Carex* spp., *Salix* spp. and foliose and fruticose lichens comprised 94% of the rumen contents of pooled samples.

The five caribou obtained on Boothia Peninsula exhibited physical characteristics ranging from the typical Peary (*R. t. pearyi*) phenotype to the typical barren-ground (*R. t. groenlandicus*) phenotype. Fetuses in three females collected on Boothia Peninsula on April 5 were significantly larger and further developed, by about 14 days, than fetuses in 11 females collected on Somerset.

Condition and fertility of caribou on Somerset and Prince of Wales were moderately high in March–April 1976 but considerably lower than a year earlier. Condition and fertility of caribou on Melville and Prince Patrick have remained low in samples collected each March–April since 1974. Those data substantiated conclusions reached previously: that fertility in Peary caribou was closely linked to physical condition, and that recovery from a malnourished state was slow.

Introduction

To facilitate future pipeline assessments and management of caribou, a study of Peary caribou was started in 1974 because almost nothing was known about their biology or ecology. This study was designed to learn more about caribou winter habitats and the inter-relationships among climate, forage availability, diet, physical condition of caribou and reproduction.

In this report, Prince Patrick, Eglinton, Melville, Byam Martin and Bathurst islands are collectively referred to as the Parry group and caribou on those islands as the Parry population. Animals on the first four islands named above almost certainly constitute one population. The population status of Bathurst animals is uncertain. Somerset, Prince of Wales and Russell islands are referred to as the Peel group; caribou on them as the Peel population. Boothia caribou constitute the third population.

In co-operation with the Resolute Bay Hunters and Trappers Association and the Northwest Territories Fish and Wildlife Service, 25 caribou were collected in March–April 1974 from Prince of Wales, Bathurst, Byam Martin, and eastern Melville islands (Parker *et al.* 1975). All 20 caribou taken on the Parry islands were in poor condition and only one of 14 adult (>2 years) females was pregnant. Of five females collected on Prince of Wales, all except a 14-year-old were in good condition, and two were pregnant. In March–April 1975, 21 Peary caribou were taken on Melville, Eglinton and Prince Patrick and 23 were obtained from Somerset and Prince of Wales. The former were relatively old, in poor condition and unproductive; the latter, relatively young, generally in excellent condition and highly productive (Thomas *et al.* 1976). Those data led us to the conclusion that fertility in Peary caribou was closely linked to physical condition and that Peary caribou recovered slowly from malnourished states.

In March–April 1976 we collected 83 caribou from Somerset, Prince of Wales, Melville and Prince Patrick islands. We also collected five caribou from Boothia Peninsula to help resolve taxonomic uncertainties and to provide data on winter habitats, winter diet, and condition of caribou there. Caribou of Boothia Peninsula were classified as barren-ground caribou by Banfield (1961).

This report presents the results of the 1976 collection and discusses them in relation to results from the previous 2 years.

Methods

Methods were essentially the same as those of the previous collections (Parker *et al.* 1975, Thomas *et al.* 1976). Age, expressed to the nearest year, was determined after examination of stained sections of roots of the first incisor and the first molar. Fat content of mandibular marrow below the molars was determined in the same way as fat content in the marrow of long bones (Thomas *et al.* 1976), i.e. by the oven-dry method of Neiland (1970).

At collection sites, plant species present in the feeding craters or scrapes were listed and voucher specimens were obtained. Snow depth and hardness were also measured by taking a series of 5–10 measurements tangentially to the crater and recording average readings. Hardness was measured with a penetrometer obtained from a National Research Council snow survey kit.

