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Investigations of Peary caribou populations on Canadian Arctic islands, March–April 1975

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Abstract

We collected 46 Peary caribou (*Rangifer tarandus pearyi*) from two populations on six Canadian Arctic islands in March–April 1975, the second year of a 3-year ecological study.

All 21 caribou collected on the Parry Islands were over 4 years of age but only 8 of 23 (two were not aged) obtained on the Peel Islands (Prince of Wales and Somerset) were that old. Subcutaneous, mesenteric and femur marrow fat reserves were depleted or low in samples from the Parry Islands but all three reserves were excellent, except in two individuals, in our sample of caribou from the Peel Islands. Mean percentage fat in the femur marrows was 32.4 and 88.4 in the populations. Only 1 of 15 adult females was pregnant in our sample from the Parry Islands; 11 of 12 adults and 4 of 5 yearlings were pregnant in our other sample.

Our data suggest that fertility in Peary caribou is closely linked to physical condition, which in turn is largely dependent on availability of forage in winter. Our data also suggest that Peary caribou are slow to recover from malnourished states.

Measurements of long bones in the hind leg indicate that both populations are Peary caribou although we found some significant between-island differences in physical attributes.

Rumen analyses indicate that mosses, *Luzula* spp. and other monocotyledons, *Saxifraga oppositifolia*, *Salix* spp. and several lichen species were most frequently eaten. We believe that mosses are accidently ingested with preferred species.

Résumé

En mars et avril 1975, nous avons recueilli 46 caribous de Peary (*Rangifer tarandus pearyi*) à même deux populations réparties dans six îles de l'Arctique canadien. C'était au cours de la deuxième année d'une étude écologique qui devait en durer trois.

Aucun des caribous recueillis aux îles Parry n'avait plus de quatre ans; dans le cas des 23 recueillis aux îles du détroit de Peel (îles Somerset et du Prince-de-Galles), l'âge de deux d'entre eux n'a pas été établi et des 21 restants, huit seulement avaient plus de quatre ans. Les réserves de graisse sous-cutanée, du mésentère et de la moelle du fémur étaient ou épuisées ou réduites chez les échantillons des îles Parry; par contre, le niveau de ces trois types de réserve était, à deux exceptions près, excellent chez l'échantillon tiré des îles du détroit de Peel. Le pourcentage moyen de graisse dans la moelle du fémur était respectivement de 32.4 et 88.4 chez ces deux échantillons. Une seule des 15 femelles adultes recueillies aux îles Parry était gravide tandis que chez l'autre échantillon, 11 femelles adultes sur 12 et quatre femelles d'un an sur cinq manifestaient cet état.

Selon nos données, la fertilité chez le caribou de Peary est étroitement fonction de son état physique et ce dernier dépend de la disponibilité de fourrage l'hiver. Il ressort aussi de nos données que le caribou de Peary ne se remet que lentement après malnutrition.

Il ressort de la mesure des os longs des pattes de derrière que les deux populations appartiennent bien au caribou de Peary en dépit d'importantes variations du physique de ce caribou d'une île à l'autre.

L'analyse du rumen montre que la diète consistait surtout en mousses des espèces *Luzula*, d'autres monocotylédones des espèces *Saxifraga oppositifolia* et *Salix* ainsi que de plusieurs espèces de lichen. Nous croyons que les mousses sont ingérées accidentellement, en même temps que les espèces effectivement recherchées.

Introduction

An ecological study of Peary caribou (*Rangifer tarandus pearyi*), concentrating on reproduction, began in March–April 1974 with the collection of 25 animals from Prince of Wales, Bathurst, Byam Martin and eastern Melville islands. Parker *et al.* (1975) published the resultant data on reproduction, physical attributes, rumen contents, winter habitats, and parasites. All 20 caribou collected on the Parry Islands were in generally poor condition and only 1 of 14 adult females (>2 years) was pregnant. The five caribou collected on Prince of Wales were females in good condition, except for a 14-year old, and two were pregnant.

Parker *et al.* (1975) and Miller and Russell (1975) indicated that there were major declines in numbers of caribou and muskoxen on Bathurst, Byam Martin and eastern Melville islands during and after the winter of 1973–74. The primary cause of the declines was starvation resulting from a long winter during which forage accessibility was poor because of deep or hard snow or ice.

To learn more about the interrelationships among environmental conditions, condition of caribou, reproduction and diet, we collected 39 caribou in March 1975. This report presents results of that collection and another sample of seven caribou and discusses them in relation to results from the 1974 study and other related research.

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Somerset, Prince of Wales, Russell and adjacent smaller islands will be referred to as the Peel Islands after Peel Sound which separates Somerset and Prince of Wales islands. The Parry Islands include Prince Patrick and Eglinton islands as well as Melville, Byam Martin and Bathurst and its satellite islands.

Methods

Methods were similar to those of the previous year (Parker *et al.* 1975). We used a twin-engine Otter aircraft to search for caribou and transport them to Resolute Bay or Mould Bay for necropsy. We asked the Inuit hunters to shoot whole groups of caribou containing adult females, subject to permit and space limitations.

Animals were difficult to obtain in the rocky Precambrian Shield of Somerset because landing areas were restricted to lakes. We overcame the problem by landing hunters and a snowmobile on a lake where caribou were locally numerous and returning for them several hours later.

We sampled snow characteristics at Resolute Bay and at four collection sites with a National Research Council (NRC) snow survey kit (Klein *et al.* 1950). We measured snow thickness, density and hardness when time permitted. However, the snow was too thin to do this at some sites.

We determined percentage marrow fat in all three long bones of the right hind leg of even numbered specimens and in the left femurs of all caribou. Any empty space in the marrow in a 10-cm section from the centre of the bones was filled with water before weighing and then oven dried for 6 days at 55°C. We used the regressions of Neiland (1970) to convert percentage water in the marrows to percentage fat.

