PEARY CARIBOU CALVING AND POSTCALVING PERIODS, BATHURST ISLAND COMPLEX, NORTHWEST TERRITORIES, 1992

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ABSTRACT. Peary caribou (Rangifer tarandus pearyi) were aerially surveyed on south-central Queen Elizabeth Islands, Northwest Territories, Canada, in June and July 1992 to obtain data on relative numbers, sex/age composition, distributions, movements, chronology of calving period, calf production, and early survival of calves. The sex/age composition of caribou on Massey Island was skewed and bulls were essentially lacking there. The frequencies of occurrence of caribou between 5-8 July 1992 on Alexander Island and Massey Island were greater than expected by chance alone ($P < 0.005$) when compared on a relative landmass basis with the other three western major satellite islands and Bathurst Island. Nonsystematic aerial searches yielded sightings of a maximum of 1174 different individual 1+ year-old caribou and 470 calves between 5 and 8 July 1992. Most of the caribou were seen on Bathurst Island: mostly on the northern part of the island, north of Polar Bear Pass; and mainly on interior areas in June, shifting to coastal areas in early July. Caribou continued to move counterclockwise around Bathurst Island, beginning some time before late May and persisting into, at least, mid July 1992. Calving peaked during the 2nd and 3rd weeks of June, then continued through the last days of June and possibly into the first week of July 1992. By 8 July 1992 there were about 94 and 62 newborn calves seen per 100 breeding cows and per 100 1+ year-old females, respectively. It appears that about 100% of the theoretical average rate of pregnancy was realized for all 2+ yr-old females within the Bathurst Island complex in 1992. Early mortality of calves appears to have been 6% or slightly less. Snow depth measurements (N = 5481) were obtained from 639 sample sites at 71 stations during May-June 1992. Snow cover was highly variable and some small patches of snow-free ground existed on exposed sites. Measured snow depths ranged from 1 to 79 cm before snow melt was advanced in late June 1992. Where snow cover persisted on individual sample sites, it averaged 20-23 cm between 29 May and 22 June on the 7.5-km snow/ice course and 13-16 cm between 27 May and 21 June on the 1-km course. Subsequently, ground fast ice accumulated only at 49% of the stations and 43% of the sample sites. Ground fast ice on the 7.5-km course averaged 6.0 cm (± 4.2 cm SD) and ranged from 2 to 14 cm in thickness, while on the 1-km course it averaged 3.2 cm (± 2.2 cm SD) and ranged from 1 to 11 cm in thickness. No positive direct evidence was obtained for Peary caribou foraging or even attempting to dig forage craters in the snow cover at any time between 27 May and 1 July 1992 anywhere within the Bathurst Island complex.

RÉSUMÉ. On a fait un relevé aérien des caribous de Peary (Rangifer tarandus pearyi) dans le centre-sud des îles de la Reine-Élisabeth (Territoires du Nord-Ouest) au Canada, en juin et juillet 1992 afin d'obtenir des données sur les nombres relatifs, la composition selon l'âge et le sexe, la répartition géographique et les déplacements de cet animal, ainsi que sur la chronologie de la période de mise bas, la reproduction, et la survie initiale des faons nouveau-nés. Sur l'île Massey, la composition selon le sexe et l'âge était asymétrique, et l'on a noté une pénurie d'adultes mâles. La fréquence d'apparition de caribous sur les îles Alexander et Massey du 5 au 8 juillet 1992 a été statistiquement plus significative que prévu ($P < 0,005$) si l'on compare la masse terrestre relative de ces îles à celle des trois grandes îles satellites à l'ouest et à celle de l'île Bathurst. Lors de recherches aériennes non systématiques, on a dénombré, au total, du 5 au 8 juillet 1992, 1174 différents caribous âgés de un an et plus ainsi que 470 faons nouveau-nés. La plupart des caribous se trouvaient sur l'île Bathurst, surtout dans le nord de l'île, au nord du col Polar Bear. En juin, ils sont restés principalement à l'intérieur de l'île, tandis qu'au début de juillet ils se sont déplacés dans les zones côtières. Les caribous ont continué à se déplacer autour de l'île Bathurst dans le sens antihoraire quelque temps avant la fin de mai et le phénomène s'est pour suivi au moins jusqu'à la mi-juillet 1992. La mise bas a plafonné durant la deuxième et la troisième semaine de juin et s'est poursuivie durant les derniers jours de juin et peut-être pendant la première semaine de juillet 1992. Au 8 juillet 1992, il n'y avait environ que 94 faons nouveau-nés pour 100 biches reproductrices, et 62 faons pour 100 biches de un an et plus. Il semble qu'environ 100 % du nombre moyen possible de faons à naître dans le groupe des biches grandes de deux ans et plus du complexe de l'île Bathurst soient nés en 1992 et que les faons morts en bas âge se chiffrent à 6 % de l'ensemble, voire à un peu moins. On a mesuré l'épaisseur de la neige ($N = 5481$) à 639 sites d'échantillonnage de 71 stations durant la période de mai à juin 1992. Le manteau nival variait grandement, et il y avait des parcelles de terre sans neige dans les sites battus par le vent. La profondeur de la neige variait de 1 à 79 cm avant que la fonte ne s'áccélère, à la fin de juin 1992. À certains sites où la neige persistait, la couche moyenne mesurait de 20 à 23 cm sur la ligne de relevés de 7,5 km du 29 mai au 22 juin, et de 13 à 16 cm sur la ligne de relevés de 1 km, du 27 mai au 21 juin. Par la suite, de la glace fixée sur le sol s'est formée à seulement 49 % des stations et 43 % des sites d'échantillonnage. Sur la ligne de relevés de 7,5 km, l'épaisseur de la glace mesurait, en moyenne, 6,0 cm (± 4,2 cm ET) et variait de 2 à 14 cm, tandis que sur la ligne de relevés de 1 km elle mesurait, en moyenne, 3,2 cm (± 2,2 cm ET) et variait de 1 à 11 cm. On n'a trouvé aucune preuve formelle directe laissant supposer que les caribous de Peary avaient fourragé ou même essayé de fourrager dans la neige du 27 mai au 1er juillet 1992, à un endroit ou un autre du complexe de l'île Bathurst.

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INTRODUCTION

The Peary caribou (Rangifer tarandus pearyi) was assigned the most dire classification of "Endangered" by the Committee On The Status Of Endangered Wildlife In Canada (COSEWIC) in April 1991. This assignment was an uplisting from the 1979 "Threatened" classification and was based on an Environment Canada, Conservation & Protection, Canadian Wildlife Service (CWS) status report on Peary caribou to COSEWIC in 1990 (Miller 1990), resulting from the most recent (1984-89) reevaluation of the status of Peary caribou by CWS. The Peary caribou is unique to arctic Canada and it is a socially important and economically valuable part of Canada's natural heritage.

Peary caribou on the southwestern and south-central Queen Elizabeth Islands (QEI) of the Canadian Arctic Archipelago remain dangerously low in number (Gunn et al. 1979, 1981, Miller 1987a, 1987b, 1988, 1989, 1990). The three major islands of significance for Peary caribou have been, and still are, Melville, Bathurst, and Prince Patrick in descending order (Fig. 1), based on the number of caribou estimated on each compared to numbers on all other QEI in 1961 (Tener 1961, 1963), 1972-74 (Miller et al. 1977a), and 1985-88 (Miller 1987a, 1987b, 1988, 1989). Peary caribou on the two major southwestern QEI of Melville and Prince Patrick remain in apparent continual decline since 1961 (Tener 1963, Miller et al. 1977a, Miller 1987b, 1988). The south-central island of Bathurst, where Peary caribou underwent the greatest proportional loss in number on an island basis during the catastrophic winter of 1973-74 (Miller et al. 1977a), is the only major island where the caribou have shown any sign of recovery from the 1973-74 low (Miller 1987a, 1987b, 1988, 1989), although Peary caribou on that island remain significantly below the number estimated in 1961 (Tener 1963).

Bathurst Island was a principle caribou hunting area for the Inuit of Resolute Bay, Cornwallis Island, prior to the cataclysmic die-off of 1973-74. The general lack of caribou on Bathurst Island thereafter resulted in the imposition of a voluntary ban on caribou hunting on Bathurst Island in 1975 by the Inuit hunters of Resolute Bay (Freeman 1975, Ferguson 1987). The ban was apparently honoured until 1990 although a desire to reinitiate caribou hunting on Bathurst Island was voiced in 1988 and 1989. Six caribou were reported to have been killed there in winter 1989-90 and four were shot on the small island of Baker, ca. 8 km off the southeast coast of Bathurst Island, in late winter 1990 (G. Eckalook, J. Hunter, T. Manik, Resolute Bay, pers. commun., 1990). An additional 6 or 7 were reportedly shot on Bathurst Island by polar bear hunters out of Resolute Bay, Cornwallis Island, in late winter 1991 (T. Manik, Resolute Bay (pers. commun., 1991). Those caribou still cannot currently be considered a harvestable population, except, perhaps, at a token level and preferably only when restricted to male caribou (Miller 1989, 1991).

The CWS has selected Bathurst Island to continue ecological studies of the relationship between Peary caribou and their environment as (1) the Inuit of Resolute Bay have resumed hunting caribou there (which makes those caribou essentially the only hunted population of Peary caribou on the QEI, except for some limited hunting on southern Ellesmere Island by the Inuit of Grise Fiord); (2) the Peary caribou on Bathurst Island are the most accessible within the QEI which also have, at least in theory, the potential for increasing in number to a level that would sustain annual harvests of meaningful sizes; and (3) apparently only the Peary caribou on Bathurst Island (and some smaller satellite islands) are currently experiencing any marked increase in number from their 1973-74 low, while Peary caribou on Melville and Prince Patrick islands (and their respective satellite islands) showed no indication of recovery when last surveyed in 1986 and 1987 (Miller 1987b, 1988).

The following is an annual progress report on the 1992 field season activities for Peary caribou studies on Bathurst Island and some of its satellite islands. This field season was the third and final operational period for most of these studies, using the present designs and field procedures. Prior studies included (1) spring-summer distributions and movements; (2) aerial sex/age segregation counts; (3) documentation of the chronology of the calving period; (4) a measure of calving success (% calves among all caribou seen and calf:female ratios); and some insight into early calf losses, which were also investigated in 1988 and 1989 (Miller 1989, 1991) and 1990 (Miller 1992).

STUDY AREA

1. Bathurst Island Complex

The study area of the current project is termed the "Bathurst Island complex" (BIC) and for the purpose of this research includes a complex of 26 islands that lie within the south-central portion of the QEI and to the south in the immediately adjacent waters of Viscount Melville Sound and Barrow Strait (Figs. 1-5). The study area lies between 74° and 77°N latitude and 93° and 107°W longitude, and the collective landmass of the 26 islands equals ca. 27 000 km². The islands are mostly low-lying and mainly below 150 m above mean sea level (amsl) in elevation. Geology, topography, and vegetation within the study area have been described in detail (e.g., Dunbar and Greenaway 1956, Thorsteinsson 1958, Savile 1961, Fortier et al. 1963, Tener 1963, Blake 1964, Kerr 1974, Wein and Rencz 1976, Edlund 1983).

For the purposes of this study, the 26-island study area is divided into three levels of importance: (1) one principal island; (2) nine major satellite islands (each island >50 km²); and (3) 16 secondary satellite islands (each island <50 km²).

1.1. The principal island

The principal island is Bathurst Island (16 090 km²) which is the largest and most important "game" island within the south-central QEI (Figs. 1 and 2). A "primary study area" for intensive ground studies has been selected on a northeastern coastal site (ca. 100 km²) between the Walker and Moses Robinson rivers (centered at ca. 76°00'N, 97°40'W).

1.2. Major satellite islands

The nine major satellite islands of Bathurst Island (in terms of possible movements or migrations of Peary caribou within the BIC) (Figs. 1-3) are the "five western major satellite islands" of Vanier (1130 km²), Cameron (1060 km²), Alexander (490 km²), Massey (440 km²), and Marc (56 km²) on the northwestern coast; the "two northern major satellite islands" of Helena (220 km²) and Sherard Osborn (60 km²) off the northern coast; and the "two eastern major satellite islands" of Cornwallis (7000 km²) and Little Cornwallis (410 km²).

1.3. Secondary satellite islands

The 16 secondary satellite islands (Figs. 1-5) are the nine southern secondary satellite islands of Browne, Garrett, Griffith, Hamilton, Lowther, Somerville, and Young in Barrow Strait, and Baker and Moore in Intrepid Passage; the six eastern secondary satellite islands of Crozier, Kalivik, Milne, Neal (Neal Islands are treated as one island), Truro, and Wood in McDougall Sound; and the one western secondary satellite island of Bradford in Graham Moore Bay.