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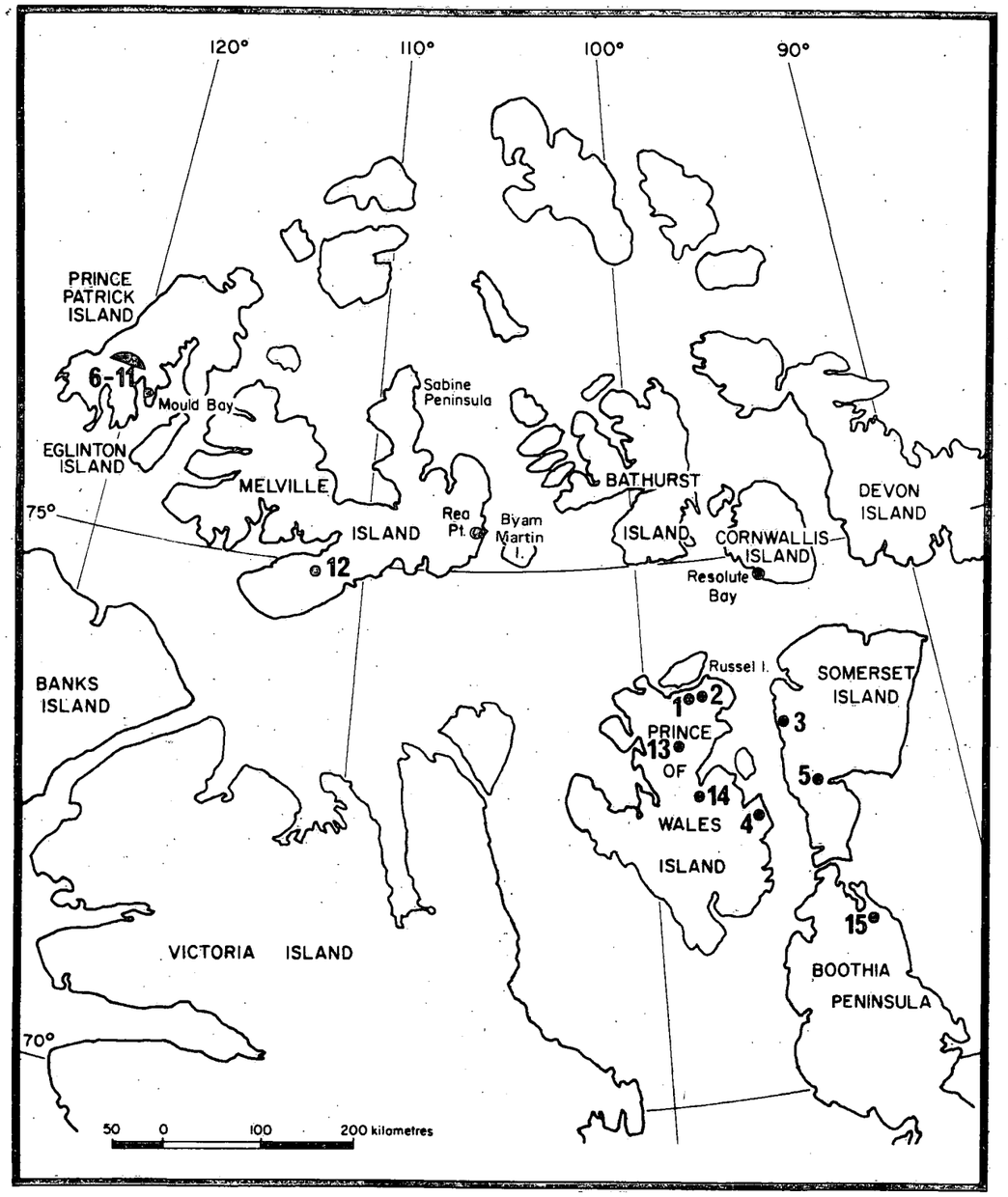
Figure 1
Location of sites in the Canadian Arctic where caribou were obtained in 1976.



Statistical comparisons of means, by F and two-tailed t tests, to evaluate regional age and sex differences in size and condition, were preliminary and conservative. Where variances were disparate, t' was calculated as described by Steele and Torrie (1960:81). We expect that additional significant differences will be found when data from all years are pooled and analyzed. Hereafter, for brevity, three standard levels of significance will be signified as follows: $> = P < 0.05$, $>> = P < 0.01$ and $>>> = P < 0.001$.

Results

Collection sites

Figure 1 shows the locations of collection sites in 1976. Coordinates, collection dates and specimen numbers are presented in Table 1. Large scale maps showing collection sites and the locations of all caribou and muskoxen seen in March–April 1976 and detailed data on each caribou collected in 1976 and in previous years are in a report on file in the CWS Western and Northern Region Library[3] and the CWS Staff Directorate Library[4] (Thomas, in prep.).

Age and sex of sampled caribou

The mean ages of caribou collected on Somerset, Prince of Wales, Melville, and Prince Patrick were 4.5, 4.3, 8.7, and 8.1, respectively (Table 2). Therefore the age distributions of caribou collected on Somerset and Prince of Wales were grouped as were those of caribou from Melville and Prince Patrick (Fig. 2). The mean ages of caribou collected on Somerset and Prince of Wales and on Melville and Prince Patrick were 4.4 (n = 54) and 8.2 (n = 29) years, respectively. Corresponding means were 4.2 (n = 23) and 8.1 (n = 21) years in 1975 (Thomas *et al.* 1976).

Fourteen of the 22 caribou collected on Prince Patrick were born in 1967 or 1969. Those two cohorts accounted for 11 of 21 caribou collected on Melville, Eglinton and Prince Patrick in 1975 (Thomas *et al.* 1976) and for 12 of 20 caribou collected on Bathurst, Byam Martin and Melville in 1974 (Parker *et al.* 1975).

Size

Tentative analyses of length, girth, height and hind foot measurements of adult females (Table 3) and males (Table 4) revealed some statistically significant differences and some trends. In general the adult females from Prince Patrick were smallest (Table 3). Significant regional differences in the means of measurements of adult females were: (1) length, Somerset >> Prince Patrick and (2) girth, Somerset >> Prince Patrick, Prince of Wales >>> Prince Patrick, Melville >> Prince Patrick, Peel group >>> Prince Patrick.

The order, from largest to smallest, of male insular caribou was Somerset, Prince of Wales, Prince Patrick and Melville (Table 4). Significant differences were as follows: (1) length, Peel group > Parry group, (2) girth, Somerset > Melville, Somerset >> Prince Patrick, Prince of Wales > Prince Patrick, Peel group >>> Parry group.

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[4]CWS, Ottawa, Ont.

Long bones were also measured because they may reflect certain size differences better than external body measurements. The femurs, tibias and tarsi of males were significantly longer than those of females in all age classes except calves. Age differences in length precluded grouping samples before age 2 years. For individual and pooled measurements of long bones of adult females, the length order (longest to shortest) was Boothia Peninsula, Somerset and Prince of Wales (equal), Melville and Prince Patrick; none of the means differed significantly from another (Table 5). However, the femurs of adult females from Somerset and Prince of Wales were significantly ($P < 0.05$) longer than those of females from Melville and Prince Patrick. Order of long bones of adult males (longest to shortest) was: Boothia Peninsula, Somerset, Prince of Wales and Prince Patrick (equal) and Melville (Table 5). The only significant differences were between means derived from combined data for the three long bones: Somerset > Parry group and Prince Patrick.