We measured maximum depths of back fat after making a cut through the rump fat anteriorly–laterally to the base of the tail (Dauphiné 1971). We cut through the fat at the ends of both kidneys and removed them and surrounding fat. Each kidney was weighed to the nearest 0.1 g with and without fat. We calculated kidney fat indices from the formula (weight of fat around both kidneys/weight of both kidneys) x 100 (Riney 1955).

Rumen samples from each caribou were examined in a tray after separation to particle size by screening through a series of sieves. The percentage of each plant species or species group in the total sample was estimated visually. We combined the results for each island and calculated mean volumes and frequencies for each plant species or species group.

We measured right hoof width, the maximum width between the two fore digits with the frogs and the anterior tips touching, and length, the distance from the anterior edge, usually the tip, to the posterior edge of the frog (pad) of the fourth digit of the right hoof.

Results

We obtained 18 caribou from a population on Somerset and Prince of Wales and 21 from a population on eastern Melville, Eglinton and Prince Patrick. We also obtained samples from seven caribou shot by Inuits who were assisting polar bear research on Prince of Wales and Russell islands in March and April. The location of flight lines, animals observed and collection sites in 1974 and 1975 are presented in Thomas *et al.* (1975).

Age and sex of the sample

Figure 1 shows the locations of collection sites in 1975 and Table 1 provides further details. Detailed data on each caribou are available in appendices on file with this report in CWS libraries.[1]

The ages of the 33 females and 11 males collected (Table 2) reveal a young population on the Peel Islands and an old one on the Parry Islands (Fig. 2). Ages to the nearest year were not estimated for two of the seven caribou obtained by the Inuit because mandibles were not received. Whereas all the caribou from the Parry Islands were over 4 years of age, only 8 of 23 from the Peel Islands were that old. Cohorts born in 1967 and 1969 were disproportionately large (11/21) in the sample from the Parry Islands and caribou born in 1965 and 1966 were fairly well represented (6/21).

Measurements

Mean values of standard body measurements of adult females (>2 years) from four islands (Table 3) show that females from Prince of Wales were of greatest weight, length, girth, and hind foot length. The shoulder height of one caribou in the sample from Prince of Wales was proportionally small in relation to other measurements and was probably in error.

Adult females from Prince of Wales were significantly heavier than those of eastern Melville ($P<0.05$), Eglinton ($P<0.02$) or Prince Patrick ($P<0.01$). Adult females from Prince of Wales were significantly longer ($P<0.01$) and of greater girth ($P<0.05$) than adult females from Prince Patrick. Adult females from Eglinton were significantly heavier ($P<0.05$) and of greater girth than those from Prince Patrick Island.

Some physical attributes are subject to considerable measuring error. A comparison of field and laboratory measurements of hind foot length of 39 caribou revealed an average difference of ±0.8 cm. Differences were as large as 2 cm for lengths 42–52 cm. Therefore we compared the more precise measurements of long bones in the right hind leg of the 39 caribou (Table 4). None of the means differed significantly nor did means of combined lengths of femur, tibia and tarsus.

Hind foot length, carefully measured in the laboratory, was not a reliable indicator of tarsus length. The mean hind foot length of caribou from Prince of Wales was significantly longer than those of eastern Melville ($P<0.01$) or Eglinton ($P<0.05$), but there was no significant difference in tarsi lengths.

We noted heavy wear on the hooves of caribou killed on Melville. A blunt rounded surface on the anterior edge of their hooves contrasted with the sharp hoof edges of caribou killed on Prince Patrick, Somerset and Prince of Wales.

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Figure 1
Location of sites at which caribou or other data were obtained in 1975 (see Table 1)