These 16 small secondary satellite islands are known or are likely to receive migrant caribou from Bathurst Island during periods of springtime environmental stress (e.g., Bissett 1968, Miller and Gunn 1978, 1980) and thus are included in the study area. All of these islands are poorly vegetated and not one is of a size that could support any significant number of Peary caribou on a year-round basis. Because of their usually exposed nature, however, these small islands could collectively provide, and sometimes have provided, valuable temporary relief for caribou fleeing widespread forage unavailability elsewhere within the BIC. These 16 small islands collectively only total about 390 km².

2. General Climate

The climate of the study area is characterized by long cold winters, short cool summers, and low precipitation. Air temperatures average below -17.7°C from December to March. Mean daily temperatures generally do not rise above 0°C until after 1 June on the extreme south of the study area, and 15 June on the north of the study area (Meteorological Branch 1970). Snow cover usually begins melting in early June, and often rapidly dissipates to bare ground through mid-June, except for snowbanks in sheltered sites (Potter 1965). Summer is the period when the ground is generally snow-free, and lasts from the beginning of July to the end of August. Winter starts when the mean daily temperature falls below 0°C, usually about 15 September. September and October are the stormiest months and much of the annual snowfall may occur in those months. From December to March, anticyclones dominate the weather causing frequent calms, clear skies, and light snowfall.

Weather patterns within the study area are varied. A comparison of 1 year's weather data from the Canadian Museum of Nature research station in Polar Bear Pass on central Bathurst Island with data from Resolute Bay, Cornwallis Island, suggests that the differences in the weather between the two locations (93 km apart) are the result of the research station's inland site and local topographical effects (Thompson 1971). The Atmospheric Environment Service (AES) weather station at Mould Bay, Prince Patrick Island, tends to have cooler, drier and less stormy weather than the weather station at Resolute Bay, Cornwallis Island (Maxwell 1981: 700 km apart).

The amount and duration of snow cover, especially in spring, are critical to arctic ungulates, and also critical are the types of snow cover and incidences of freezing rain. Wind removes the snow from exposed slopes and redeposits it as shallow but hard compacted cover and drifts in more sheltered and relatively well-vegetated sites. Freezing rain in autumn that results in ground fast ice before snow cover accumulates, ice layering in the snow cover, crusting of the snow, and the formation of ground fast ice in spring (e.g., Miller _et_ _al_. 1982) compound the stress of forage unavailability on arctic ungulates. Despite these known conditions, detailed range-wide information on type of snow cover and the incidence of ground fast ice or ice layering is generally unavailable for the QEI.

METHODS

1. Nonsystematic Helicopter Searches

For the purpose of aerial searches, Bathurst Island was divided into 12 "search zones": (1) northeast coast (NEC); (2) northeast interior (NEI); (3) southeast coast (SEC); (4) southeast interior (SEI): (5) south coast (SC); (6) southwest coast (SWC); (7) southwest interior (SWI); (8) northwest coast (NWC); (9) northwest interior (NWI); (10) north coast, western section (NCW); (11) north coast, eastern section (NCE); and (12) Polar Bear Pass (PBP). All of the land area divisions (search zones) were tied to the three aerial survey strata of Bathurst Island (Fig. 2) used by Miller _et_ _al_. (1977_a_) and Miller (1987_a_, 1989). Zone 12 (Polar Bear Pass) includes all of the lowlands from the middle of the valley north to the crest of high ground and a nearly equal distance to the south from near the head of Goodsir Inlet through the pass to near the head of Bracebridge Inlet. All coastal areas were strips of land that extended about 5 km inland from the sea coast. The middle lowlands of Polar Bear Pass through central Bathurst Island were used to divide Bathurst into north and south sections (the common boundary of survey Stratum (St.) II and St. III, Fig. 2). The northern portion of Bathurst Island was divided into eastern and western halves along the common land and water boundaries of St. I and St. II (Fig. 2). The southern portion of Bathurst Island was divided in half on an east and west basis along about the 99°00'W meridian (passing just west of the head of Bracebridge Inlet at the north end to just west of Dyke Acland Bay on the south coast.

1.1. Aircraft

A Bell 206L-1 (Long Ranger-1) turbo-helicopter on an emergency floatation system (pop-out floats) was used as the search aircraft in June and July 1992.

1.2. Observers

I used a 4-person aerial search team: pilot-navigator-spotter (right front seat); navigator-spotter-observer (left front seat); and a left and right rear seat observer. Navigation was carried out either with a "Global Positioning system" or by the pilot and the left front seat person. The left and right rear seat observers recorded observations for their respective side of the aircraft: (1) date; (2) location; (3) composition of animal(s) sighted, as bull, cow, calf, juvenile, or yearling (juv. & yr. were separated by sex); and (4) remarks, if any. The animals sighted were circled, if necessary, to determine their number and sex/age composition (all 4 crew members participated in the determinations).

1.3. Altitude

Altitude of the helicopter varied mainly between 10 and 90 m above ground level (agl) during the nonsystematic helicopter searches over land and sea ice.

1.4. Helicopter air speed

The air speed of the helicopter mainly varied between about 96 and a cruising speed of 180 km $\cdot$ h^{-1} during the searches (usually at cruising speed when searching for animals). Slower speeds were temporarily maintained when examining tracks or animals and the helicopter was sometimes hovered for better inspection of tracks.

2. Relative Numbers

Relative numbers of caribou by search zone and by island within the BIC were determined by nonsystematic helicopter searches. The technique does not necessarily provide accurate population estimates on an island basis or for the inter-island population within the entire BIC. The maximum count obtained during a discrete search period can, however, provide some insight into the likely seasonal population levels by island and for the entire BIC.

3. Distributions And Intra- Or Inter-island Movements/migrations

Distributions and intra-island movements and seasonal migrations by search zone or an entire island were determined by nonsystematic helicopter searches over land areas of the various islands within the BIC. Evidence for inter-island movements or seasonal migrations of caribou within the BIC was to be obtained by low-level nonsystematic helicopter searches over the interjacent sea ice and adjacent coastal areas of the 26 islands within the BIC.

Direction of travel on trails on the sea ice would be determined and, if possible, their exact origins and termini. Animals sighted on the sea ice would be left undisturbed. We would have first back tracked along their trails to find where they left the land (point of origin). Then, we would have subsequently followed the trail in the direction of travel from about where we first saw the animals to determine the terminus.

Comparison of the sex/age structure of caribou on the five western major satellite islands of Bathurst Island vs. that for only Bathurst Island could provide indirect evidence for inter-island movements or migration, and, possibly, the selection of calving areas. The skewedness of the distribution of sex/age classes of caribou among the islands of the BIC also could serve as indirect evidence for seasonal inter-island movements/migrations; and thus, the existence of an inter-island population of caribou. Comparison of the sex/age composition of caribou seen on the various areas of Bathurst Island could allow some indirect evaluation of intra-island movements/migrations, and the degree of spatial segregation of caribou on Bathurst Island, at least at one season of the year.

4. Sex/age Composition And Social Groupings

Segregations of caribou seen during aerial activities by sex/age classes (bulls, cows, calves, juveniles and yearlings) were used to determine the approximate sex/age structures of the "precalving" and "postcalving" population segments on an island basis and between and among islands. The overall data base from combined aerial activities allowed approximations of the precalving and postcalving sex/age compositions of the entire inter-island population of Peary caribou within the BIC. These data provide some insight into the current population dynamics and the potential for growth of the caribou population within the BIC.

4.1. Sex/age classification

Peary caribou are recognized and classified by sex/age class as follows.

4.1.1. **"Bulls" (mature males, assumed 4+ yr-old)** are recognized in May through mid June by the relatively large size and advanced development of their new antler growth, which is exaggerated by the presence of velvet on the antlers. Diagnostic characteristics are the large diameter of the main beams; the long, posteriorly curved main beams; and the presence of well-developed, anteriorly directed brow or bez tines. Secondary characteristics include large body size, relatively large head size; and new pelage, especially on the lateral parts of the body and on the face. When the caribou under consideration exhibits male-like antler growth, the observer distinguishes mature males from juvenile males by mentally evaluating the length of the new antler growth present in relation to the length of the animal's head (from crown of skull to tip of nose). When the antler growth is longer than the head - the animal is classified as a bull; and if shorter than the head - a juvenile male. By late June the distinction between the larger antlers of bulls compared to those of juvenile males becomes obvious, and there is no chance of confusing the two sex/age classes, with one possible exception. Males just coming of age, "borderline bulls", are classified as "bulls" when their antler growth is characterized by large-diameter main beams that are directed strongly posteriad, and considerable terminal growth on the main beam is yet to occur. When the main beams of the antlers are directed posteriorally but have already begun to curve anteriorally along the middle and terminal portions of the main axes, and the antlers, seemingly, are going to be only slightly longer than the anterio-posteriad axis of the head, from the nose to the back of the neck, the animal is classified as a "juvenile male".

4.1.2. **"Cows" (mature females, assumed to be mostly 3+ yr-old)** are recognized by the retention of hard antlers from the previous year or the absence of antlers and any new growth of antlers. In a few cases, minor new growth on the simple main beams has begun (such new growth most likely occurs among individuals just coming of age or possibly in a few older cows that maintained better physical condition because they did not have the added burden of carrying a fetus and nursing a calf in the current year). Cows, especially those that calved in the current year, still retain much of their previous winter's pelage and have a faded, lifeless, often patchy appearance about them (relative to other sex/age classes in July). The general drab appearance of a successful maternal cow often remains clearly recognizable into August of the year (individual variation, however, may be important after mid-July). Whenever possible, the presence of a stained "vulval patch" or a distended udder in combination with retained hard antlers in June is noted (cf. Bergerud 1961, 1964). Empirical impressions formed over several years of springtime (May-June) aerial searches indicate that the adult cow-like characteristics ascribed to a "breeding cow" apply to all paturient females regardless of age. Therefore, a certain but unknown, and most likely annually changing, percentage of "breeding cows" in each year would actually be pregnant juvenile or yearling females. On occasion, obviously small-sized "breeding cows" are recognized but consistent comparative size distinctions over time are not currently feasible or possible. Thus, "breeding cows" represent the sum total of all females (1+ yr-old) in the population that have either produced a calf (viable or nonviable) or carried a fetus to near- or full-term in that year.

4.1.3. **"Juvenile/yearling males" (males, assumed 1-3 yr-old)** are recognized in May through mid June by their new pelage, and their relatively small body size (especially that of yearlings), which, when compared to adults, aids in their separation from bulls and cows. (Initially, an attempt is made to separate juvenile males from yearling males.) The advanced, well-developed, but relatively small (when compared to bulls) new antler growth of at least 2 and 3-yr olds is used to separate them from juvenile females. Yearling males are judged by their associations, relative antler development and body size, as well as the absence of a "vulval patch", when possible (cf. Bergerud 1961). By late June and early July there could be some confusion between the diagnostic characteristics of some juvenile male antlers (most likely those of 2-yr olds) and those of some females, especially nonpregnant females and particularly those females just "coming of age". At this time, it appears that the most accurate basis for separation of some juvenile males from heavily antlered females lies in the comparative shapes and priorities of antler growth. That is, the growth of juvenile (and, seemingly, yearling) male antlers is directed to the development of strongly posteriorally curved main beams. When viewed from above (from a low-level helicopter) the two main beams of males are directed both backwards and outwards, the pair giving a posteriorally inclined "V-shaped" appearance from above. Such male main beams are devoid of any terminal growth of lateral tines. Most often, one or more of usually the 1st ("bez") or occasionally the 2nd ("trez") tine(s) are well-developed in an oblique, upwards, anteriorad direction, usually well exceeding 50% of the lineal growth of the main beams in length. The same conditions but on a smaller scale appear to apply to yearling males during the same time period (except that the terminal portion of one or both main beams may be beginning to fork).