Condition

Weight

Males were significantly heavier than females on a given island except for calves, of which our sample size was small. In our sample, age classes differed significantly in weight up to the >3-year group.

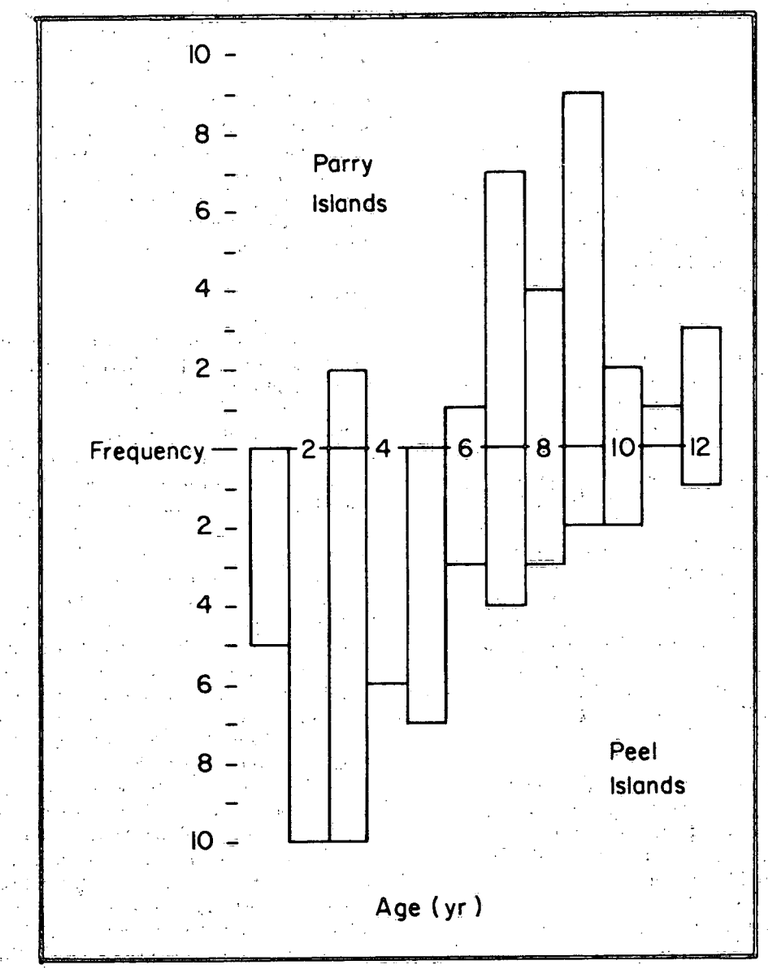
Plots of weight on age indicated that males and females on Somerset and Prince of Wales attained or approached maximum weight by 4 years, whereas both sexes on Melville and Prince Patrick continued to add weight with age. However, on the average they never attained the weight of caribou of Somerset and Prince of Wales.

Assuming no difference in body size and no pregnancy effect, weight is an index of condition. The order heaviest to lightest for females >3 years was Boothia Peninsula, Somerset, Prince of Wales, Melville and Prince Patrick (Table 6). The same order prevailed in males in the same age class except that the order of the last two locations changed. Significant differences in weight of females >3 years were: Somerset > Melville, Somerset >>> Prince Patrick, Prince of Wales >>> Prince Patrick, Peel group > Melville, Peel group >>> Prince Patrick and Peel group >>> Parry group. Significant regional differences in the weight of males >3 years were: Somerset >>> Prince Patrick, Peel group >>> Prince Patrick and Peel group >>> Parry group.

Mean weights (kg), standard errors and sample sizes (parentheses) for females nearing 3 years of age on Somerset, Prince of Wales and Prince Patrick were 55.7 ± 1.5 (4), 54.3 ± 3.1 (3) and 40.6 ± 2.5 (2), respectively. Significant differences were: Somerset >> Prince Patrick and Peel group >>> Prince Patrick.

Mean weights, standard errors and sample sizes for yearling females from Somerset and Prince of Wales were 49.0 ± 4.6 (2) and 43.2 ± 1.6 (4); corresponding values for males were 60.1 ± 0.7 (2) and 53.3 ± 1.1 (2) (Somerset > Prince of Wales). The heavier weights of Somerset males and females

Figure 2
Age distribution of Peary caribou collected on the Parry islands (Melville and Prince Patrick) and on the Peel islands (Somerset and Prince of Wales) in March–April 1976



of all ages compared with those of Prince of Wales, and the small size differences, suggest the former were in better condition.

Kidney fat indices (KFI)
There were no significant within-island sex differences in the KFI of adults from any of the islands or Boothia Peninsula. However, with the exception of samples from Somerset, the indices of adult males were 6–14 points below the indices of adult females (Table 7). The mean KFI of six yearling females from the Peel group (18.5) was similar to that of four yearling males (21.4) from the same region.