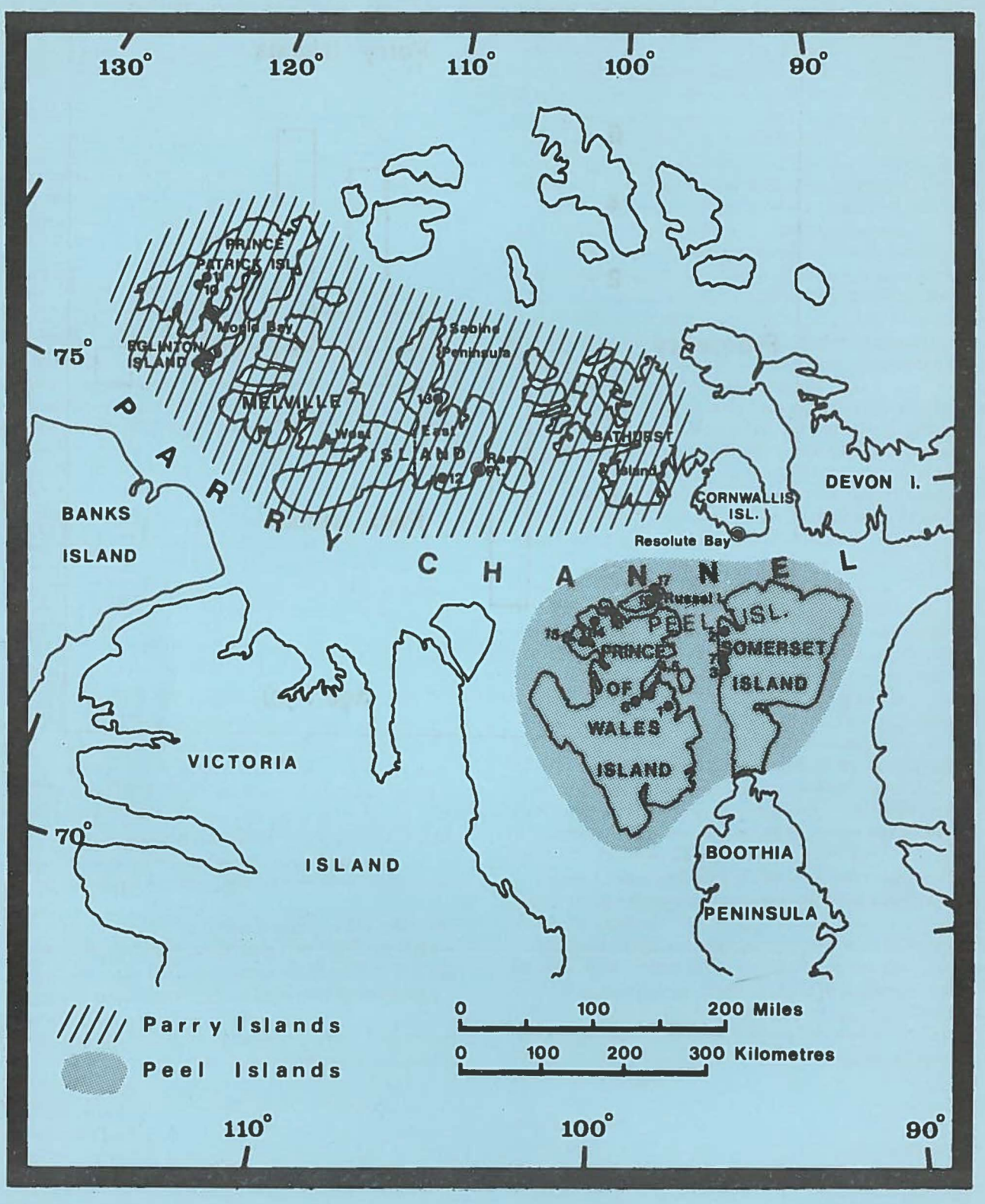
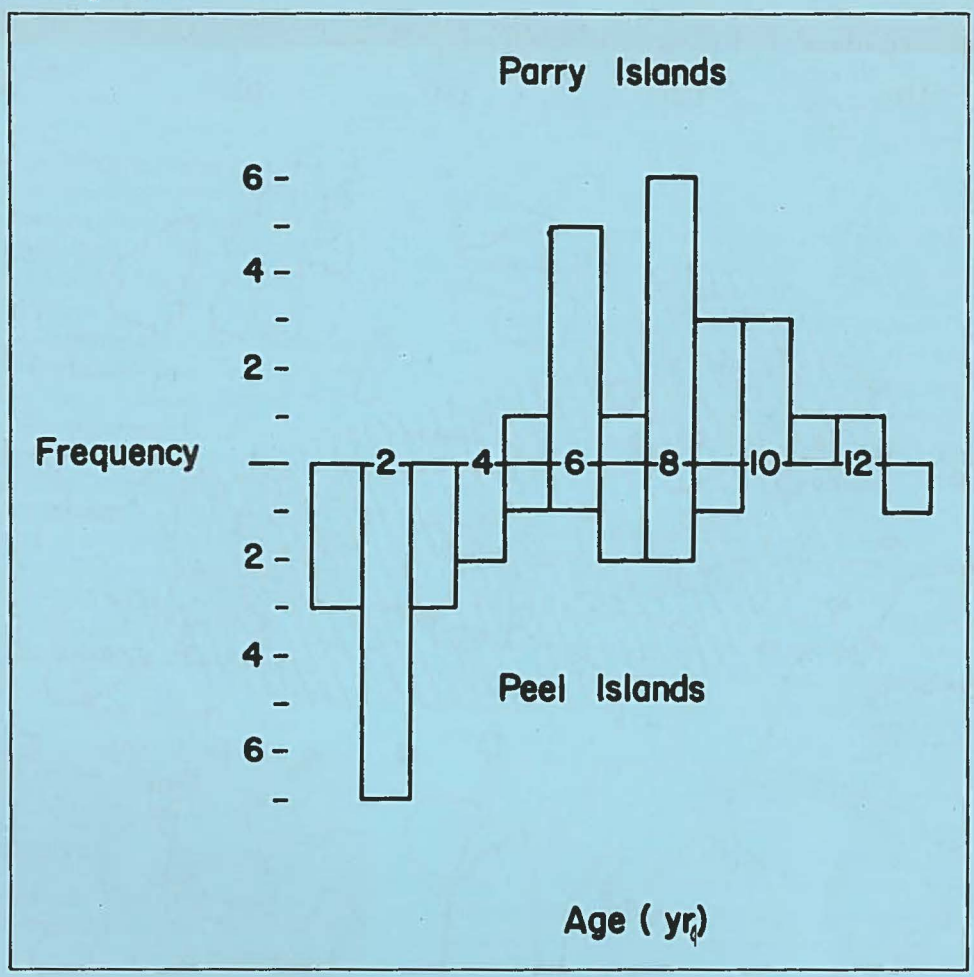


Figure 2
Age distribution of Peary caribou killed on the Parry Islands and on the Peel Islands (Somerset, Prince of Wales and Russell islands) in March–April 1975



Hooves of caribou collected on Eglinton were intermediate in degree of wear.

Front hooves of adult females from Melville were significantly shorter than those of adult females from Prince of Wales ($P<0.02$) or Prince Patrick ($P<0.02$) (Table 5). They were also significantly narrower, the probabilities being <0.01, <0.02 and <0.01 respectively. Excessive wear of the tips results in a narrower hoof because the tips curve inward to meet in the medial plane. The front hooves of adult females from Eglinton were significantly shorter ($P<0.02$) than those of females from Prince of Wales. The hind hooves of adult females from Melville were shorter and narrower than those of caribou from the other islands but the differences were not statistically significant in our small sample.

Reproduction

Only 1 of 15 adult females obtained from the Parry Islands was pregnant, but 11 of 12 adult females from the Peel Islands were, the exception being a 13-year old taken on Russell. In addition, four of five yearling females taken on the Peel Islands were pregnant. The non-pregnant yearling, taken on Prince of Wales, was the lightest at 49.0 kg. The others weighed 50.3, 52.6, 53.1 and 60.8 kg.

Condition

Weight

Average weights (in kg) of adult females from four islands were as follows (sample sizes in parentheses): Prince of Wales 65.4 (6), Eglinton 55.2 (5), Melville 53.5 (6) and Prince Patrick 47.9 (4). Average weight of yearling females from Somerset was 54.6 (3) and from Prince of Wales 51.0 (2).