4.1.4. **"Juvenile/yearling females" (females, assumed 1-2 yr-old)** are recognized in May through mid June by their new pelage, new antler growth, relatively small body size (particularly yearlings) and the presence, when visible, of a "vulval patch" (and the absence of a distended udder) (cf. Bergerud 1961, 1964). Yearling females are separated from juvenile/yearling males or juvenile females by their new antler growth appearing shorter than the ears and being restricted to small spike-like main beams or at the most, small main beams with simple branching. Antler growth characteristics, together with the relatively small body size and new pelage, separate juvenile/yearlings from cows or bulls. (Initially, an attempt is made to separate juvenile and yearling males from juvenile and yearling females.) In late June and early July, antler growth of some juvenile females vs. some juvenile (and possibly some yearling) males becomes more difficult to separate. It appears that the main diagnostic characters of juvenile females (and nonpregnant cows) with relatively large antlers are more of form and apparently of growth priorities than of size. The main beam of the juvenile female antler tends to be more upright in its earlier stages of growth than that of the juvenile or yearling male. The main beam of a female exhibits initial curvature in an anteriorad direction at a relatively early stage compared to at least juvenile and possibly yearling males. Also, relatively little growth appears to be devoted to the development of proximal (bez and trez) tines in females, with such growth of those tines on females usually being much less than 50% of the length of the main beams. Highly stained pelage in the area of the vulva appears to be essentially characteristic of females only. The occurrence of "scours" in some juvenile or yearling males could lead to possible confusion in a few cases in most years. Group association with "breeding cows" just prior to, during, or immediately after calving, seemingly, strongly favours classification of juvenile/yearling animals of undetermined sex as females (as does association of juvenile/yearling males with bulls, but apparently to a lesser extent for juvenile/yearling males than for juvenile/yearling females associated with "breeding cows").

4.1.5. **"Calves" (male or female, assumed newborn in June of the year)** are obvious by their relatively small size compared to other sex/age classes. No attempt is made to sex calves (cf. Bergerud 1961) during aerial composition counts.

4.2. Caribou social formations

A "caribou social group" is composed of two or more individual caribou that are seen in close association (no fixed minimum or maximum distance of separation but usually much closer than 100 m) and apparently spatially isolated from other individuals of the same species at the time of observation. Two or more individual caribou are considered as one group even if they are more than 100 m apart but moved together when disturbed by the survey aircraft.

4.2.1. Mixed sex/age caribou group

A "mixed sex/age caribou group" may be mixed by sex or age or both and contains any possible combination of bulls, cows, juveniles, yearlings, or calves (when bulls cannot be recognized, the presence of both sexes might not be determined with complete confidence).

Mixed sex/age groups can occur as any of 22 possible combinations of designated sex/age classes: (1) cow-only; (2) cow/calf; (3) cow/juvenile; (4) cow/yearling; (5) cow/calf/juvenile; (6) cow/calf/yearling; (7) cow/juvenile/yearling (8) cow/calf/juvenile/yearling; (9) bull/cow; (10) bull/cow/calf; (11) bull/cow/juvenile; (12) bull/cow/yearling; (13) bull/cow/calf/juvenile; (14) bull/cow/calf/yearling; (15) bull/cow/juvenile/yearling; (16) bull/cow/calf/juvenile/yearling; (17) juvenile/yearling; (18) juvenile-only; (19) yearling-only; (20) bull/juvenile; (21) bull/yearling; and (22) bull/juvenile/yearling.

The presence of a calf in a mixed sex/age group without a cow being present would be considered an unstable anomalous social grouping (a temporary gathering) and thus would not be considered as a valid mixed sex/age group. The presence of a calf (female or male) in a male-only group would also be considered an anomaly and would not be considered as a valid male-only group. Such anomalous groupings would be recorded but they would not be used in the calculation of any statistics for either mixed sex/age or male-only groups.

A juvenile or yearling caribou can be either female or male in a mixed sex/age group if at least one cow is present, but can only be female if no cow is present. Two or more juveniles or yearlings in a mixed sex/age group can be either sex or of mixed sex if at least one cow is present, and can be either all females or mixed by sex if no cows are present.

4.2.2. Male-only caribou group

A "male-only caribou group" can be composed of mature males only (assumed 4+ yr-old bulls with relatively large antler size) or juvenile males or yearling males or any combination of bulls, juvenile males, and/or yearling males. In June-July of the year both bulls and immature males (at least 2- and 3-yr olds and possibly 1-yr olds) are readily recognizable by their relatively advanced antler development from other sex/age classes of Peary caribou.

Male-only groups can occur as any of seven possible combinations of designated male age classes: (1) bull-only (2) bull/juvenile male (3) bull/yearling male; (4) bull/juvenile male/yearling male; (5) juvenile males; (6) yearling males; and (7) juvenile male/yearling male.

5. Calving Period

The timing of the calving period, with emphasis on the peak of calving, was determined by the measurement of the percentages of newborn calves present among all caribou segregated over time in June-July 1992. Ratios of newborn calves per 100 breeding cows and per 100 1+ yr-old females throughout the same time period also were used to determine the overall chronology and the peak of the calving period.

The multi-year collective data base of these measures obtained by aerial activities over the life of the project will be used to determine:

(1) timing of calving in relation to yearly variation in snow/ice conditions during the calving period;
(2) whether Peary caribou have evolved a later calving period than mainland caribou in adjustment to harsh environmental conditions during calving, and often, shortly after calving; and
(3) possible between or among-year variation in calving dates, especially the peak of calving.

6. Calf Production

Initial calf production (calving success) was measured by the maximum percentage of calves among all individual caribou seen and the maximum ratios of newborn calves per 100 breeding cows and per 1+ yr-old females in grouped samples of different individuals obtained by aerial searches in June-July 1992.

The multi-year collective data base of those measures obtained by aerial activities over the life of the project will be used to determine:

(1) the influence of the previous winter's physical environmental conditions (based on AES weather records);

(2) the influence (importance) of yearly snow/ice conditions during calving; and
(3) the relationship between calving location and the subsequent rates of calves at heel in July of that year.

7. Early Survival Of Calves

Early survival of newborn calves was determined by examination of percentages of calves among all individual caribou seen and the ratios of calves per 100 breeding cows and per 100 1+ yr-old females in grouped samples of different individuals obtained by aerial searches in June-July 1992.

The multi-year collective data base of these measures obtained by aerial activities over the life of the project will be used to determine:

(1) the apparent influence of the previous winter's physical environmental conditions (based on AES weather records);
(2) the apparent influence of snow/ice conditions that prevailed during the calving period on subsequent early calf survival in that year; and
(3) the likelihood that the Peary caribou population within the BIC will reach a size within the near future, that would support annual sustained harvests of any appreciable number.

8. Snow/ice Measurements

The original sampling design called for a single 7.5-km snow/ice course on the primary study area. That course, laid out in August 1989, begins at the seacoast and runs about 7.5 km inland, terminating at one of the highest sites on the primary study area (ca. 210 m above mean sea level). Sampling stations were placed at every 0.5 km along the main run of the snow/ice course. Lateral arms along the course extend 250 m northward and 250 m southward at each 1-km marker (from 1-km to 7-km) to obtain a larger sample of measurements at each of six elevational rises along the main run of the snow/ice course. In spring 1990, after making the first set of measurements along the 7.5-km snow/ice course, it was decided that more intensive sampling of snow depths would be desireable. Therefore, a 1-km snow/ice course was established to permit more intensive sampling of the snow cover and the subsequent formation of ground fast ice.

The following equipment was constructed for snow/ice measurements. Two pieces of high-quality SPS steel rod (ca. 1.6 cm in diameter) were each cut 103.6 cm in length. One end of one 103.6-cm section was milled and tapered to a blunt point for relative ease of penetration through hard snow layers or ice lenses in the snow cover. A grooved ring was scored 10 cm from the tip of the rod and every 5 cm thereafter for an overall length of 1-m. The last 1.9 cm of the rod was milled down to about 0.6 cm in diameter and threaded so that the second rod (when bored and tapped) could be attached, if desired. The bored hole in the proximal end of the second section of rod was tapped so that it would joint with the threaded distal end of the first section of rod, when necessary. The first grooved ring was scored on the second section of rod so that when meshed with the first section it formed a 5-cm distance from 100 to 105 cm. Thereafter, each 5 cm of the second section was scored off for an overall length of 2 m, when both sections are combined. The last 1.9 cm of the distal end of the second section of rod was reduced and threaded as was the first section so that either section could take a "T" handle. A hole was drilled through the centre of a 22.2-cm section of the same SPS steel rod material so that it would pass over the threaded distal portion of either of the two sections of 103.6-cm rod and could be secured by means of a winged-nut or a standard hex nut. Only the first section of rod with the blunt point was used with the "T" handle attached to its distal end, when the snow cover was 1-m or less in depth.

A sampling tarpaulin was designed to permit the use of a systematic grid pattern sampling procedure for measuring snow depths. Grommets (2.5 cm inside-diameter) were set in the tarpaulin in three rows and three columns at 0.5 m on centre. This design permitted nine point samples (measurements) to be obtained on 1-m^2 at 0.5-m intervals.

The nine grommet holes on the sampling tarpaulin were numbered consecutively and snow depths were always sampled in that chronological order (1 to 9) as follows: (1) 1st row, 1st column - upper left corner; (2) 1st row, 2nd column - upper centre; (3) 1st row, 3rd column - upper right corner; (4) 2nd row, 3rd column - centre right side; (5) 3rd row, 3rd column - lower right corner; (6) 3rd row, 2nd column - lower centre; (7) 3rd row, 1st column - lower left corner; (8) 2nd row, 1st column - centre left side; and (9) 2nd row, 2nd column - centre of tarpaulin.

The steel rod was passed vertically down through each grommet hole and pushed to the bottom of the snow cover (ground surface, or top of ground fast ice when present). The thumb and index finger were then placed immediately above the surface of the snow cover and the rod was withdrawn from the hole. Snow depths were measured to the closest whole centimetre. The rod was read directly to the closest 5 cm. The difference, if any, was then measured to the closest centimetre by holding a steel measuring tape against that portion of the rod. Ice thickness measurements were made by chopping a vertical profile to ground level with an axe, then measuring the thickness of the ice with a steel measuring tape to the closest whole centimetre.

Snow depth and ice thickness measurements were obtained from a 7.5-km snow/ice course and a 1-km snow/ice course. Markers (205-litre empty fuel drums) were dug about one-quarter of the way into the ground for the 7.5-km course in summer 1989. The 7.5-km course ran from about 30 m in from the seacoast at an elevation of ca. 4 m amsl inland in a westerly direction to a point of land on some of the highest ground in the study area (ca. 160 m amsl). The 7.5-km course consisted of 30 1-m^2 sample plots called "stations": 16 stations were spaced systematically at 0.5-km intervals along the main axis of the course from 0.0 to 7.5 km; and

14 stations were established in 7 pairs with one marker of each pair placed 250 m north and the other 250 m south of each whole kilometre station from 1.0 to 7.0 km. The 1-m^2 sampling tarpaulin was placed about 5 paces north of each drum-marker so that the 1-m^2 sample site fell between 4 and 5 m north of each drum-marker.

The 1-km course was located about 2 km inland from the seacoast. The 1-km course ran essentially north-south for 0.5 km from the 2.0-km North Station past the 2.0-km Station to the 2.0-km South Station of the 7.5-km course. Then, it made a right angle turn and ran downslope to the east toward the seacoast from the 2.0-km South Station for another 0.5 km past the 1.5-km Station and in line with the 1.0-km North Station of the 7.5-km course (but not all the way to it). The 1-km course consisted of 41 stations each spaced systematically at 25-m intervals. Stakes (1.2 m x ca. 5 x 5 cm) were driven about 0.3 m into the ground at each station on both snow/ice courses in July 1990 to serve as permanent markers to facilitate repeat sampling at those sites. Each stake was set on the middle point (0.5 m, no. 6 sample point of the 9-hole sampling point pattern) immediately outside the margin of each 1-m^2 sample site closest to the marker side of each station. Each stake was labelled on two sides at the top end with the station number and the remainder of the stake was spray painted amber yellow and hi-gloss red or orange.

The 1-m^2 sampling tarpaulin was placed about 2.5 m (3 paces) eastward of each marker on the north-south running 0.5-km leg and 2.5 m northward on the east-west running 0.5-km leg of the 1-km course. Numbering of stations on both snow/ice courses was begun closest to the seacoast.

In order to facilitate the accurate replacement of the sampling tarpaulin, the following system was devised. The hook portions of standard metal coat hangers were snipped off on both sides immediately below the twisted "neck" portion. The remainder of each hanger was then straightened to ca. 78 cm and one end tightly coiled one and one-half turns so that a ca. 15 cm piece of hi-gloss orange flagging tape could be tied to the coil, leaving two ca. 7 cm tails of flagging on a ca. 76 cm shaft. The straightened hanger (shaft end first) was then inserted and left in the no. 5 and no. 7 holes at each station on both snow/ice courses.