In samples from the Peel group the mean KFI of 38 adults (33.7) was significantly ($P < 0.05$) larger than the mean indices of 10 yearlings (19.7) and 14 subadults (20.5). The mean index of four calves (22.7) was marginally higher than the index for 10 yearlings (19.7) collected on the Peel group. Significant differences between islands in KFI of adult females were: Prince of Wales > Prince Patrick and Peel group >> Parry group. The only significant difference among adult males was: Peel group > Parry group. Significant differences between regions in KFI of all adults were: Somerset > Prince Patrick, Somerset > Melville, Prince of Wales > Melville, Prince of Wales > Prince Patrick and Peel group >>> Parry group.

Marrow fat
Within age classes and within regions there were no significant ($P < 0.05$) sex differences in percentage fat in the femurs (Table 8). Fat averaged 29.0% in the femur marrows of two female calves compared with 73.5% in the femurs of three male calves on Somerset and Prince of Wales. Corresponding values in six female and four male yearlings from the same population were 60.1 and 58.7%, respectively. There was no significant difference in mean percentage fat in the femur marrows of five calves (55.7%) compared with 10 yearlings (59.6%) collected on the Peel group, in spite of one low reading (1.4%) in a female calf collected on Prince of Wales. There were significant differences in femur marrow fat between adults and yearlings ($P < 0.05$) and between adults and subadults ($P < 0.01$) collected on Somerset and Prince of Wales.

Based on percentage fat in the femur marrows, the caribou of Somerset were in the best condition followed by those of Prince of Wales, Boothia Peninsula, Prince Patrick and Melville (Table 8). Adult females of both Somerset and Prince of Wales had significantly ($P < 0.01$) higher femur fat reserves than adult females from Melville or Prince Patrick. Similarly such reserves were significantly higher in adult males of Somerset than in those of Melville ($P < 0.05$) or Prince Patrick ($P < 0.001$).

Similar regional differences in fat reserves, with higher significance, were found between adults, sexes combined. Femur fat reserves in 22 adults from Prince Patrick were significantly ($P < 0.01$) higher than those in seven adults from Melville.

Data on percentage fat in the mandibular marrow (Table 9) were similar to those for femurs and pointed to the same regional differences in condition. The mathematical relationships between the two data sources will be explored in detail in a completion report. The mandibular marrow appears to be a reliable indicator of condition, and there are many advantages of using mandibles instead of femurs.

Back fat
Approximately two thirds of adult females and one quarter of males in the sample from Somerset and Prince of Wales had subcutaneous back fat reserves (Table 10). Only two of 22 caribou collected on Prince Patrick had measurable back fat, although four others had traces of fat. None of the seven caribou obtained from Melville had subcutaneous fat. Back fat reserves, as measured by mean back fat thickness, were highest in adult females of Prince of Wales followed by those of Boothia Peninsula, Somerset, Prince Patrick and Melville.

Reproduction
All three females obtained on Boothia Peninsula were pregnant as were 19 of 26 adult females collected on the Peel islands, including 11 of 13 from Somerset and eight of 13 from Prince of Wales. Ages of the seven non-pregnant females were 3, 3, 4, 4, 7, 10 and 10 years. None of the six yearling females obtained on Somerset and Prince of Wales were pregnant. Only one of 18 adult females collected on Melville and Prince Patrick was pregnant, the exception being one of the five collected on Melville.

Three fetuses from females collected 5 April on Boothia Peninsula averaged 2322 g, significantly ($P < 0.001$) heavier than fetuses from 11 females obtained 25–27 March on Somerset and from eight females collected 15 March – 3 April on Prince of Wales, which had mean weights of 1182 and 973 g, respectively.

Morphologically the Boothia fetuses were markedly more advanced than the others. The heads and bodies were hirsute and darkly pigmented; others were pink with only traces of hair and pigment. A cursory fitting of the data on forehead–rump lengths and hind foot lengths to fetal growth curves for mule deer (*Odocoileus hemionus*) (Hudson and Browman 1959), the species which most closely resembles caribou in length of gestation and size at birth, suggests that the fetuses from Boothia Peninsula were more advanced than the others by approximately 24 days; i.e. a net difference of 14 days. This estimate, to be refined later, is interesting when considering that there was no significant difference in condition and phenotype between the females collected on Boothia and the females from Somerset and Prince of Wales.

Rumen contents
By volume
Luzula spp., mosses, *Saxifraga oppositifolia*, *Dryas integrifolia*, *Salix* spp., foliose and fruticose lichens and *Carex* spp. constituted 94% of identifiable fragments in the 86 rumen samples from caribou of all regions (Table 11). Striking regional differences are apparent but similarities between the lists for Somerset and Prince of Wales are evident as are similarities in the lists for Melville and Prince Patrick.

Carex spp., mostly *C. stans* made up 76% of vegetation in the rumens of caribou collected on Boothia; in samples from the islands it was absent or insignificant in quantity.

The species lists for Somerset and Prince of Wales were similar but *Luzula* spp. and *Dryas integrifolia* made up 51% of the contents of rumens from caribou of Somerset compared with 20% of the Prince of Wales samples. Though *Saxifraga oppositifolia* and foliose and fruticose lichens constituted 43% of the samples from caribou of Prince of Wales, they made up only 10% of the contents of rumens of caribou collected on Somerset.