Kidney fat indices

Kidney fat indices of adult caribou (Table 6) reveal that average values for Somerset and Prince of Wales islands were larger than those of adults from the Parry Islands. The mean value for adult females from Prince of Wales was significantly larger ($P<0.01$) than those of Melville, Eglinton or Prince Patrick islands. The mean kidney fat index of adult caribou from Melville was significantly larger ($P<0.05$) than that of adults from Eglinton. Data of adult males and females were grouped because their within-island indices were similar.

The average index (22.0) of two yearling males collected on Somerset was markedly lower than that (70.7) of three yearling females from the same island but the difference was not statistically significant ($P<0.1$) between the small samples.

Mean kidney fat indices were smallest (6.9) in two calves, intermediate (20.6) in two yearlings and largest (40.7) in six adults collected within 21 km of one another on Prince of Wales. All the means differed significantly ($P<0.05$).

Back fat

In our small samples, the subadults collected on Somerset had thicker back fat than those from Prince of Wales (Table 7). Subadults collected on Prince of Wales had little or no back fat, whereas all five adults had at least 1 cm of back fat.

We found no back fat on any of the 21 caribou from the Parry Islands except for traces on two from Prince Patrick and on one from Melville.

Marrow fat

Age, sex and insular differences in femur marrow fat

Data for mean percentage fat in the femur marrow suggest that caribou on Somerset had the largest reserves followed in order by caribou from Prince of Wales, Prince Patrick, eastern Melville and Eglinton islands (Table 8). Caribou on Eglinton appeared to be in good condition, judging from external appearances, but the long hair masked their contours and made subjective evaluations of condition useless.

The sample from Melville Island was highly variable, with values ranging from 4.5 to 90.2% fat in the marrows.

Data for calves were excluded from Table 8 because one, a male collected on Prince of Wales, had a low value, 5.7%. The other two calves had values (78% for a female on Prince of Wales, 86.9% for a male on Somerset) comparable to older caribou on the respective islands.

There were no significant sex or age differences in marrow fat reserves among the eight caribou taken on Somerset. The sample included a male calf, two male and three female yearlings and an adult of each sex. Reserves in males collected on all three Parry Islands averaged lower than those of females (Table 9) but only in the samples from Prince Patrick were there significant ($P<0.05$) differences.

Variability among leg bones in fat content of marrow

We divided the data into two groups for preliminary statistical analyses because little variability was possible among femurs, tibias and tarsi of animals in good condition. We placed caribou with femur fat percentages above 75% in group 1, the remainder in group 2.

Analysis of variance on group 1 data ($n = 11$) revealed that means for marrow fat in the three bones (femur 87.6%, tibia 89.2% and tarsus 88.8%) were significantly ($P<0.05$) different. A similar test applied to group 2 data ($n = 8$) also revealed significant differences ($P<0.01$) among the means of the three bones but the order was different: femur 18.4%, tibia 22.8% and tarsus 39.2%.

Paired t tests applied to all the data and to groups 1 and 2 gave probabilities that the means differed significantly, shown in Table 10.

On the average, fat reserves were utilized earlier in the femur and tibia than in the tarsus. In four of the eight caribou in group 2 the percentage fat in the femur was much lower than in the tarsus. Only in the individual with the lowest marrow fat reserves was the percentage fat higher in the femur than in the tarsus and that difference was only marginal.

Rumen contents

By volume

After combining the data from all samples we found that mosses followed in order by *Luzula* spp., unidentified monocotyledons, *Saxifraga oppositifolia*, *Thamnolia vermi-*

culata and *Salix* spp. made up the largest proportions of identifiable fragments (Table 11). The unidentified monocotyledon group was largely *Luzula* spp. in some samples, for rumen samples of other caribou collected on the same site had high proportions of *Luzula* spp. and it was the only monocotyledon present on some of the sites. However, *Alopercurus alpinus* was abundant on southern Eglinton and *Arctagrostis latifolia* is sometimes associated with *Luzula* spp.

The most striking differences in species proportions by volume in the rumens were (1) the relatively low proportion of mosses and *Luzula* spp. in samples from Prince of Wales, (2) the relatively high proportion of *Luzula* spp. in the Prince Patrick samples, (3) the relatively high proportion of *Saxifraga oppositifolia* in the samples from Prince of Wales, (4) the relatively high proportion of *Thamnolia vermiculata* in samples from Melville and (5) the relatively low proportion or lack of *Salix* spp. in samples from eastern Melville, Eglinton and Prince Patrick.

By frequency

Another statistic used in rumen analyses is percentage frequency of occurrence of plant species, *i.e.*, (samples with species present/total number of samples) x 100. These data (Table 12) agree closely with the proportion data except that *Thamnolia vermiculata* ranks higher and *Dryas integrifolia* is not in the list of the 10 most frequent species.

The most striking differences among islands include (1) the relatively low frequency of *Luzula* spp. in samples from Prince of Wales, (2) the absence of *Saxifraga oppositifolia* in samples from Eglinton and Prince Patrick and its high frequency in samples from Melville, and (3) the high frequency of *Salix* spp. in samples from the Peel Islands and its low frequency in samples from the Parry Islands.

Plants present in craters

We examined the frequency occurrence of plant species in craters, where caribou had pawed away the snow with their front hooves to expose vegetation (Table 13). Only plant species which occurred in over 15% of all 64 craters examined are included in the table. The data indicate the number of times a species was found and not the amount of the species in the craters.

Mosses occurred in 73% of the craters; *Rhacometrium* spp. were the most frequent (25%) of those identified. *Luzula* spp. were the most frequently identified vascular plants followed by *Salix* spp. and *Papaver radicatum*. The last named species was not in the lists of the 10 most frequent and most abundant species found in the rumen samples (Tables 11, 12). Lichen species comprised 7 of the 11 most frequent species or species groups found in the craters.

Saxifraga oppositifolia was identified in only 12.5% of the craters but it was abundant and frequent in the rumens. *Saxifraga caespitosa* was found in only 6% of the craters but it occurred in 44% of the rumen samples.