Patterns of the obliteration of snow cover were obtained by measuring the amounts of snow covered ground vs. snow-free ground over time on each of the 40 25-m intervals between stations 1-2 through 40-41 on the 1-km snow/ice course. A steel measuring tape was placed from the centre (no. 6 sample point) of one station to that of the next for each of the 40 pairs of stations and all segments of snow covered ground or snow-free ground were read to the closest 0.1 m and recorded in consecutive order. The amount of snow-free ground present was compiled for all 40 pairs of stations on each sample date to obtain a composite progression with time of snow-free ground on the 1-km course.

9. Environmental Conditions

Environmental conditions, especially any extreme or anomalous ones, were described qualitatively and quantified whenever possible. A general empirical description of snow/ice cover and seasonal conditions on land and on the sea ice were recorded in relation to how they might influence caribou distributions, aggregations, or movements/migrations.

9.1. On-site weather and automatic monitoring weather stations

Weather observations at the field base camp were made twice daily at ca. 0700 and 1900. Each 12-h set of observations included (1) sky conditions and/or ceiling (100's ft, m = 30.48 x 100's ft); (2) visibility (miles, km = 1.609 x miles); (3) weather and obstruction to vision (brief description); (4) dry bulb temperature (°C); (5) wind direction (at 10° intervals); (6) wind speed (knots $\cdot h^{-1}$, km $\cdot h^{-1}$= (1.852) knots $\cdot h^{-1}$); (7) clouds and/or obscuring phenomena (types, amount); (8) maximum temperature (°C); (9) minimum temperature (°C); (10) precipitation (mm); and (11) remarks. Thermometers were housed in a modified Polar Continental Shelf Project white weather screen at ca. 1.5 m above ground level. A calibrated, transparent plastic rain gauge was mounted upright on a vertical stake ca. 1-m above ground level. Wind speed was measured with a hand-held anemometer and wind direction was approximated in 10° classes with the aid of a fastened streamer (North being known from sun reading). Cloud types were identified from a standard Atmospheric Environment Service cloud chart and cloud cover was visually estimated in amounts by tenths of the sky from horizon to horizon.

Two remote monitoring automatic weather stations are located on the study area. Both weather stations operate on a 14-volt battery pack, supplemented by a solar panel for recharging after the long "polar night". Each station employs (1) an SM192 storage module (192 976 bytes) and a CRID measurement and control module; (2) a Model 207C temperature and relative humidity probe housed in a Model 41004-5 gill multi-plate radiation shield; (3) four Model 107 temperature probes; (4) an L12005 silicon pyranometer for measuring incoming shortwave radiation; (5) a Model 013A heavy duty wind speed sensor; and (6) a Model 023A net-one wind direction sensor. The stations are maintained annually.

The following variables are recorded by both weather stations: average, maximum, and minimum daily values for (1) air temperature and relative humidity, 2 m agl (originally this combination sensor was housed in the radiation shield at 1-m agl but due to polar bear damage was moved up to 2-m agl); (2) soil temperature, ca. 1-cm below ground surface, 2 under vegetation and 2 under bare ground surfaces; (3) average daily incoming shortwave radiation; (4) wind speed, direction, daily magnitude and standard deviation; and (5) battery voltage, Julian day, and Greenwich Mean Time (i.e., Universal or Zulu).

9.2. Off-site weather records

Weather records were obtained from the two closest AES weather stations at Resolute Bay, Cornwallis Island, and Mould Bay, Prince Patrick Island. A cursory initial examination of those records was made for the current caribou-year (June 1991 to June 1992). The following variables were included: (1) monthly mean daily maximum temperature (°C); (2) monthly mean daily temperature (°C); (3) monthly average of daily mean temperature (°C); (4) standard deviation of monthly average of daily mean temperature (°C); (5) monthly extreme maximum temperature (°C, for entire period of record); (6) monthly extreme minimum temperature (°C, for entire period of record); (7) rainfall (mm); (8) snowfall (cm); (9) total precipitation (mm); (10) standard deviation of each total monthly precipitation; (11) number of days per month with total precipitation greater than 1-cm; and (12) depth of snow on ground on last day of each month (cm).

A detailed evaluation of relatively long-term "off-site" weather records from the AES weather stations at Mould Bay, Prince Patrick Island, and Resolute Bay, Cornwallis Island, will subsequently be carried out, when the necessary computerized weather records can be obtained from AES, Downsview, Ontario. As a necessary first step, we will compare the "on-site" weather records to those AES records for the same time periods to evaluate the potential usefulness of the "off-site" weather records on both a temporal and spatial basis (e.g., "completeness indices", Wheaton and Chakravarti 1988). This will require examining both the degree of completeness of the available time series of data and the spatial adequacy of the network of reporting stations in the area under consideration. It is obvious beforehand that the use of only Mould Bay and Resolute Bay weather records do not meet the World Meteorological Organization's recommendations of having reporting stations no more than 50-60 km apart for temperature measurements and not greater than 30 km apart for precipitation measurements (Gandin 1970). The Mould Bay AES weather station is ca. 480 km and the Resolute Bay AES weather station is ca. 160 km from the CWS Walker River base camp on northeastern Bathurst Island. Weather data will also be obtained from the Canadian Museum of Nature High Arctic Research station located in Polar Bear Pass on central Bathurst Island, if possible. If long-term off-site weather records appear comparable to on-site data the entire data base for the weather station at Resolute Bay and the one at Mould Bay will be analyzed for climatic factors or patterns that appear to significantly influence caribou within the BIC, especially if the conditions appear to detrimentally impact those caribou.

10. Fecal Pellet Sampling

Snow-free feeding sites where Peary caribou were observed foraging were subsequently searched on foot and obviously fresh droppings were collected. Also, fresh droppings were obtained by snowmobile-mounted searchers following caribou trails in the snow.

An average of 73.1 sightings of caribou · 100 min^{-1} of search effort was obtained during 88.6 h of actual helicopter searches (Table 1, App. 1-3). Rates of caribou sightings on Bathurst Island were lowest in the first two sampling periods between 13 and 17 June 1992. The rate of caribou seen per 100 min of search effort increased markedly on Bathurst Island from only ca. 40 to 47 caribou · 100 min^{-1} on 13 June and between 15-17 June to 139 caribou · 100 min^{-1} between 5-8 July.

Much of the variation in the daily rates of caribou sightings throughout the 5 sampling periods mainly reflects the greater effort expended on some days in zones, or sections of zones, where few caribou occurred at those times to better document the locations of bulls (and the absence of cows with newborn calves) and the changes in distributions from calving to the postcalving period. The significant increases in the rates of caribou seen per 100 min of search effort during 13-25 June (sample periods 1-3, average of 45.8 caribou · 100 min^{-1}) vs. 27-30 June (sample period 4, 74.9 caribou · 100 min^{-1}) and especially compared to 5-8 July (sample period 5, 126.3 caribou · 100 min^{-1}) most likely mainly resulted, however, from improved viewing conditions over time. More precisely, viewing conditions changed from mostly snow-covered ground to mottled ground to essentially snow-free terrain in association with more days with at least partial sunshine vs. more low overcast days between 13 and 25 June 1992. Larger social groups and greater "clumping" of individuals, also likely contributed to the highest rates obtained during at least July if not also 27-30 June. These improved viewing conditions and thus, likely, changes in the ease of detection of caribou, seemingly, also apply to the observed increases in numbers and rates of caribou seen on the major satellite islands of Alexander, Massey, and Vanier (17 June vs. 6 July); and on Helena and Sherard Osborn (20 June vs. 27 June).

Secondary satellite islands. Only 3 of the 16 secondary satellite islands were searched by helicopter in June-July 1992 (0.6 h total search effort). No attempt was made to search the other 13 secondary satellite islands in 1992: there was extensive open water interjacent to Bathurst Island and the satellite islands in McDougall Sound, and the emergency floatation system on the helicopter was not functional until the last 4 days of the survey period; unfavourable weather prevented initiation of helicopter flying until 13 June; the calving season peaked relatively early in 1992 at the end of the second week of June; and project funds were limiting, so essentially all resources were devoted to Bathurst Island, the 5 western major satellite islands, and the 2 northern major satellite islands.

Only Baker and Moore islands, off southeast Bathurst Island, in Intrepid Passage, and Bradford Island, off west-central Bathurst Island in Graham Moore Bay, Bracebridge Inlet, were aerially searched in 1992. A cow and her newborn calf were seen on Baker Island on 16 June. One cow-calf pair was again seen on Baker Island on 22 June (I assume that they were most likely the same two seen on 16 June). A single cow without any calf, but with a large whitish wolf (Canis lupus arctos) lying several hundred metres away, was seen on Baker Island on 30 June (no calf carcass was found). Only a lone female caribou was seen on Baker Island during the fourth and final search on 7 July (whether it was the original cow could not be ascertained, but it is likely so). Moore Island also was searched by helicopter on the same four dates as Baker Island. One bull was seen there on 16 June; 1 bull and 2 yearling males on 22 June; 1 bull and 1 yearling male on 30 June; and 3 bulls on 7 July (the number of different individuals represented by these 9 sightings is unknown, however, the minimum possible is 5 and the maximum 9). Bradford Island was searched on 13 and 25 June and no caribou were seen there.

1.1. Relative numbers

The largest (N = 1644) and most representative count of different individual caribou by sex/age classes within the BIC in 1992 came from the following grouped sample (Table 1): Bathurst Island, 5, 7-8 July; and Vanier, Alexander, Massey, and Marc islands, 6 July. Those 1644 sightings are believed to all be from different individuals, based on their spatial and temporal separations. Eighty-seven percent (1428) of those 1644 caribou were on Bathurst Island, and 1019 of them were 1+ yr-old animals. The remaining 13% (216) of the 1644 caribou were collectively on four of the five western major satellite islands (155 were 1+ yr-olds).

The mean frequency of occurence of caribou on Bathurst Island by grouped samples during the five sampling periods was significantly underrepresented during the first three sampling periods (13-25 June), occurred at a rate about as expected by chance alone during the fourth sampling period (27-30 June), and was significantly greater than expected during the fifth sampling period (5-8 July)($X^2 = 726.33$, 4df; $P < 0.005$).

Caribou on Vanier, Alexander, Massey, and Marc islands collectively occurred at less than half (45%) the rate during the 17 June search compared to during the search on 6 July 1992 (Table 1, App. 3). Most, if not all, of the observed difference in the two rates can be attributed to the poor viewing conditions that existed on 17 June (low overcast and scattered fog banks against an essentially totally snow-covered background). The frequency of occurrence of caribou was extremely low on Cameron Island (Table 1); therefore, further resources were not expended on any subsequent search of that island. Helena and Sherard Osborn islands were also first searched under unfavourable viewing conditions and the subsequent rates of occurrence of caribou on those two islands were 2.1 and 1.7 times greater during the second search, respectively (Table 1, App. 3).

There is no feasible way to extrapolate population estimates for caribou on Bathurst Island, the five western major satellite islands, or within the entire BIC from the caribou sightings obtained by nonsystematic aerial searches. The 1644 different individual caribou (1174 + 470) counted on Bathurst (n = 1428) and four of the five western major satellite islands (n = 216) between 5 and 8 July 1992 suggest that the 1988 estimate of 1102 (± 146 SE) caribou within the entire BIC (Miller 1989) is still realistic and likely a good approximate, possibly somewhat conservative, estimate for caribou within the BIC in summer 1992. The proportion of caribou that were seen on Bathurst Island in early July 1992

(87%) vs. four of the five western major satellite islands (13%) was similar to the effort expended in the nonsystematic aerial searches on Bathurst (79%) and the five western major satellite islands (19%). The ca. 6.6:1 caribou seen on Bathurst vs. four of the five western major satellite islands in early July 1992 is markedly different from the ca. 3.0:1 ratio obtained in early July 1990 and 1991, and the ca. 2.5:1 caribou seen on those respective land areas in July 1989 (Miller 1991, 1992, 1993). The ratio indicates that in 1992 proportionately more caribou were present on Bathurst Island vs. the four western major satellite islands than during the same season in 1989 (2.5:1), 1990 and 1991 (3.0:1).

1.2. Distributions and intra- or inter-island movements/migrations

The 1992 data base for late spring and early summer distributions and movements of caribou within the BIC is fragmentary, particularly for the late May to early June period. The frequencies of occurrence of caribou varied both spatially and temporally among the search zones and major land areas within the BIC (Tables 2-4). Some apparent patterns can be deduced, however, from the existing data.

Bathurst Island. We had no helicopter support between 26 May and 9 June and because of weather, could not fly until 13 June 1992. We saw 56 caribou in the area just west of our base camp on 11 days during that time period (daily range 3-9 caribou; X ± SD, 5.1 ± 1.8 caribou). Essentially all of those caribou were 3-7 km inland from the seacoast, where snow-free patches of ground were most prevalent at that time. The caribou appeared to be paralleling the coast line in a slow generally northward movement.