The rumen contents of caribou collected on Melville and Prince Patrick were remarkably similar. *Luzula* spp. contributed over half and mosses 29 and 41% (respectively) of the rumen contents.

By frequency

Data on frequency of occurrence of plant species in the rumen samples (Table 12) also point to considerable regional differences in diets. For example, *Cassiope tetragona* was present only in samples from Somerset; *Dryas integrifolia* and *Carex* spp. were absent in samples from Melville and Prince Patrick. *Thamnolia vermiculata* occurred in 60% of all samples, but it accounted for only 3% of the volume of those samples.

Plants present in craters

We listed the plant species present in 10–20 craters at 11 sites on Boothia Peninsula (1 site), Somerset (2 sites), Prince of Wales (2 sites), Melville (1 site) and Prince Patrick (5 sites). Excluding mosses and crustose lichens (both of doubtful significance as forage), foliose lichens occupy nine of the 12 top frequency positions (Table 13) when species are listed by frequency of occurrence in feeding craters.

Snow characteristics

Measurements of snow thickness and hardness obtained at nine sites cratered or scraped by caribou revealed thicknesses of 1–31 cm and hardness values of 300–10 000 g/cm^2 for the hardest layer (Table 14). At site 15, Boothia Peninsula, a 0.5–1 cm moderately hard (2000 g/cm^2) layer of snow overlaid about 16–25 cm of crystalline snow. The crust would not support a person with large footwear, but it was hard enough to cause hair loss from the medial nasal region of two of the caribou. At all other sites, with the exception of sheltered areas among rocks and boulders at the sites on Somerset, the hardest layer of snow at or near the surface supported the weight of humans.

Extremely hard snow was encountered at most sites on Somerset, Prince of Wales, and Melville islands. Hardness means and maxima were lowest on Prince Patrick (Table 14). Hardness values were highly variable on Somerset because of shelter differences created by rocks and boulders. All caribou observed on Somerset in March 1976 were distributed in areas of rock rubble. Relief is greater on western Somerset than on most other regions where Peary caribou winter. On the windward (generally northern) side of hills, the snow either is blown clear from the ground or it is compacted into a hard layer. On the lee side the snow is deeper but softer. Topography also affects winds and snow conditions on a regional scale. That region of the Stanwell Fletcher lowlands located north of the Union River, where caribou were most numerous, may be protected from northern winds by the high hills to the north.

In our opinion snow was markedly deeper and harder on Somerset, Prince of Wales, Melville and Prince Patrick islands in March–April 1976 than a year earlier. A 0.5 cm layer of ice was present at ground and vegetation level at site 4 on Prince of Wales and ice lenses were encountered in the snow at site 5 on Somerset. In March–April 1976 local topographically high regions were covered by a layer of snow several centimetres in thickness. A year earlier these areas were free of snow or covered thinly.

Pathology and parasites

Serum samples were collected from 66 caribou and tested for the presence of Brucella antibodies using the standard tube agglutination test at dilutions of 1/25, 1/50, 1/100 and 1/200. All samples were negative.

Frequencies (%) of warble fly (*Oedemagena tarandi* L.) larvae in caribou collected in 1976 (Table 15), with the previous year's frequencies in parentheses, were as follows: Somerset 30 (63), Prince of Wales 13 (78), Melville 0 (13), and Prince Patrick 0 (50). Although frequencies were lower in the 1976 sample, the mean number of larvae in those having them increased from 12 to 44 in samples from Somerset and from 36 to 107 in Prince of Wales samples. The significance of these changes is not known but the influence of climate was undoubtedly important.

Discussion

Our data extended earlier indications that the Peel population of caribou was young, the Parry population old. The 1967 and 1969 cohorts have accounted for 39 of the 70 caribou collected on the Parry islands from 1974 to 1976. The two 3-year-olds collected on Prince Patrick are proof that some of the calves born in 1973 on the Parry islands survived the severe winter of 1973–74. Some calves born that year probably survived on Prince Patrick and Eglinton because snow was shallower and softer there than on eastern Melville and Bathurst. That conclusion is based on snow data (Thomas *et al.* 1976), subjective observations made by one of us in late winter 1974 and on satellite imagery, which shows earlier snow melt on western Melville, Eglinton and Prince Patrick than on eastern Melville, Bathurst and Cornwallis islands.

Data for length, girth, height, and hind foot reveal size trends among the populations of caribou (Boothia animals largest, Parry islands smallest) but no significant differences for all four attributes prevailed among the three populations. Many of the significant differences were in girth, an attribute influenced by physical condition. The total length measurement is probably the most independent of fat reserves and the least influenced by measuring error. Adult males in our sample from the Peel islands were significantly ($P < 0.05$) longer than their counterparts on the Parry islands but the difference between females in the two populations was not significant, even though females in the sample from Prince Patrick were significantly ($P < 0.01$) shorter than the females in either the Prince of Wales or the Somerset sample. Data on long bones indicate that differences in leg length between the caribou of the two insular populations are not statistically significant.

Our data show a strong correlation between condition in March–April and fertility as expressed by pregnancy rate.

Weight, back fat reserves, kidney fat indices and marrow fat are all useful indicators of condition. The mathematical relationships among these indices and between indices and pregnancy rates will be explored in a later publication. Our goal is to construct a model from which pregnancy rates may be predicted from condition data. Perhaps a sample of 10–20 mandibles from caribou of either sex killed on a given island in late winter by Inuit hunters may provide sufficient data to monitor trends in condition and productivity. Such information will aid management practices on the islands. As populations fluctuate in response to natural and human factors, hunting may have to be regulated on other islands, as it was on Bathurst with the curtailing of hunting after 1974.