Snow characteristics

Great variability in snow thickness and hardness was apparent at all sites. Adequate sampling probably would have taken an hour at each site because many replicates of each horizontal and vertical stratum would be necessary. Nevertheless, we took a few measurements to test the suitability of the NRC snow kit for measuring snow on the tundra.

Measurements of snow hardness taken within a few centimetres of one another were highly variable within a given layer of snow. An approximate average value was obtained from several tests. Values (g/cm^2) obtained for various layers of snow were as follows (sample sizes, *n*, in parentheses): (1) surface powder, 20 ($n = 1$), (2) surface or near-surface hard layer, 2000–8500 ($n = 6$), (3) intermediate layer, 2500 and 4000 ($n = 2$), (4) crystalline layer above the ground, 500–1000 ($n = 5$).

Specific gravities of the same layers were (1) 0.16 ($n = 1$), (2) 0.36–0.49 ($n = 3$), (3) 0.30–0.32 ($n = 2$), (4) 0.26–0.37 ($n = 3$).

Pathology and parasites

Blood samples were obtained from 33 of the 39 caribou collected. No serological evidence of brucellosis was found in any of them.

All 39 carcasses were examined for the presence of the protozoan parasite *Besnoitia* spp. Although this parasite is fairly widespread in the Kaminuriak caribou (*R. t. groenlandicus*) population of Manitoba and Keewatin, NWT, no evidence of it was found in the Peary caribou.

Data on the frequency and number of warble-fly larvae (*Oedemagena tarandi* L.) are presented in Table 14. The proportion of caribou with larvae was highest on Prince of Wales (78%), followed by caribou of Somerset (63%), Prince Patrick (50%), Eglinton (29%) and Melville (13%).

Antler velvet

There were no apparent differences between sex, among islands or among ages (calves excluded) in the frequency occurrence or amount of velvet present on antlers in our small sample. Dry velvet was present on 17 of 21 adult females, on two of four long yearling females and on all three calves of both sexes. Excluding calves, the proportion of the antlers covered by dry velvet, as estimated visually, was usually less than 10% except for 6 of 27 caribou, which had 16, 16, 18, 22, 22 and 80% of their antlers covered.

Discussion

Our data and those of Parker *et al.* (1975) on pregnancy rates, recruitment and age structure indicate an old declining population of caribou on the Parry Islands and a young expanding population on the Peel Islands. All 21 caribou collected on the Parry Islands in 1975 were born in 1970 or earlier and 56% (23/41) of those collected in 1974 (Parker *et al.* 1975) and 1975 were born in 1967 and 1969.

At least a partial explanation for the absence of 1971 and later cohorts in the 1975 sample may be found in climatic data obtained from Monthly Records of Atmospheric Environment, Environment Canada. Survival of calves born in 1970 was probably poor because the winter of 1970–71 was severe, at least in the western Arctic,

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Snow characteristics

Great variability in snow thickness and hardness was apparent at all sites. Adequate sampling probably would have taken an hour at each site because many replicates of each horizontal and vertical stratum would be necessary. Nevertheless, we took a few measurements to test the suitability of the NRC snow kit for measuring snow on the tundra.

Measurements of snow hardness taken within a few centimetres of one another were highly variable within a given layer of snow. An approximate average value was obtained from several tests. Values (g/cm^2) obtained for various layers of snow were as follows (sample sizes, n, in parentheses): (1) surface powder, 20 ($n = 1$), (2) surface or near-surface hard layer, 2000–8500 ($n = 6$), (3) intermediate layer, 2500 and 4000 ($n = 2$), (4) crystalline layer above the ground, 500–1000 ($n = 5$).

Specific gravities of the same layers were (1) 0.16 ($n = 1$), (2) 0.36–0.49 ($n = 3$), (3) 0.30–0.32 ($n = 2$), (4) 0.26–0.37 ($n = 3$).

Pathology and parasites

Blood samples were obtained from 33 of the 39 caribou collected. No serological evidence of brucellosis was found in any of them.

All 39 carcasses were examined for the presence of the protozoan parasite *Besnoitia* spp. Although this parasite is fairly widespread in the Kaminuriak caribou (*R. t. groenlandicus*) population of Manitoba and Keewatin, NWT, no evidence of it was found in the Peary caribou.

Data on the frequency and number of warble-fly larvae (*Oedemagena tarandi* L.) are presented in Table 14. The proportion of caribou with larvae was highest on Prince of Wales (78%), followed by caribou of Somerset (63%), Prince Patrick (50%), Eglinton (29%) and Melville (13%).

Antler velvet

There were no apparent differences between sex, among islands or among ages (calves excluded) in the frequency occurrence or amount of velvet present on antlers in our small sample. Dry velvet was present on 17 of 21 adult females, on two of four long yearling females and on all three calves of both sexes. Excluding calves, the proportion of the antlers covered by dry velvet, as estimated visually, was usually less than 10% except for 6 of 27 caribou, which had 16, 16, 18, 22, 22 and 80% of their antlers covered.

Discussion

Our data and those of Parker *et al.* (1975) on pregnancy rates, recruitment and age structure indicate an old declining population of caribou on the Parry Islands and a young expanding population on the Peel Islands. All 21 caribou collected on the Parry Islands in 1975 were born in 1970 or earlier and 56% (23/41) of those collected in 1974 (Parker *et al.* 1975) and 1975 were born in 1967 and 1969.

At least a partial explanation for the absence of 1971 and later cohorts in the 1975 sample may be found in climatic data obtained from Monthly Records of Atmospheric Environment, Environment Canada. Survival of calves born in 1970 was probably poor because the winter of 1970–71 was severe, at least in the western Arctic,

resulting in considerable mortality among adult caribou on Banks Island (Miller *et al.* 1973). For the period September 1970 to June 1971, inclusive, snowfall at Resolute was 6 cm below the long-term average but it was 64 and 46 cm above the averages at Mould Bay and Sachs Harbour, respectively. At Rea Point on Melville, about midway between Resolute and Mould Bay, snowfall for the same period was 18 cm above the average for the six winters (1969–75) the station has been in operation. Snowfall in October was 11 cm above average.