Caribou were already well represented on the northern portion of Bathurst Island by 13 June 1992, when we carried out our first helicopter searches (Table 2). Unfortunately, the weather was unfavourable for aerial searching on the southern portion of the island, so the search effort on 13 June was restricted to north of the mid-island lowlands of Polar Bear Pass. Most of the caribou appeared to be on the move and caribou were relatively overrepresented on a zonal search effort basis in the NEC, NWC, and NEI zones in descending order. Although snow-free sites were relatively frequent throughout much of northern Bathurst Island, most were small, well-scattered patches with more or less continuous snow cover in between them. It is likely that most of the prevailing snow-free sites at that time had been markedly reduced in size by the then recent snowfalls of late May and early June 1992. As in early June 1991, but unlike early June 1990, high frequencies of snow-free sites throughout northern Bathurst Island, made it possible for caribou, especially parturient cows, to occupy interior areas at intermediate elevations above mean sea level. By 15-17 June 1992, with calving well advanced, the strongest representation was in the NEC and SWC. Parturient and maternal cows were scattered to a lesser degree in the NEC and NCE zones. Male caribou (1+ yr-olds) caused the overrepresentation in the SWC zone and essentially all of those male caribou were on the northern section of that zone, adjacent to the south shore of Bracebridge Inlet (PBP). The SEI and

SWI zones were not searched because of persistent "white out" conditions over them.

By 20-25 June 1992, when, for the first time, all 12 zones were searched, caribou remained overrepresented in the NEC, NEI, and in the NCW zones. In general, caribou were overrepresented on northeastern Bathurst Island compared to the southern and western portions of the island (Table 3). My general impression was that more caribou were in the north of the SEC zone and many were still moving northward through that zone toward the NCE zone. Caribou were noticeably underrepresented elsewhere on the island.

By 27-30 June 1992, in the last days of calving, caribou were overrepresented in descending order in the NCW, NEI, NCE, PBP, and NEC zones; and increasingly underrepresented in the NWI, NWC, SWC, SEC, SC, SWI, and SEI zones. Maternal cows and their newborn calves mainly caused the overrepresentation in the northern and eastern zones, while males contributed mainly to the overrepresentation in PBP and the NCW zones. The 47 caribou in PBP were all on coastal sites: 27 on the southwestern coast; and 20 on the northwestern coast. Relative to the search effort expended, more (54%) of the 978 caribou in the 27-30 June grouped sample were seen on northeastern (NEC, NEI, and NCE) sites than on the remainder of Bathurst Island. Maternal cows and their newborn calves along with many juvenile and yearling animals and some bulls had moved in large numbers into the extreme northern part of the island, especially on the eastern side and on the east side of the northwestern section of the island (east side of Stratrum I & all of Stratum II, Miller <u>et</u> <u>al</u>. 1977<u>a</u>). Bulls were increasing in number in the NCW zone on the north shore of Bracebridge Inlet into the western section of Polar Bear Pass, on the largest unnamed island in Bracebridge Inlet, along the northern section of the SWC, and also on the NEC.

Eighty-three percent (811) of the 978 caribou in the 27-30 June grouped sample were on the northern portion of Bathurst Island, north of the mid-island lowlands of Polar Bear Pass (survey strata I & II of Miller <u>et</u> <u>al</u>. 1977<u>a</u>: includes 20 caribou from northwestern section of PBP). Most (65%) of those 811 caribou were on northeastern Bathurst (Stratum II) and 42% of those 527 caribou were on coastal sites. Overall, 59% (577) of the 978 caribou were on coastal sites; but only 27% (157) of them were on southern coastal sites (includes 27 caribou from southwestern section of PBP).

The largest and most spatially representative sample was obtained during the fifth (last) sampling period, 5-8 July 1992. We segregated 1428 caribou on Bathurst Island and found caribou in all zones, except the SEI. The 22 caribou in PBP were all on western coastal sites. Caribou were overrepresented on a zonal search effort basis in the NCE, NCW, NEC, and NEI. It appeared that many maternal cows, their newborn calves, and associated juveniles and yearlings had left the NEI for the NCE and possibly the NCW, with some northward movements also out of the NWI. Caribou were significantly overrepresented for the first time during June-July 1992 on coastal sites compared to interior sites. Caribou remained significantly overrepresented on northern and eastern sections of Bathurst Island compared to southern and western sections. Ninety percent (1287) of the 1428 caribou in the 5-8 July grouped sample were on the northern portion of Bathurst Island, north of the mid-island lowlands of Polar Bear Pass (including the 5 caribou in northwestern PBP). Most (71%) of those 1287 caribou were on northeastern Bathurst Island (Stratum II) and 75% (678) of those 908 caribou were on coastal sites. Overall, 83% (1185) of the 1428 caribou were on coastal sites; but only 12% (137) of them were on southern coastal sites (includes 15 caribou in southwestern PBP). On a zonal search effort basis (1) maternal cows and their newborn calves were overrepresented in descending order in the NCE, NEI, NEC, and NCW zones; (2) juvenile/yearling females were overrepresented in the NCE, NCW, and NEC zones; (3) bulls were overrepresented in the NWC, PBP, SWC, SEC, SC, and NEC zones; and (4) juvenile/yearling males were overrepresented in the NCW, NWC, and SEC zones.

Major satellite islands. When Alexander, Marc, Massey, and Vanier islands were first searched on 17 June 1992, it was done under poor viewing conditions and only 97 caribou were seen there (Table 4). All four islands were essentially snow-covered, with only a few small snow-free patches showing on some interior sites. My visual impression was that snow-free range was more available on northeastern Bathurst Island than on the western satellite islands in mid June 1992. It is probable that the low counts for caribou on Massey and Alexander islands are inaccurate due to survey conditions on 17 June 1992. If, however, the low counts obtained in mid June 1992 for those islands are accurate, they represent the lowest numbers of caribou found there between 1985 and 1992 (Miller 1987a, 1989, 1991, 1992, 1993).

When Alexander, Marc, Massey, and Vanier islands were searched the second and last time on 6 July 1992, the resultant counts were in agreement with the first count but were still markedly low on a proportional basis when compared with the number of caribou counted on Bathurst Island during 5-8 July 1992. The frequencies of occurrence of caribou seen was significantly greater on 6 July than on 17 June 1992 on both Massey Island ($X^2 = 67.51$, 1df; $P < 0.005$) and Alexander Island ($X^2 = 13.05$, 1df; $P < 0.005$) on an island search effort basis. Caribou were overrepresented among the four western satellite islands on Massey and Alexander islands, in that order (Table 4). Those caribou were also more common on Massey and Alexander islands when considered on a proportional landmass basis to Bathurst, Vanier, and Marc islands ($X^2 = 215.16$, 4df; $P < 0.005$) or among the four satellite islands only ($X^2 = 186.95$, 3df; $P < 0.005$). No clear pattern of distribution could be discerned for the caribou on the satellite islands on an island basis, but most of those seen on Alexander, Massey and Vanier were on interior sites. More (47%) caribou were seen on Massey Island than on the other 3 western major satellite islands; and as in all past years, bulls were essentially lacking (only one bull was seen on Massey). A nearly equal proportion of the caribou (43%) were on Alexander Island; only ca. 8% were on Ile Vanier; and ca. 2% on Ile Marc (only 5 caribou were seen on Cameron Island on 20 June 1992).

The two northern satellite islands of Helena and Sherard Osborn were also first searched under unfavourable viewing conditions against an essentially snow-covered background on 20 June 1992, only 33 caribou were seen there (Table 4). When searched the second and last time on 27 June 1992, 65 caribou were seen there. There were, however, no significant differences between the number of caribou seen on these two islands, when the first search period is compared to the second. The increases in the numbers of caribou seen on Helena and Sherard Osborn islands most likely reflects the increase in numbers of caribou moving into the NCE zone of Bathurst Island as June progressed and a greater spin-off from the movement onto the northern satellite islands (as in past years).

Original plans called for low-level aerial searches over the sea ice for evidence of inter-island movements by Peary caribou in the BIC (cf. Miller _et al_. 1977_b_, Miller and Gunn 1978, 1980, Miller _et al_. 1982). The plans were altered, however, because of the lateness of initiation of aerial searches and the relatively early progression of the calving season in the second and third weeks of June 1992. As in past years, evidence for inter-island movements, at least among the western satellite islands, comes from the highly skewed sex/age composition of caribou on the western satellite islands. In 1992, we could not, however, detect apparent ongoing changes in numbers of caribou on those islands during June and July, because of the lack of adequate repeated sampling of those five islands in 1992.

1.3. Sex/age composition

Nonrandom distribution of 1+ yr-old caribou by sex/age classes within the BIC (among the 12 search zones on Bathurst Island and among Bathurst and each of the five western major satellite islands) markedly influenced and confounded the determination of sex/age composition at the population level. All grouped samples, except the last grouped sample (5-8 July 1992) were spatially incomplete or were apparently overrepresented by male caribou (Tables 1,2,5; App. 2,3).

The best information obtained from the 5-8 July grouped sample of 1644 caribou during 1992 suggests that the sex/age composition of the population of 1+ yr-old caribou within the BIC favoured young animals (Table 6). There were 93 juvenile/yearlings:100 breeding cows or 225 juvenile/yearlings:100 bulls. Bulls were well represented at ca. 41 bulls:100 breeding cows and about 43 in every 100 animals were breeding cows. Females (1+ yr-old) equalled 64.7% of all 1+ yr-old caribou, based on the actual counts (Tables 1,6). Those segregation counts suggest, however, that there were only 80 juvenile/yearling males:100 juvenile/yearling females, which appears questionable as the "secondary sex ratio" for the species is supposedly 51-55 males to 49-45 females at birth (e.g., Kelsall 1968, Skoog 1968, Miller 1974, Bergerud 1978). The percentage of 1+ yr-old females dropped by slightly more than 3% to 62.5%, when I assumed that only 50% (rather than the 55.5% obtained from the counts) of the juvenile/yearlings should have been females. Thus, the representation of females in the population appears to lie somewhere between 167 (adjusted) to 184 1+ yr-old females:100 1+ yr-old males.

Males (1+ yr-old) equalled 35.3% of all 1+ yr-old caribou, based on the actual counts. Male representation increases by about 6% to 37.4%, however, when the juvenile/yearling animals are adjusted to a 50:50 sex ratio. Thus, the representation of males in the population appears to lie somewhere between 54 to 60 (adjusted) 1+ yr-old males:100 1+ yr-old females.

Calves were most commonly seen on Massey Island and on the NEI and NCE zones of Bathurst Island, based on "observed/expected" ratios obtained from the grouped sample of 1644 caribou. However, the frequency of occurrence of those calves on Massey Island was essentially as expected by chance alone, when compared to the remainder of the BIC. The frequency of occurrence of calves in the NEI and NCE zones of Bathurst Island was greater than expected by chance when compared to Massey Island ($X^2 = 5.27$, 1df; $P < 0.025$). No calves occurred in the 5-8 July grouped sample on the SWC, NWI, and PBP zones of Bathurst Island or on Ile Marc (and Cameron Island on 20 June).

__Bathurst Island__. Aerial searches yielded 2040 sightings of caribou between 13-30 June and 1428 sightings between 5-8 July 1992 (Tables 1,2). Spatial overlaps, involving possible uneven distribution of sex/age classes by zonal divisions, and temporal spans (involving possible redistributions throughout the overall sampling period) probably sometimes caused over- or underrepresentation of some sex/age classes and duplication of effort (possible repeated counts of the same individuals) in June-July 1992. Therefore, the grouped sample of 1428 caribou believed to be of different individuals on 5-8 July taken from all 12 search zones on Bathurst Island is both the largest and most representative on an island-wide basis (Table 6). The second and third largest grouped samples obtained on 27-30 June (n = 978) and 20-25 June (n = 604) are also relatively well-represented spatially but are less satisfactory because both are relatively small in size compared to the 5-8 July sample. The 27-30 June sample resulted in ca. 20% overrepresentation of males and the 20-25 June sample ca. 29% overrepresentation of males when compared to the 5-8 July grouped sample composition. Females equalled 62.9% of the 1019 1+ yr-old caribou sampled on 5-8 July 1992, based on the actual count. It appears that the postcalving structure of the caribou population segment on Bathurst Island in late June-early July 1992 approximated 13.3% bulls, 30.5% breeding cows, 28.6% calves, and 27.5% juvenile/yearlings of both sexes (ca. 8.7% juvenile males, 6.0% juvenile females, 4.5% yearling males, and 8.3% yearling females). When the juvenile/yearling sample (n = 393) is adjusted to an assumed 50:50 sex ratio, the percentage of 1+ yr-old females drops by only 1.4% to 62.0% (juvenile/yearling females were nonsignificantly overrepresented among all juvenile/yearlings.