A sharp decrease in productivity occurred on the Peel islands from 1975 to 1976. For example, four of five yearlings were pregnant in 1975; none of six in 1976. Condition and productivity varied little on the Parry islands during the same period. Fat reserves in the marrow decreased slightly while weight and kidney fat indices increased marginally.

Since 1974, 116 serum samples from Peary caribou have been tested for brucellosis but no serological evidence of the disease has been detected. It can be concluded from these results that the marked variation in reproductive success cannot be attributed to Brucella infection.

Although there were marked regional differences in diets, inferred from rumen contents, the lists for 1975 and 1976 coincide; only the proportions changed slightly. We consider lichens to be under-represented in the rumen samples, mosses over-represented.

We believe that further research is urgently needed in the following areas:

1. A larger sample of caribou is required from Boothia Peninsula in order to unravel their taxonomy, further document their apparent earlier breeding season and to obtain more data on winter ranges and diet.
2. More data are needed on the relationship between condition and reproduction, especially for the caribou on Prince Patrick, where the pregnancy rate is lower than predicted by the data on physical condition. The result will be a model from which productivity can be predicted from the data on condition.
3. There is a need to monitor condition and productivity each year to aid both managerial and conservation functions. With such monitoring the status on populations can be estimated for several years after major surveys of numbers are conducted, as on the western Queen Elizabeth islands, 1972–74 (Miller *et al.* 1975) and on Somerset, Prince of Wales and Boothia Peninsula, 1974–75 (Fischer and Duncan 1976).
4. Inter-island movements and resulting potential for gene pool mixing.

Continued monitoring of the status of insular and peninsular caribou populations is important because their management, to achieve maximum yield for native hunters, will be difficult and controversial. Populations may require many years to recover from major declines as exemplified by caribou on the Parry islands. A similar decline and slow recovery period could occur in the Peel islands and Boothia populations, leaving native hunters without a source of caribou in their traditional hunting territories.

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References

Banfield, A.W.F. 1961. A revision of the reindeer and caribou, genus *Rangifer*, Nat. Mus. Can. Bull. 177:1–137.

Fischer, C.A. and E.A. Duncan. 1976. Ecological studies of caribou and muskoxen in the Arctic Archipelago and northern Keewatin. Interim rep. by Renewable Resources Consult. Serv. Ltd. to Polar Gas.

Hudson, P. and L.G. Browman. 1959. Embryonic and fetal development of the mule deer. J. Wildl. Manage. 23(3):295–304.

Miller, F.L., R.H. Russell and A. Gunn. 1975. The recent decline of Peary caribou on western Queen Elizabeth Islands of Arctic Canada. Polarforschung 45(1):17–21.

Neiland, K.A. 1970. Weight of dried marrow as indication of fat in caribou femurs. J. Wildl. Manage. 34(4):904–907.

Parker, G.R., D.C. Thomas, E. Broughton and D.R. Gray. 1975. Crashes of muskox and Peary caribou populations in 1973–74 on the Parry Islands, Arctic Canada. Can. Wildl. Serv. Prog. Note No. 56. 10 p.

Steele, R.G.D. and J.H. Torrie. 1960. Principles and procedures of statistics. McGraw-Hill Book Co. Inc., Toronto. 481 p.

Thomas, D.C., R.H. Russell, E. Broughton and P.L. Madore. 1976. Investigations of Peary caribou populations on some Canadian Arctic Islands, March 1975. Can. Wildl. Serv. Prog. Note No. 64. 13 p.

Table 1
Site locations, dates and specimen numbers of the 1976 March–April collection of caribou from five regions of the Canadian Arctic

Site	Region	Coordinates	Date	Specimen no.
1	Prince of Wales	73°44′N, 98°28′W	Mar. 15	76: 1, 2
2	Prince of Wales	73°44′N, 98°11′W	Mar. 15	76: 3– 5
3	Somerset	73°23′N, 95°33′W	Mar. 19	76: 6– 9
4	Prince of Wales	72°34′N, 96°38′W	Mar. 20	76:10–19
5	Somerset	72°45′N, 94°22′W	Mar. 25–27	76:21–46
6	Prince Patrick	76°32′N,120°31′W	Mar. 30	76:47–49
7	Prince Patrick	76°30′N,120°26′W	Mar. 30	76:50–53
8	Prince Patrick	76°32′N,120°15′W	Mar. 30	76:54–57
9	Prince Patrick	76°30′N,119°56′W	Mar. 31	76:58–61
10	Prince Patrick	76°33′N,119°58′W	Mar. 31	76:62–65
11	Prince Patrick	76°29′N,119°48′W	Mar. 31	76:66–68
12	Melville	74°52′N,111°58′W	Apr. 2	76:69–75
13	Prince of Wales	73°24′N, 98°58′W	Apr. 3	76:76–78
14	Prince of Wales	72°50′N, 98°35′W	Apr. 3	76:79–84
15	Boothia Peninsula	71°33′N, 93°47′W	Apr. 5	76:85–89

Table 2
Ages and sex of 88 caribou collected on four Arctic islands and on Boothia Peninsula in March–April 1976