Any calves born in 1971 probably died before or during the following winter, which was characterized by above average temperatures and snowfalls in September–November at Resolute and Mould Bay and below average temperatures in December–June 1972. Snowfalls at Resolute and Mould Bay were about 16 and 41 cm above the long-term averages for August 1971 to June 1972. Many dead caribou were found on Sabine Peninsula, Melville, in summer 1972 by R. Russell, F.L. Miller and M. Barnett (pers. comm.).

No calves were seen among 1481 caribou observed on Byam Martin, eastern Melville or Eglinton in August 1972 (Miller *et al.* 1973). Either the females did not bear calves or there was heavy mortality of calves in June and July 1972. The former is probable, for mean temperatures for June and July 1972 at Resolute were only 1–2°C below the long-term average; at Mould Bay they were about average.

Snowfalls at Resolute and Rea Point for the period September 1972 to June 1973 were 20 and 15 cm below average. Snowfall at Mould Bay was 30 cm above the long-term average for the same period. We noted that in March–April 1973 the snow was generally soft on Eglinton, Melville and Bathurst. Ironically, had calves been produced in 1972 their survival probably would have been good.

Calf production in 1973 was fair, for 15.7% of 1882 caribou seen in July–August on Byam Martin, Melville, Eglinton and Prince Patrick were calves (Miller and Russell 1974). Most of those calves probably died in the severe winter of 1973–74 when caribou numbers on Bathurst and eastern Melville were reduced by 62 and 68% respectively (Miller and Russell 1975, Parker *et al.* 1975). For the period August 1973 to June 1974 snowfalls at Resolute, Rea Point and Mould Bay were respectively 58, 15, and 37 cm above average.

The pregnancy rate in adult females collected on Bathurst, Byam Martin and eastern Melville in March–April 1974 was only 7.1% (Parker *et al.* 1975) and the females were in such poor condition that survival of any calves born the following summer was unlikely. Miller and Russell (1975) saw no calves on a survey of Bathurst in August 1974 and calves comprised only 1.1% (10/895), 4% (1/25) and 7% (33/469) respectively of caribou segregated by age on Melville, Eglinton and Prince Patrick in July–August 1974.

The pregnancy rate in adult females collected on the Parry Islands in 1975 was only 6.7% and the only pregnant female had low fat reserves and her survival was unlikely. With little or no calf production in June 1975 the population on the Parry Islands will reach a low level by May 1976, for productivity has been almost zero for the past 5 years and negligible for the last 6 years.

Availability of forage on Prince of Wales and Somerset was good to excellent in winters 1973–74 and 1974–75. The excellent environmental conditions on Somerset are reflected by the fact that the three yearlings were pregnant and had large fat reserves. Fat reserves were lower in the two yearling females from Prince of Wales and one was not pregnant. Peary caribou have the potential to reproduce at a high rate if environmental conditions are favourable. Dauphiné (in prep.) reported that only 1 of 57 yearling barren-ground caribou in the Kaminuriak population was pregnant, as were only 47.8% of those 1 year older. This slow attainment of full reproductive capacity in barren-ground caribou could not be ascribed to poor condition because fat reserves were generally good in all seasons (Dauphiné, in prep.).

Adult females from Prince of Wales were significantly heavier than females from any of the Parry Islands. However, weight is not a valid index of size except in comparisons between groups of approximately equal condition. We cannot explain why the adult females collected on Eglinton were significantly heavier than those of Prince Patrick even though the former were in poorer condition. The girths of adult female caribou from Prince Patrick were also significantly smaller than those of Eglinton, but more samples are needed before we can conclude that caribou on Prince Patrick are smaller than those of other islands. There is no obvious biological basis for such a difference because there is interchange of animals among Melville, Eglinton, and Prince Patrick (Russell *et al.* in prep.).

Adult females from Prince of Wales were significantly larger in length and girth than the females from Prince Patrick but both measurements are subject to considerable error. An indication of the subjectivity of some standard body measurements is shown by within-island comparisons between data for adult females collected in 1974 and 1975. The 1975 mean for shoulder height (100.2 cm, $n = 6$) was significantly larger ($P<0.01$) than the 1974 mean (88.7 cm, $n = 7$) for adult females collected on eastern Melville. However, the 1975 mean for girth (107.0 cm, $n = 6$) was significantly ($P<0.05$) smaller than the 1974 mean (116.4 cm, $n = 7$). Caribou form is essentially static so the conflicting size data must reflect measuring error.

In our 1975 sample some significant differences in length and girth occurred among caribou from some of the islands, but our data on length of longbones in the hind legs indicate that all are from one subspecies, *i.e.* Peary caribou. More detailed analyses of size relationships among caribou from various Canadian islands, including skull measurements, will be reported on completion of the study.

Hind foot lengths of caribou are of little value because of possible hoof wear differences among animals. The degree of wear, especially on the front hoofs, is in our judgement related more to past accessibility of forage in winter than to differences in substrate during the snow-free season. Thus, the hooves may be of diagnostic value.

Caribou on the west coast of Somerset were in the best condition. Subadults in our collection from Somerset had higher fat reserves than those of Prince of Wales. In fact one calf collected on Prince of Wales had used most of its fat reserves. Fat reserves in subadults would appear to be the most sensitive indicator of feeding conditions during the previous 1–2 years. Only one leg bone should be used for all comparisons of marrow fat content because of the observed variability among bones. Had differences among bones not been significant, future marrow fat determinations could have been made on the tarsus which is easiest to remove from the animal. In a malnourished caribou, fat is often present in the tarsus when it is nearly depleted from the femur and tibia. Therefore, percentage fat in the femur is probably the best index to fat reserves in malnourished Peary caribou.

Dauphiné (1971) found that barren-ground caribou mobilized fat reserves in the sequence (1) subcutaneous (back), (2) perinephric (kidney), (3) omental and mesenteric and (4) femur. The same pattern prevails in Peary caribou and consequently there is no need to determine marrow fat content in caribou that have subcutaneous and perinephric fat reserves.