__Five western major satellite islands__. The postcalving sex/age structure of the caribou population segment on four of the western major satellite islands on 6 July 1992 was 7.9% bulls, 30.6% cows, 28.2% calves, and 33.3% juvenile/yearlings of both sexes (ca. 6.9% juvenile males, 12.0% juvenile females, 1.9% yearling males, and 12.5% yearling females)(Table 6). Females equalled 76.8% of the 155 1+ yr-old caribou sampled on 6 July 1992 based on the actual count (Table 1). When the juvenile/yearling sample (n = 72) is adjusted to an assumed 50:50 sex ratio, the percentage of 1+ yr-old females drops by 14.3% to 65.8% (juvenile/yearling females were significantly overrepresented among all juvenile/yearlings (Table 1: $X^2 = 15.90$, 1df; $P < 0.005$).

In June 1992 persistent fog cover prevented us from carrying out successful aerial searches of the five western major satellite islands. We were able to find only a total of 97 caribou (77 + 20) on Vanier (n = 17), Alexander (n = 44), Massey (n = 22), and Marc (n = 14) islands on 17 June 1992 and only 5 caribou on Cameron Island on 20 June 1992 (Table 4). These samples were obtained under unfavourable viewing conditions in a desperate attempt to obtain some measure of the progression of calving on the western major satellite islands in late June 1992. This data set is not considered further herein, because of its collective small size and questionable representation of the numbers and sex/age compositions of the caribou on those islands at that time.

Accuracy of sex/age classifications. The evaluation of the airborne observer's ability to consistently visually recognize and separate juveniles from yearlings and to make accurate sex determinations for both juveniles and yearlings remains ongoing. The 1992 segregations, like those in June-July 1989 - 1991 (Miller 1991, 1992, 1993), resulted in an unexplainable overabundance of juveniles over yearlings (1.2 juveniles:1 yearling); female juveniles over male juveniles (1.2 females:1 male); and female yearlings over male yearlings (2.1 females:1 male), based on the 5-8 July 1992 grouped sample. It is probable that much of this overrepresentation of females, at least among the juveniles in 1989-91, can be explained by the mistaken classification of nonpregnant cows as juvenile females during June-July of the year. It now seems reasonable to assume that the "drab appearance" of a "breeding cow" at that time of the year is a function of the burden of carrying a fetus to full-term or near-term and thus applies to all pregnant females regardless of age. Therefore, while most "breeding cows" will be 3+ yr old, a certain percentage, most likely varying annually, will be juveniles (2 yr old) or even yearlings (1 yr-old). This condition would explain our failure to detect any juvenile or yearling females with calves at heel in June-July during all years (1989-92) of the study. Only in 1992 were juvenile females nonsignificantly underrepresented in the largest and most representative overall annual sample for the Bathurst Island complex (112 juv. females vs. 139 juv. males: $X^2 = 2.54$, 1df; $P > 0.05$). Proportional representation of sex/age classes in the 5-8 July sample is within previously reported levels for calves, bulls, and all 1+ yr-old females, (e.g., Miller 1974, 1982). A more complete evaluation of the results still awaits a better understanding of the probable bias associated with the consistent recognition of all the individuals in all of the designated sex/age classes.

The strengths of the sex/age classifications, with a high degree of empirical confidence, are currently restricted to the consistent identification of (1) all "bulls"; (2) all newborn "calves"; (3) all or essentially all "breeding cows"; (4) at least most of juvenile/yearlings combined; and (5) the separation of juvenile/yearling females from "breeding cows" (and "bulls"). We currently do not know (1) if the annual number of parturient and maternal juvenile and yearling females that are classified as "breeding cows" actually equals, exceeds, or falls below the number of nonpregnant 3+ yr-old cows that are mistakenly classified as "juvenile females"; (2) if we can separate all nonpregnant 3+ yr-old cows from "juvenile males", especially before the end of June in each year; (3) if we can separate all juveniles from all yearlings, especially after mid June of each year; (4) if we can make correct determinations of the sex for all juveniles and all yearlings, especially before the end of June in each year; and (5) if we could consistently sex newborn "calves", while the observer is airborne.

1.4. Social formations

Caribou were seen on 964 sites throughout the five search periods (Tables 7,8). Groups of two or more individuals constituted 84% of those observations. The remaining 16% of the observations were of solitary animals: 65 bulls; 13 cows; and 72 juvenile/yearlings. All groups (n = 814) averaged 4.6 ± 3.12 (SD) and ranged from 2 to 27 members each: mixed sex/age groups (n = 509), mean 5.2 ± 3.52 (SD), range 2-27; and male-only groups (n = 305), mean 3.5 ± 1.89 (SD), range 2-11. Over two-thirds (68.3%) of all individuals seen were caribou in mixed sex/age social groups; 27.8% were in male-only groups; and only 3.9% occurred as solitary individuals. All sex/age classes were represented by solitary individuals, except newborn calves.

Overall, mixed sex/age groups averaged significantly larger than male-only groups (t-test; P <0.05). When compared as grouped data on a five-sample-period basis (Table 7), however, this significant difference pertained to only the 27-30 June and 5-8 July 1992 periods (t-test; P <0.05). The mean group size for mixed sex/age groups with calves present during 20-25 June, 27-30 June, and 5-8 July 1992 also averaged significantly greater than the mean for mixed sex/age groups without calves present during those periods (Table 7: t-test; P <0.05). The presence of newborn calves in those groups on 20-25 and 27-30 June accounted for the significant difference during both periods; when calves were excluded from group sizes, there were no significant differences between group sizes for groups that had calves excluded vs. those that had no calves (Table 7: t-test; P >0.05). In the 5-8 July 1992 sample, however, average group size for mixed sex/age groups, with calves excluded, were still larger than the mean group size for mixed sex/age groups with no calves present (Table 7: t-test; P <0.05).

The average group size for male-only groups did not vary significantly among any of the five search periods (Table 7). The largest male-only group seen was only ca. 41% as large as the largest mixed sex/age group with calves present (11 vs. 27, respectively).

The following statistics are obtained for formations of social groupings of caribou and solitary individuals within the BIC, when the composite sample of 1644 different individual caribou sampled between 5 and 8 July 1992 is used. Those caribou were seen on 315 sites. Groups of two or more individuals constituted 88% of those observations. The remaining 12% of the observations were of solitary animals: 16 bulls, 2 cows, and 20 juvenile/yearlings. All groups (n = 277) averaged 5.8 ± 4.1 (SD) and ranged from 2 to 27 members each: mixed sex/age groups (n = 181), mean 6.9 ± 4.5 (SD), range 2-27: and male-only groups (n = 96), mean 3.8 ± 2.1 (SD), range 2-11. All mixed sex/age groups averaged larger than all male-only groups (t-test, P <0.05). The significant difference between the mean size of all mixed sex/age groups with calves present vs. all those mixed sex/age groups with no calves present could not be accounted for by the presence or absence of calves (Table 7: t-test; P<0.05). Calves were present in ca. 90% (n = 162) of all mixed sex/age groups seen, or 58% of all groups. Nearly 99% (n = 495) of the breeding cows were seen in groups with calves present, and ca. 82% (n = 211) of all juvenile/yearling females were in those groups. Only ca. 2% of all 1+ yr-old males seen (bulls = 1, juv./yrl. males = 8) occurred in those mixed sex/age groups with calves present. The possibility of seeing a caribou group with no females present was 1 in 3 on average. Group formations followed the same general patterns exhibited in 1985 (Miller 1987<u>a</u>), 1988 (Miller 1989), 1989 (Miller 1991), 1990 (Miller 1992), and 1991 (Miller 1993).

On an island basis, only the sample sizes for Bathurst Island were large enough to be statistically meaningful. As in the overall sample, all mixed sex/age groups averaged significantly larger than male-only groups for all groups seen on Bathurst Island (Table 8: t-test; P <0.05). Those significant differences occurred, however, only during the 27-30 June and 5-8 July 1992 sampling periods (Table 7: t-test; P <0.05).

1.5. Calving period, calf production, and early survival of calves

The data suggest that calving apparently peaked 2 weeks earlier in June 1992 than in June-July 1990, and 1 week earlier than in June 1991 (Miller 1992). The overall period of calving extended, however, from at least the 7th of June until the last days of June, and possibly into the first few days of July 1992 (Tables 9,10). Both initial calf production and immediate survival of newborn calves appeared exceptionally high in June as did early survival of calves in the first week of July 1992. By 8 July 1992, it appeared that either 94% of the calves remained alive or 6% of the breeding cows had not produced viable neonates in 1992, based on the calf:breeding cow ratio (Table 9).

These data indicate that the 1992 calving season was the most successful one observed to date compared to 1989-91 (Miller 1991, 1992, 1993). It also appears that 100% of the theoretical average rate of pregnancy was realized within the BIC in 1992, assuming that 82% of all 2+ yr-old female caribou should have been pregnant in any one year (cf. Bergerud, e.g., 1980). Therefore, if overall early mortality of calves was 6%, ca. 94% of the theoretical maximum calf production and early survival of calves was realized within the BIC in 1992, if the above assumption applies to Peary caribou within the BIC. Apparent initial calf production (observed number of calves/0.94) and observed early survival of calves in 1992 declines somewhat to 94 and 88% of the expected maximums, respectively, when it is assumed that 70% of all 1+ yr-old females should have been pregnant (cf. Dauphine 1976). As most of the calving in 1992 took place during the second and third weeks of June, the time lapse between then and 5 to 8 July was great enough for all initial and most, if not essentially all, early calf mortality to have taken place (e.g. Zhigunov 1961, Miller and Broughton 1974, Baskin 1983, Mauer _et_ _al_. 1983, Whitten _et_ _al_. 1984, Miller _et_ _al_. 1988). The 1961, 1985, 1988, 1989, and 1991 calving seasons were also relatively successful ones but the 1992 calving season is the most favourable documented to date (Tener 1963, Miller, 1987_a_, 1989, 1991, 1992, 1993). The 1990 calving season was relatively poor (Miller 1992) but the poorest calving season documented within the BIC was in 1974, when almost no calves were produced or survived due to environmental stresses (Gauthier 1975, Parker _et_ _al_. 1975, Fischer and Duncan 1976, Miller _et_ _al_. 1977_a_).

Problems with overrepresentation of 1+ yr-old males obtained in all but the 5-8 July 1992 sampling period seriously detract from accepting the observed and even the "adjusted" percentages of calves among all caribou seen as necessarily accurate determinations of the timing of calving, initial calf production, and immediate and early survival of calves (Table 10). At times, observed percentages of calves among all caribou seen appear to overestimate immediate and early mortality of newborn calves, or possibly underestimate initial production of calves. Even "adjusted" percent calves seems to overestimate early survival of calves in July 1992. Although the observed calf:1+ yr-old female ratios might be accurate, there is more liklihood of errors in determining all 1+ yr-old females than in identifying breeding cows only. Therefore, I currently assume that calf:breeding cow ratios permit the most accurate evaluations of the timing of calving, initial calf production, and immediate and early survival of calves in June-July 1992.

In June 1990 and June 1991, the shedding of hard antlers (previous year's growth) by breeding cows was not well synchronized with calving (Miller 1992, 1993). We could not adequately determine the relationship between the timing of calving and the timing of antler casting by parturient or maternal cows in June 1992, as the initiation of aerial searches in 1992 (13 June) essentially coincided with the beginning of peak calving. About 91% of the breeding cows had cast both (ca. 87%) or one (ca. 4%) of their hard antlers by 13 June 1992, when about ca. 67 out of every 100 of those cows had calves at heel (Table 11, App, 4). Subsequently, essentially all (ca. 99.7%) of the breeding cows were without hard antlers by 27 June, during the later part of calving.

Bathurst Island. The calving season on Bathurst Island in June 1992 appeared to be initiated on schedule but progression was at a high rate during the second seek of June and was somewhat early (Tables 9,10). Only one newborn calf (on 7 June) was among the 56 caribou seen by ground observers in the vicinity of the CWS base camp between 26 May and 12 June 1992. By 13 June, when the helicopter was first in use, 30 (23.8%) of the 126 caribou segregated were newborn calves. Proportions of newborn calves among all caribou seen then suggest a slight decrease but show no real change between 13-30 June and reached a high of ca. 29% by 5-8 July 1992 (Table 10).