		Age (nearest year)											
Location	Sex	1	2	3	4	5	6	7	8	9	10	11	12
Boothia Peninsula	M			1	1								
	F				1					1	1		
Somerset	M	3	2	2	1	2	1	1	2				
	F	1	2	4	1	4			1	1	1		1
Melville	M						1		1				
	F								1	2	1	1	
Prince of Wales	M		2	1		2	1						
	F	1	4	3	4		1	3		1	1		
Prince Patrick	M							3	1	3		2	
	F			2				4	1	4	1	1	

Table 3
Size (mean ± standard error in cm) of physical attributes of adult (>2 yr) female caribou obtained from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

Physical character	Boothia Peninsula (3)	Somerset (13)	Prince of Wales (13)	Melville (5)	Prince Patrick (13)
Length	146.0±5.1	148.8±1.8	149.7±1.7	147.6±2.7	145.0±2.0
Girth	106.7±1.9	105.2±1.1	108.3±1.4	106.2±1.9	99.8±1.0
Shoulder height	101.3±1.5	99.2±3.9	97.9±1.0	99.6±1.4	98.0±1.1
Hind foot	48.7±1.5	46.8±0.3	47.1±0.4	47.0±0.6	46.7±0.3

Table 4
Size (mean ± standard error in cm) of physical attributes of adult (>2 yr) male caribou obtained from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

Physical character	Boothia Peninsula (2)	Somerset (9)	Prince of Wales (4)	Melville (2)	Prince Patrick (9)
Length	164.0±6.0	162.4±2.1	164.8±4.3	153.0±1.0	157.3±1.9
Girth	118.0±5.0	123.9±3.2	119.0±4.9	107.5±4.5	110.2±1.6
Shoulder height	116.0±1.0	105.8±1.8	107.0±1.4	103.0±2.0	107.3±1.7
Hind foot	53.5±4.5	50.0±0.5	49.8±0.8	48.5±0.5	49.3±0.5

Table 5
Mean ± standard error (cm) of long bone measurements of caribou collected from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

	Boothia Peninsula	Somerset	Prince of Wales	Melville	Prince Patrick
Adult females	(3)	(13)	(13)	(5)	(13)
Femur	26.0±0.6	25.3±0.4	25.5±0.2	25.0±0.4	24.8±0.2
Tibia	28.7±0.6	27.9±0.7	27.9±0.2	27.8±0.3	27.5±0.2
Tarsus	28.2±0.4	27.3±0.5	27.2±0.2	27.3±0.4	27.2±0.2
Three bones	82.9±1.5	80.5±4.0	80.6±0.5	80.1±1.0	79.5±0.6
Adult males	(2)	(9)	(4)	(2)	(9)
Femur	29.2±0.3	28.0±0.2	27.3±0.2	26.2±0.4	27.1±0.3
Tibia	32.5±1.5	30.8±0.3	29.7±0.5	28.9±0.4	30.0±0.3
Tarsus	31.2±1.1	29.3±0.4	28.5±0.3	28.1±0.2	28.7±0.2
Three bones	92.8±2.8	88.3±0.9	85.8±0.7	83.1±1.0	85.8±0.7

Table 6
Mean ± standard error weights (kg) of caribou >3 yr collected from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

	Boothia Peninsula	Somerset	Prince of Wales	Melville	Prince Patrick
Females	67.9±2.3 (3)	63.0±1.6 (9)	59.8±2.1 (10)	54.3±2.6 (5)	50.8±1.0 (11)
Males	92.1 (1)	91.3±3.3 (7)	77.6±4.9 (3)	66.0±5.2 (2)	69.2±2.4 (9)

Table 7
Mean kidney fat indices ± standard errors of adult (>2 yr) caribou collected from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

	Boothia Peninsula	Somerset	Prince of Wales	Melville	Prince Patrick
Adult females	42.1±14.8 (3)	31.5±3.4 (12)	40.2±5.8 (13)	21.8±5.6 (5)	24.4±2.7 (13)
Adult males	30.0±21.7 (2)	32.3±5.3 (9)	22.1±9.8 (4)	9.9±2.3 (2)	18.1±3.3 (9)
Adults	37.2±11.0 (5)	31.9±2.9 (21)	35.9±5.2 (17)	18.4±4.4 (7)	21.8±2.2 (22)

Table 8
Mean ± standard error of percentage fat in the femur marrows of adult (>2 yr) caribou obtained from five regions of the Canadian Arctic, March–April 1976 (sample sizes in parentheses)

	Boothia Peninsula	Somerset	Prince of Wales	Melville	Prince Patrick
Adult females	60.4±24.9 (3)	76.5±4.8 (13)	76.4±6.2 (13)	22.6±10.3 (5)	51.2±6.0 (13)
Adult males	47.0±39.6 (2)	83.5±3.1 (9)	62.3±12.7 (4)	18.1±4.2 (2)	51.7±6.3 (9)
Adults	55.1±18.8 (5)	79.4±3.2 (22)	73.1±5.6 (17)	21.3±7.2 (7)	51.4±4.3 (22)

Table 9
Means ± standard errors of percentage fat in the mandibular marrow of caribou obtained from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