Our 1975 data on frequency of warble fly larvae in Peary caribou suggest that environmental conditions for warble flies are most favourable on Prince of Wales and Somerset, followed in order by Prince Patrick, Eglinton, and Melville. The incidence of larvae in caribou on the Parry Islands was 10% (2/20) in late winter 1974 and 29% (6/21) a year later. The observed increased incidence is difficult to explain in view of the marked reduction in host numbers from summer 1973 to summer 1974 and the warmer June and July of the earlier year. Unequal sampling of the member islands between years could also account for the apparent frequency differences, because the summer climate of Bathurst may be cooler than that of Eglinton and Prince Patrick and the warble fly is at the edge of its range in the Parry Islands.

The results of the caribou collections of 1974 and 1975 point to the need for continuance of collections to gain insight into which environmental factors control population numbers. Our hypothesis is that, in the past, populations of Peary caribou have fluctuated greatly in numbers, with climatic factors being the prime cause. Man's activities, the effects of which are exceedingly difficult to evaluate, may have influenced natural fluctuations to a minor extent in recent years.

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Table 1
Location of sites (shown on Fig. 1) where caribou were killed and vegetation and snow were sampled in March–April 1975

Site	Island	Coordinates	Date	Samples
1	Prince of Wales	72°46′N, 97°53′W	Mar. 21	75:1, 2*
2	Somerset	73°38′N, 95°30′W	Mar. 22	75:3, 4, Veg, snow
3	Somerset	73°14′N, 95°32′W	Mar. 23	Veg, snow
4	Prince of Wales	72°59′N, 98°17′W	Mar. 23	Veg, snow
5	Prince of Wales	72°59′N, 98°13′W	Mar. 23	75:5–9
6	Prince of Wales	72°50′N, 98°32′W	Mar. 24	75:10–12
7	Somerset	73°17′N, 95°27′W	Mar. 24	75:13–18
8	Eglinton	75°36′N, 119°12′W	Mar. 26	75:19–23, Veg
9	Eglinton	75°44′N, 118°44′W	Mar. 26	75:24, 25, Veg
10	Prince Patrick	76°23′N, 120°29′W	Mar. 27	75:26–29, Veg
11	Prince Patrick	76°29′N, 120°18′W	Mar. 27	75:30, 31, Veg, snow
12	Melville	75°06′N, 107°20′W	Mar. 28	75:32–35, Veg
13	Melville	75°58′N, 108°13′W	Mar. 30	75:36–39
14	Prince of Wales	73°40′N, 100°23′W	Mar. 27	75:C1
15	Prince of Wales	73°26′N, 100°31′W	Mar. 28	75:C2
16	Prince of Wales	73°50′N, 99°34′W	Apr. 10	73:C3
17	Prince of Wales	74°01′N, 98°11′W	Apr. 10	75:C4
18	Prince of Wales	73°58′N, 98°08′W	Apr. 10	75:C5–7

*Specimens No. 1 and 2 in the 1975 series.

Table 2
Ages and sex of 44 Peary caribou shot on several Arctic islands in March–April 1975

	Ages (nearest yr.)	
Island	Males	Females
Somerset	1, 2, 2, 3	2, 2, 2, 7
Prince of Wales	1	1, 2, 2, 3*, 3*, 4, 4*, 5 6*, 7, 8, 8, 9, 13*
Eastern Melville	6, 6	6, 7, 8, 9, 9, 9
Eglinton	6, 8	8, 8, 10, 10, 11
Prince Patrick	8, 8	5, 6, 10, 12

*Specimens collected by Inuit assisting H. Kiliaan with polar bear studies.

Table 3
Size (mean and standard error) of various physical attributes of adult (>2 yr.) female Peary caribou from four Arctic islands, March 1975, as measured in the field (sample sizes in parentheses)

Physical character	Prince of Wales (6)	Melville (6)	Eglinton (5)	Prince Patrick (4)
Weight (kg)	65.4±2.1	53.5±2.9	55.2±1.3	47.9±1.7
Length (cm)	155.5±2.3	150.0±3.9	149.8±3.5	142.3±2.1
Girth (cm)	115.3±2.4	107.0±2.9	112.6±2.7	101.3±1.7
Shoulder height (cm)	100.2±2.2*	100.2±2.4	101.0±1.5	103.5±0.9
Hind foot (cm)	47.4±0.5	45.4±0.3	47.2±0.4	46.3±0.3

*Includes one value probably in error.

Table 4
Length of components of the hind legs (mean and standard errors in cm) of adult (>2 yr.) female Peary caribou from four Arctic islands, March 1975, measured in the laboratory (sample sizes in parentheses)

Leg component	Prince of Wales (6)	Melville (6)	Eglinton (5)	Prince Patrick (4)
Femur	25.4±0.2	24.5±0.4	25.1±0.3	24.8±0.2
Tibia	27.7±0.2	27.4±0.3	27.7±0.2	27.6±0.2
Tarsus	27.1±0.2	26.8±0.4	27.0±0.1	27.1±0.3
Hind foot	47.9±0.3	45.8±0.4	46.7±0.3	46.3±0.8
Femur, tibia and tarsus	80.2±0.5	78.2±0.9*	80.1±0.4†	79.4±0.8

*Sample size 5.
†Sample size 4.