The 23.8% calves among all caribou seen on 13 June 1992 is likely an overestimate of calf representation on that date because the small sample was obtained from only sections of northern Bathurst Island where parturient cows tend to congregate at that time of the year. It is likely that if an island-wide sample had been obtained on 13 June, the resultant estimate of calf representation would have been noticeably less. This position is supported by the subsequent estimates of calf representation among all caribou seen being slightly lower between 15-17, 20-25, and 27-30 June 1991 (Table 10).

The best evaluations of calf production appear to come from the calf:breeding cow ratios (Table 9). Two-thirds of the breeding cows seen had calves at heel by 13 June 1992. The percentages of breeding cows with calves in their company then rose to 83% by 15-17 June and nearly 87% by 20-25 June 1992. By 30 June 1992, 90% of all breeding cows had calves at heel and that figure rose to 94% by 5-8 July.

Early mortality of newborn calves on Bathurst Island appears to have been only 6% or less. Nearly 102% of the theoretical average rate of pregnancy was realized in 1992, when it is assumed that 82% of all 2+ yr-old female caribou should have been pregnant in any one year (cf. Bergerud 1980). Therefore, only ca. 96% of the theoretical potential maximum calf production and early survival of calves on Bathurst Island was realized in 1992, if the above assumption applies to Peary caribou within the BIC. Apparent initial calf production and early survival of calves declines somewhat to 97 and 91% of the expected maximums, respectively, when it is assumed that 70% of all 1+ yr-old females should have been pregnant (cf. Dauphine 1976).

It thus appears that both the rate of initial calving and that of subsequent early survival of calves were exceptionally high among breeding cows, and those breeding cows represented ca. 68% of all 1+ yr-old females sampled. Therefore, allowing for ca. 1-2% mortality of parturient cows, it appears that the maximum potential growth of the Bathurst Island segment of the BIC population in 1992 would have been nearly 95% of the 0.3 theoretical maximum annual rate of population growth for the species (e.g., Bergerud 1980). When the maximum of ca. 28% growth is accepted, observed percent calves suggests that the maximum level was reached some time after 30 June 1992 (Table 10).

Five western satellite islands. On a collective basis, initial calving and early survival of newborn calves was high among all breeding cows on the five western satellite islands (Tables 9,10). Those breeding cows represented, however, only about one-half (ca. 55%) of all 1+ yr-old females sampled on four western major satellite islands. Thus, the maximum potential rate of increase in 1992 at 0.28 was also only slightly less than the expected theoretical maximum high for the species of 0.30. These data suggest that on a collective basis, at least 92% of the newborn calves were still alive at the end of the first week of July 1992 (Tables

9,10). However, only 87% of the theoretical average rate of pregnancy was realized in 1992, when it is assumed that on average 82% of all 2+ yr-old female caribou should be pregnant in any one year (cf. Bergerud 1980). Therefore, only 80% of the theoretical potential maximum calf production and early survival of calves was realized in 1992, if the above assumption applies to Peary caribou within the BIC. Apparent initial calf production and early survival of calves remains similar at 79 and 73% of the expected maximums, respectively, when it is assumed that 70% of all 1+ yr-old females should have been pregnant (cf. Dauphine 1976).

It was not possible to track the timing of the calving season on the five satellite islands in June-July 1992. There is, however, no obvious reason for believing that the timing of the calving period varied markedly from that for Bathurst Island in 1992. Also, although only Vanier, Alexander, Massey, and Marc islands were sampled in the first week of July 1992 (Table 1), there is no reason to believe that Cameron Island would have contributed any significant number of calves to the July 1992 sample (based on both the 20 June 1992 search of Cameron Island and results from 1989-91: Miller 1991, 1992, 1993).

Calving success and early survival of calves on the four satellite islands is noticeably less than the 5-8 July rate for Bathurst Island on a collective basis (Tables 1,9,10). Possible initial calf production and early survival of calves varied noticeably, however, among the four satellite islands. Unfortunately, the lack of repeated useful sampling and the small sample sizes for the satellite islands detract from subsequent analyses and evaluations of the success of the 1992 calving period for caribou on each of the five western major satellite islands (including Cameron Island).

On 6 July 1992, females and newborn calves were seen on Vanier, Alexander, Massey, and Marc islands. Percentages of calves present among all caribou by actual count ranged from 16.7% on Ile Vanier, to 26.1% on Alexander Island, to 32.7% on Massey Island. However, those values became 21.4, 25.2, and 23.9%, respectively, when the sample sizes for those three islands were adjusted by assuming that the number of 1+ yr-old females present should equal 64.7% of each sample, when the sample is representative of the inter-island population of caribou within the BIC. The adjusted values on 6 July 1992 suggested that while the contribution of calves on Massey Island appeared to be the highest within the BIC, it was likely considerably lower than the actual count suggests (33.3 vs. 23.9%). The adjusted value of 25.2% for Alexander Island also suggests that the observed percent of calves was marginally inflated on Alexander Island. The condition of misleadingly low actual counts also appears to pertain to caribou on Ile Vanier (16.7% observed vs. 21.4% adjusted). The small sample size of only 3 calves might have confounded the adjustment effort; thus only a tenuous acceptance of the actual value (21.4%) can be made.

The representation of newborn calves among all caribou seen was significantly greater (X^2 = 11.77, 2df; P <0.005) by island on a landmass basis for calves on Massey Island than those proportions for

Bathurst or Alexander islands. Overrepresentation of calves on Massey Island contributed 66.4% to the Chi-square value. However, 1+ yr-old females were grossly overrepresented among 1+ yr-old caribou in the sample for Massey Island: 6 July, 95.6% (65/68). Therefore, the percentages of calves seen among all caribou are reduced by ca. 27% to 23.9%, when the 1+ yr-old females are adjusted to represent 64.7% of the 1+ yr-old animals in each sample. Thus, the true proportion of calves among all caribou on Massey and Alexander islands are probably somewhat low compared to the proportion for Bathurst Island or the entire BIC.

2. Ground Activities

2.1. Snow depth measurements

Snow depth measurements (including zero values) were obtained from 5481 sample sites at 71 sampling stations along the 7.5-km and 1-km snow/ice courses during May-June 1992. Sampling effort on both the 7.5-km and 1-km snow/ice courses was governed both by the timing of changes in the snow pack during the 1992 season and the need for devoting more time to aerial searches during mid June 1992. The snow cover did not become very wet until the end of the third week of June 1992 and free-standing water was not visible on the edges of ponds until then. Two-fifths (n = 29) of the snow/ice stations were snow-free by 22 June 1992 and none of them had any ground fast ice formations present on any of the 261 sample sites. Travel by snowmobile was not severely limited until the fourth week of June 1992. Streams in the primary study area did not show any areas of open water until 23 June, when stream freshets prevented snowmobile or foot travel beyond the 3.0-km Station on the 7.5-km course. Therafter, sampling of stations 3.0- through 7.5-km had to be carried out with helicopter support (all other remaining stations on both courses were sampled on foot after 23 June 1992).

7.5-km Snow/ice Course. Snow depths (n = 2160) were measured, or recorded as zero values, on 8 different days at all 30 stations (270 sample sites) from 29 May to 27 June 1992 (Table 12). Time intervals between samples averaged 4.1 d (± 1.68 d, SD) and ranged from 2 to 7 d. Snow cover on the 7.5-km course was highly variable, both within the sets of 9 sample sites at each of the stations and among all sample sites at all 30 stations. Where snow cover persisted on individual sample sites, it averaged ca. 19-22 cm and ranged from 1 to 79 cm in depth during the 29 May-27 June period (Table 12).

When the 7.5-km snow/ice course was reestablished and first measured on 29 May 1992, all 30 of the sample stations were entirely snow-covered (Table 12, App. 5). The absence of any snow-free sample sites was due mainly to blowing snow and fresh light snowfalls between 27 and 29 May (and also apparently was influenced by snowfalls, and most likely by wind action, earlier in May 1992). Fifty-three (20%) sample sites had ≤5 cm of fresh snow cover on them (only 3 of those sites were recorded as "traces", <1 cm of snow cover). The snow cover was thin enough on all of those 53 sites to allow the dark ground to show through; thus, indicating where the ground previously had been snow-free in late April or early May. Most importantly, the shallow fresh snow cover still allowed caribou to see or visually discern the raised matt growths of Saxifraga oppositifolia under the thin covering of snow. Caribou appeared to be concentrating their foraging on simply pawing or nosing the snow cover off the matts of Saxifraga. The snow cover averaged ≤10 cm in depth at 11 of the 30 sample stations; >10 to ≤30 cm at 12 stations; >30 to ≤60 cm at 6 stations; and >60 cm at only one station. Minimum average snow depth at a station on 29 May 1992 was 1.1 ± 0.33 cm (X ± SD) and the maximum average snow depth at a station was 68.4 ± 5.41 cm (X ± SD). Snow depths at all sample sites where snow persisted varied from a "trace" to 78 cm.

The snow cover had changed noticeable by 3 June 1992, when the 7.5-km course was sampled the second time. Thirty-three (12%) of the sample sites had become snow-free (including 2 entire stations). Snow depths decreased at 84% (227) of the sample sites, remained the same at 12% (33), and actually increased at 4% (10) of the sites between 29 May and 3 June. Average snow depths at all 30 stations had declined slightly from 29 May to 3 June. The number of sites where the snow depth was ≤5 cm had increased to 63 (23%); however, the snow cover on those sites was drifted and settled (6 of those sites were recorded as "traces" of snow only) and showed little or none of the freshness of 27 May. Stations with snow depths that averaged ≤10 cm had increased to 13 of the 30 sample stations; while the number of stations with >10 to ≤30 cm snow depth dropped to 11; those with >30 to ≤60 cm of snow depth decreased to 5; and the one station with a mean snow depth of >60 cm remained so. The minimum snow depth at a station where snow persisted averaged 1.0 ± 1.00 cm (X ± SD) and the maximum average at a station was 67.2 ± 6.14 cm (X ± SD) on 3 June 1992. Snow depths at all sample sites where snow persisted showed the same range as on 29 May (i.e., "trace" to 78 cm). There was a general tendency for the beginning of a decline in depths of snow, but nonsignificantly so.

On 7 June 1992, when the 7.5-km course was sampled for the third time, the number of snow-free sample sites had increased to 39 (14%), but only one station remained entirely snow-free. Directional changes between 3 and 7 June were similar to those observed between sampling periods 1 and 2, with snow depths decreasing at 87% (236) of the sites, remaining the same at 10% (27), and increasing at 3% (7) of the sites. The average snow depth decreased at 26 stations, increased at 2, and remained the same at 2 from 3 to 7 June. The number of sites where the snow depth was ≤5 cm had increased from 3 June to 77 (28%), but the snow cover was compacted on all of those sites (5 sites were recorded as "traces" of snow). Stations with snow depths that averaged ≤10 cm remained at 13 of the 30 sample stations; while the number of stations with >10 to ≤30 cm snow depth increased slightly to 12; those with >30 to ≤60 cm snow depth dropped to 4; and the one station with a mean snow depth of >60 cm remained so. Where snow persisted, the minimum snow depth at a station averaged 0.1 ± 0.33 cm (X ± SD) and the maximum average at a station was 67.0 ± 5.98 cm (X ± SD) on 7 June 1992. The same range in snow depths at sample sites persisted on 7 June as on 29 May and 3 June (i.e., "trace" to 78 cm). The tendency for the initiation of a decline in snow depth was slightly stronger on 7 June than on 3 June but essentially only at sites with ≤10 cm snow cover.

A series of light snowfalls, strong winds, and major changes in the direction of then prevailing peak winds markedly altered the snow cover between 7 and 12 June 1992. When the 7.5-km course was sampled on 12 June, for the fourth time, 29 of the 30 sample stations had greater average snow depths than when previously measured on 7 June. The average snow depth on 12 June at 24 of those 29 stations was even greater than when measured on 3 June. Ten of those 24 stations had average snow depths on 12 June greater than the initial average snow depths for those stations when first measured on 29 May 1992. Not a single station was entirely snow-free on 12 June 1992. The number of snow-free sample sites had been reduced by 4.9 times to only 3% (8) of all sample sites on 12 June. Loss of snow cover had been markedly retarded, with snow depths decreasing at only 55% (148) of the sample sites between 7 and 12 June. Snow depths actually increased at 24% (66) of the sites and remained the same at 21% (56) of the sites. The average snow depth had decreased at only one station from 7 to 12 June. The number of sites where the snow depth was ≤5 cm declined only slightly from 7 June, however, to 68 (25%). Six of those sites were recorded as "traces" of snow cover. Stations with snow depths that averaged ≤10 cm declined from 7 June to 10 of the 30 sample stations; while the number of stations with >10 to ≤30 cm snow depth increased slightly to 13; those with >30 to ≤60 cm snow depth also increased to 6; and the one station with an average snow depth of >60 cm remained so. Minimum snow depth at a station averaged 0.8 ± 0.97 cm (X ± SD) and the maximum averaged 68.0 ± 5.63 cm (X ± SD) on 12 June 1992. The overall range in snow depths by sample site where snow persisted was from a "trace" to 79 cm (a 1-cm increase in the maximum value). The deterioration of the snowpack had been noticeably stagnated on many sites.