	Boothia Peninsula	Somerset	Prince of Wales	Melville	Prince Patrick
Adult females	63.2±18.3 (3)	67.6±2.6 (13)	70.5±5.7 (13)	26.9±5.3 (5)	46.6±3.3 (13)
Adult males	48.8±26.6 (2)	71.2±4.4 (9)	78.4±3.6 (3)	29.6±0.4 (2)	54.6±3.6 (9)
Adults	57.4±13.5 (5)	69.0±2.3 (22)	72.0±4.7 (16)	27.7±3.7 (7)	49.9±2.5 (22)

Table 10
Frequency (%), mean and maximum thicknesses (mm) of subcutaneous back fat in females and males from five regions in the Canadian Arctic, March–April 1976 (sample size in parentheses)

	Boothia Peninsula		Somerset		Prince of Wales		Melville		Prince Patrick	
	F(3)	M(2)	F(13)	M(9)	F(13)	M(4)	F(5)	M(2)	F(13)	M(9)
Frequency	67	50	62	22	69	25	0	0	8	11
Mean thickness	6.7	7.5	4.6	0.8	10.6	0.5	0	0	0.1	0.1
Maximum thickness	15	15	17	5	27	2	0	0	1	1

Table 11
Proportion by volume (%) of plant species in the rumens of caribou obtained from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

Plant species or group	Boothia Peninsula (5)	Somerset (30)	Prince of Wales (24)	Melville (7)	Prince Patrick (20)	All regions (86)
Luzula spp.		32	12	54	58	33
Mosses		19	16	29	41	23
Saxifraga oppositifolia		8	27	15		11
Dryas integrifolia	22	19	8			10
Salix spp.		11	11			7
Carex spp.	76		3			4
Thamnolia vermiculata	2		8			3
Cetraria spp.		1	7			2
Alectoria spp.		1	1			1
Others		9	7		1	6

Table 12
Frequency of occurrence (%) of plant species in rumens of caribou collected from five regions of the Canadian Arctic in March–April 1976 (sample sizes in parentheses)

Plant species or group	Boothia (5)	Somerset (30)	Prince of Wales (24)	Melville (7)	Prince Patrick (20)	All regions (86)
Mosses	0	97	92	100	100	91
Luzula spp.	0	100	46	100	100	79
Saxifraga oppositifolia	40	80	75	100	10	62
Thamnolia vermiculata	80	70	100	0	15	60
Salix spp.	80	90	33	43	0	49
Dryas integrifolia	100	93	29	0	0	47
Cetraria spp.	0	43	54	0	35	38
Alectoria spp.	0	70	17	0	25	35
Cassiope tetragona	0	77	0	0	0	27
Draba spp.	0	7	38	86	15	23
Carex spp.	100	30	21	0	0	22
Saxifraga caespitosa	0	0	50	71	10	22

Table 13
Frequency (%) of the 14 most frequent plant species or species groups in craters excavated by caribou at 11 sites on four arctic islands and on Boothia Peninsula in March–April 1976

Plant species or group	Frequency in craters (%)
Mosses	91
Alectoria ochroleuca	73
A. nitidula	73
Cetraria nivalis	73
C. cucullata	64
Thamnolia vermiculata	64
Saxifraga oppositifolia	55
C. islandica	55
Crustose lichens	55
Luzula spp.	45
C. telisei	45
Umbilicaria spp.	45
Dryas integrifolia	36
Dactylina arctica	36

Table 14
Total thickness of snow and hardness of the hardest layer of snow adjacent to caribou craters at 10 locations in the Canadian Arctic in March–April 1976

			Thickness (cm)			Hardness of hardest layer ($g/cm^2 \times 10^2$)			
Region	Site	Date	Mean	Range	Sample size	Mean	Range	Sample size	Topography
Boothia Peninsula	15	5 Apr	17	16–18	2	20	None	2	Inter-beach ridges, coastal lowlands
Somerset	0	26 Mar	14	4–31	9	15	10– 20	2	Boulder field on hillside
Somerset	5	26 Mar	9	4–25	17	28	3– 90	17	Rocky ridge tops in lowlands
Somerset	5	27 Mar	9	5–12	12	78	60–100	12	Rocky ridge tops in lowlands
Prince of Wales	4	20 Mar	7	1–18	48	64	20–100	47	Uplands, moderate relief
Prince of Wales	13	3 Apr	26*		1	63	55– 70	10	Uplands, little relief
Prince of Wales	14	3 Apr	6*		1	45	40– 50	10	Raised beaches, river terrace
Melville	12	2 Apr	6	3– 9	10	74	50–100	10	Upland, hilltop
Prince Patrick	6	30 Mar	11	4–24	19	23	10– 40	19	Gently rolling gravel peneplain
Prince Patrick	8	31 Mar	9	5–15	30	38	3– 70	30	Gently rolling gravel peneplain

*Approximate mean depth, as judged and measured in the field, of snow in area cratered by caribou.

Table 15
Frequencies (%), means and ranges of warble-fly larvae (*Oedemagena tarandi* L.) in caribou collected from five regions in March–April 1976 (sample sizes in parentheses)

	Boothia Peninsula (5)	Somerset (30)	Prince of Wales (23)	Melville (7)	Prince Patrick (22)
Frequency (%)	100	30	13	0	0
Mean no. larvae	87	13	14	0	0
Mean no. larvae in caribou having them	87	44	107	0	0
Range in no. larvae	5–278	4–153	53–140	0	0