Table 5
Hoof size (mean and standard error in cm) of adult (>2 yr.) female Peary caribou from four Arctic islands, March 1975 (sample sizes in parentheses)

	Prince of Wales (6)	Melville (6)	Eglinton (5)	Prince Patrick (4)
Front hoof length	8.4±0.2	6.9±0.3	7.8±0.1	8.0±0.0
Front hoof width	10.5±0.2	9.3±0.2	10.5±0.3	10.5±0.1
Hind hoof length	8.8±0.3	7.9±0.2	8.2±0.1	8.2±0.2
Hind hoof width	9.2±0.1	9.0±0.1	9.3±0.2	9.5±0.2

Table 6
Kidney fat indices of adult (>2 yr.) Peary caribou on five Arctic islands, March 1975 (sample sizes in parentheses)

Statistic	Prince of Wales (6)	Somerset (2)	Melville (8)	Eglinton (7)	Prince Patrick (6)
Mean	40.7	63.0	11.4	6.5	10.9
Standard error	5.4	6.0	1.8	0.8	1.7
Confidence interval ($P = 0.05$)	26.8–54.6	N/A	7.1–15.7	4.5–8.5	6.5–15.3

Table 7
Fat thickness on the backs of individual caribou of three age classes collected on Prince of Wales and Somerset islands, March 1975

	Back fat thickness (cm)	
Age	Prince of Wales	Somerset
1 yr.	0 (M)*	0.5 (M)
2 yrs.	0.1 (F)	1.1, 2.8, 3.0 (all F)
Over 2 yrs. (adults)	1.0, 1.1, 1.4 1.9, 2.0 (all F)	1.6, 1.8 (1 F, 1 M)

*M males; F females.

Table 8
Percentage fat in femur marrow of Peary caribou, exclusive of calves, collected on five Arctic islands, March 1975

Statistic	Somerset	Prince of Wales	Prince Patrick	Melville	Eglinton
Mean	90.8	86.3	57.7	34.2	8.6
Standard error	0.8	1.7	9.1	10.8	2.4
Confidence interval ($P = 0.05$)	88.9–92.7	82.2–90.4	34.3–81.1	8.6–58.8	2.7–14.5
Sample size	7	8	6	8	7

Table 9
Percentage fat in the femur marrows of adult female and male Peary caribou collected on four Arctic islands, March 1975

Statistic	Prince of Wales	Prince Patrick		Melville		Eglinton	
	Females	Females	Males	Females	Males	Females	Males
Mean	87.6	70.8	31.4	40.6	14.9	10.9	3.0
Standard error	1.9	5.9	2.2	13.6	3.7	2.7	1.1
Confidence interval ($P = 0.05$)	82.7–92.5	52.4–89.2	3.4–59.4	5.7–75.5	Neg. No.–61.3	3.3–18.5	Neg. No.–17.0
Sample size	6	4	2	6	2	5	2

Table 10
Probabilities that differences between means of marrow fat content in leg bones of Peary caribou are attributable to chance using the paired *t* test

Bone	Group 1 (Femur fat above 75%, $n = 11$)	Group 2 (Femur fat below 75%, $n = 8$)	Both groups
Femur–tibia	$P < 0.01$	N.S.	N.S.
Femur–tarsus	$P < 0.05$	$P < 0.01$	$P < 0.01$
Tibia–tarsus	N.S.	$P < 0.05$	$P < 0.05$

Table 11
Proportion by volume (%) of various plant species in rumen samples obtained from Peary caribou on five Arctic islands in March 1975. Only species whose mean in all the samples exceeded 0.9% are included (sample sizes in parentheses)

Plant species or group	Prince of Wales (17)	Somerset (8)	Eglinton (7)	Prince Patrick (6)	Melville (8)	All samples (46)
Mosses	5	39	46	43	27	26
Luzula spp.	8	29	24	50	10	20
Unident. monocotyledons	27	10	28	0	16	19
Saxifraga oppositifolia	32	2	0	0	8	14
Thamnolia vermiculata	10	1	1	<1	27	9
Salix spp.	11	6	0	0	<1	5
Dryas integrifolia	3	4	0	0	0	2
Alectoria spp.	<1	3	<1	3	2	1
Cetraria spp.	<1	1	<1	1	3	1
Others	2	5	0	2	6	3

Table 12
Frequency of occurrence (%) of plant species in rumen samples of Peary caribou collected on five Arctic islands in March 1975. Only those species which occurred in more than 25% of all samples are included (sample size in parentheses)

Plant species or group	Prince of Wales (17)	Somerset (8)	Eglinton (7)	Prince Patrick (6)	Melville (8)	All samples (46)
Mosses	100	100	100	100	100	100
Thamnolia vermiculata	94	50	79	33	100	76
Luzula spp.	17	88	79	79	50	57
Saxifraga oppositifolia	82	50	0	0	100	57
Unident. monocotyledons	82	50	57	0	38	54
Salix arctica	71	100	0	0	13	46
Cetraria spp.	29	63	14	67	75	46
Saxifraga caespitosa	35	25	79	0	88	44
Alectoria spp.	12	50	14	50	63	33
Draba spp.	29	25	0	0	63	36

Table 13
Frequency of occurrence of plant species in 64 craters examined at eight sites on several Arctic islands in March 1975

	Site no.* and no. of samples at each site (in parentheses)								
Plant species or group	2 (6)	3 (6)	4 (7)	8 (7)	9 (11)	10 (11)	11 (7)	12 (9)	All (64)
Mosses	5	6	4	5	8	5	6	8	47
Luzula spp.	4	2	0	2	11	8	0	1	28
Thamnolia vermiculata	2	0	6	1	0	3	3	7	22
Cetraria islandica	4	1	0	2	7	3	2	1	20
Alectoria pubescens	2	0	0	0	0	8	5	0	15
A. ochrolenca	3	0	0	1	2	2	7	0	15
A. nigricans	4	0	0	1	0	2	2	2	11
Salix spp.	0	6	4	1	0	0	0	0	11
Umbilicaria spp.	0	0	0	0	0	9	2	0	11
Cetraria cucullata	0	0	0	0	2	2	0	6	10
Papaver radicatum	0	0	1	0	2	0	0	7	10

*See Fig. 1 and Table 1 for locations.

Table 14
Frequency, mean and range of warble-fly larvae (*Oedemagena tarandi* L.) in Peary caribou on five Arctic islands in March 1975

	Eglinton	Prince of Wales	Prince Patrick	Somerset	Melville
Sample size	7	9*	6	8	8
No. caribou with larvae	2	7	3	5	1
Mean no. larvae in those with larvae	47.5	35.7	14.0	11.8	2
Range	41–54	1–80	7–24	5–22	N/A

*No data for 10th caribou collected on the island.