Although light snowfalls and periods of blowing snow continued from 12 to 14 June, after the latter date the deterioration of the snow cover once again picked up momentum. The number of snow-free sites had increased from 12 June by 5.9 times to 47 (17%) on 19 June, when the 7.5-km course was sampled for the fifth time. Three stations were entirely snow-free. There was some acceleration of snow loss, with the snow depth at 68% (184) of sample sites decreasing, but 24% (64) actually increasing, and 8% (22) remaining the same in depth between 12 and 19 June. The average snow depth decreased at 21 stations, increased at 8, and remained the same at 1 from 12 to 19 June. The number of sites where the snow depth was ≤5 cm remained, however, essentially the same as on 12 June (71, 26%, 3 sites more than on 12 June). Stations that averaged ≤10 cm in snow depth had increased to 12 stations; stations with an average snow depth of >10 to ≤30 cm had declined to 10; those stations with average snow depths of >30 to ≤60 cm increased to 7; and the one station >60 cm remained so. Minimum snow depths at the 27 stations where snow persisted averaged 0.1 ± 0.33 cm (X ± SD) and the maximum averaged 67.6 ± 5.08 cm (X ± SD). The overall range in snow depths at sites where snow persisted was 1 to 77 cm, a decrease in the overall range of 2 cm from 12 June and only 1 cm from 29 May.

The snowpack was in an advanced state of deterioration from 19 June onward. The number of snow-free sites had essentially doubled since 19 June to 92 (38%) at the 27 active stations on 22 June, when the 7.5-km course was sampled for the sixth time. Ten sample stations had become entirely snow-free between 19 and 22 June. Snow depths had decreased at all of the 151 sites where snow still persisted on 22 June. Thus, average snow depths also had decreased at all 27 active stations from 19 to 22 June. The number of remaining sample sites where snow depths averaged ≤5 cm had markedly increased from 19 June to 106 (44%) on 22 June. Stations that averaged ≤10 cm in snow depth had increased from 19 June to 14; stations where the snow depth averaged >10 to ≤30 cm continued to decline to 9; stations that averaged >30 to ≤60 cm were reduced to 3; and the one station that averaged >60 cm still remained so. Minimum snow depth at the 17 stations where snow persisted averaged 2.8 ± 3.83 cm (X ± SD) and the maximum averaged 63.2 ± 4.24 cm (X ± SD). The overall range in snow depths where snow persisted was 1 to 72 cm, a decrease of only 5 cm from 19 June and 6 cm from 29 May.

Only 13 stations were still active when sampled for the seventh time on 24 June 1992. Six of those 13 stations had become entirely snow-free between 22 and 24 June. Snow-free sites had increased to 46% (54) of the sample sites, while 49% (57) had snow depths of ≤5 cm. Snow depths at all 117 sample sites had decreased from 22 to 24 June as had the average snow depths at the 13 active stations. Eight of the 13 stations had snow depths that averaged ≤10 cm; snow depths at 3 stations averaged >10 to ≤30 cm; and snow depths at the remaining 2 stations averaged >30 to ≤60 cm. Minimum snow depth at the 7 stations where snow persisted averaged 7.8 ± 2.90 cm (X ± SD) and the maximum averaged 43.6 ± 4.28 cm (X ± SD). The overall range in snow depths where snow persisted at sample sites had been reduced to 2 to 50 cm, a 30% decrease in the maximum snow depth from 22 June and a 36% decrease from 29 May.

On 27 June 1992 the 2 remaining active stations were sampled for the eighth and final time. One station still averaged 28.9 ± 5.32 cm (X ± SD) and the other 13.3 ± 4.50 cm (X ± SD) when terminated on 27 June. Final snow depths at the 18 individual sample sites ranged from 9 to 35 cm.

Thirteen of the 30 stations on the 7.5-km snow/ice course became entirely snow-free and were terminated by 22 June 1992 (App. 5). Four other stations with snow cover still present were also closed out on 22 June, each averaged <10 cm in snow depth. Those stations were terminated because I judged that both snowmobile and foot travel would have soon become exceedingly difficult. Most importantly, it appeared that the caribou had ample snow-free range at that time, as collectively ca. 40% of the area was without snow and the melt was advancing rapidly. Eleven of the 13 remaining stations were terminated on 24 June 1992, 5 had become entirely snow-free and the other 6 were entirely snow-covered. The last two stations were terminated on 27 June 1992, both were still snow-covered.

<u>1-km Snow/ice Course</u>. Snow depths (n = 3321) were measured, or recorded as zero values, on 9 different days at all 41 stations (369 sample sites) between 27 May and 27 June 1992 (Table 13). Time intervals between samples averaged 3.9 d (± 1.86 d, SD) and ranged from 2 to 6 d. As on the 7.5-km course, snow cover on the 1-km course was highly variable both within the 9 sample site sets and among all 41 stations. Where snow cover persisted on individual sample sites, it averaged 12-16 cm and ranged from 1 to 58 cm during the 27 May-23 June period (Table 13). The mean snow depths recorded on 25 June (7.6 cm) and 27 June (11.9 cm) were markedly influenced by the closing out of stations on 21 and 23 June that still had snow cover present. The increase in mean snow depth from 25 to 27 June was caused by the last remaining snow-covered site having been originally the deepest.

When the 1-km snow/ice course was reestablished and first measured on 27 May in 1992, none of the sample stations was completely snow-free (Table 13). Twenty-four (6%) of the 369 sample sites were snow-free; 61 (16%) of the sites had ≤1 cm of fresh snow cover (23 of them were recorded as "traces", <1cm of snow cover); 101 (27%) of the sites had ≤3 cm of fresh snow cover; and 117 (32%) had ≤5 cm of mainly fresh snow cover. The snow cover averaged ≤10 cm in depth at 21 of the 41 sample stations, >10 to ≤30 cm at 16, and >30 to ≤60 cm at only 4 of the stations on 27 May 1992. Minimum average snow depth at a station on 27 May was only 0.3 ± 0.50 cm (X ± SD) and the maximum average was 50.2 ± 3.56 cm (X ± SD). The overall depth of the snow cover ranged from a "trace" (<1 cm) to 58 cm on sample sites where snow cover persisted (n = 345).

The maximum snow depth was markedly less (25-26 cm) in 1992 than when first measured at about the same time in 1990 (2 June, 83 cm) and 1991 (26 May, 84 cm). Caribou were foraging mostly on small (<1000 m^2) snow-free patches and also on the few moderate-sized (>1000 to <10 000 m^2) patches of snow-free ground in the vicinity of the Canadian Wildlife Service Walker River field base camp during the last week of May and the first week of June 1992. No large (>10 000 m^2) snow-free patches were found in the primary study area (between the Walker and Moses Robinson rivers from the seacoast up to 10 km inland) during the last week of May and the first week of June 1992.

A combination of blowing snow and fresh light snowfalls altered the snow cover on the 1-km course between 27 and 31 May 1992. When sampled for the second time, on 31 May 1992, snow-free sites no longer existed on the 1-km course as a result of wind action and new snowfalls. Snow depths had decreased at 159 (43%) sample sites, stayed the same at 111 (30%) sites, and increased at 99 (27%) sites from 27 to 31 May. Average snow-depths had changed between 27 and 31 May at 40 stations: 26 stations had decreased average snow depths; 14 had increased in average depth; and one remained the same. The number of sites where the snow cover was ≤5 cm in depth remained about the same as on 27 May, however, at

124 (34%) vs. 117 (32%). Fourty-four (12%) of those sites were recorded only as "trace" depths. The distribution of sample sites by snow depth class remained similar between the two sampling periods, where snow persisted. The only noticeable increase was in the >0 to ≤1 cm class, where fresh snowfall covered up previously snow-free sites. The snow cover averaged ≤10 cm in depth at 20 of the 41 stations, >10 to ≤30 cm at 17, and >30 to ≤60 cm at only 4 of the stations on 31 May 1992. Minimum average snow depth at a station where snow persisted on 31 May was 1.0 ± 0.00 cm ($\bar{X}$ ± SD) (snow cover was recorded as "traces" on all 9 sites at each of 4 stations, but "traces" are given the value of 1-cm in the analysis). The maximum average snow depth was essentially the same as on 27 May at 49.9 ± 3.89 cm ($\bar{X}$ ± SD). The depth of snow cover ranged from a "trace" to 56 cm on the 369 sample sites, a decline of 2 cm from 27 May.

The 1-km course was sampled for the third time on 6 June 1992. One station was entirely snow-free and 29 (8%) sample sites were snow-free; thus, returning the proportion of snow-free sites to slightly more than the 27 May (7%) level. Average snow depths had been altered from 27 May to 6 June by a combination of wind action, sublimation, light snowfalls, and extremely limited melting. Snow depths decreased at 275 (75%) sample sites, remained the same at 57 (15%), and increased at 37 (10%) from 31 May to 6 June. The average snow depth had decreased slightly on 38 stations; increased on 2 stations; and remained the same on one from the previous sampling period on 31 May. The number of sites where the snow cover was ≤5 cm in depth had increased only slightly to 140 (38%) but the snow cover on those sites was mostly hard-packed. Thirty-five of those sites had only "traces" of snow cover present. The distribution of sample sites by snow-depth class was highly comparable to that for 27 May but with slightly weaker representation in the two deepest classes on 6 June. The downward trend in snow depth for sample sites and for the average of all 9 sites at each station was more apparent than on 31 May, though not markedly so, for most station mean values were nonsignificantly different. Multi-directional changes among the 9 sample sites at each of the 41 sample stations remained prevalent, however, at 28 of the stations. The snow cover averaged ≤10 cm in depth at 22 of the 41 stations; >10 to ≤30 cm at 16; and >30 to ≤60 cm at only 3 of the stations on 6 June 1992. Minimum average snow depth at a station where snow persisted on 6 June was 0.2 ± 0.44 cm ($\bar{X}$ ± SD) and the maximum average was essentially the same as on 27 May at 49.7 ± 2.06 cm ($\bar{X}$ ± SD). The overall depth of snow cover ranged from a "trace" to 53 cm on sample sites where snow persisted (n = 340), a decline of 5 cm from 27 May.

Frequent light snowfalls and changeable brisk winds between 6 and 10 June 1992 had altered the snow cover, resulting in increased snow depths at many stations and sites by 11 June, when the 1-km course was measured for the fourth time. Average snow depths on 11 June were greater at 22 stations than when first measured on 27 May; although highly variable among sample sites. Nineteen stations also had average snow depths on 11 June greater than on 31 May and 38 stations had greater average snow depths than they did on 6 June. The overall distribution of sample sites by snow depth classes remained generally similar to the 27 May distribution. The apposition of snow was apparent for all but 3 of the 41 stations: the one inactive, snow-free station remained so; and 2 active stations had slightly decreased average snow depths on 11 June from 6 June. Multi-directional changes among the 9 sampling sites at each of the 40 active stations remained prevalent, however, at 36 of the stations. One of the 40 active stations was entirely snow-free but snow-free sample sites had been reduced to 17 (5%). Thus, the proportion of active snow-free sample sites on 11 June was still similar to the proportion recorded on 27 May, when the 1-km course was first measured. Snow depths had declined at 153 (43%) sample sites, but had increased at 148 (41%) other sites, and remained the same at 59 (16%) sites from 6 to 11 June. Average snow depth had increased slightly on 38 of the 40 stations from the previous sampling period on 6 June and decreased at the other two. The number of active sites where the snow cover was ≤5 cm in depth had decreased somewhat to 114 (32%) and the snow cover on those sites varied from fresh to well-packed, depending on the previous wind action during the last several days. Traces of snow cover were recorded at only 6 of those 114 sites. The snow cover averaged ≤10 cm in depth at 19 of the 40 stations; >10 to ≤30 cm at 17; and >30 to ≤60 cm at only 4 of the stations on 11 June 1992. Minimum average snow depth at a station where snow persisted on 11 June was only 0.7 ± 0.71 cm (X ± SD) and the maximum average was slightly increased, but nonsignificantly so, from previous maximums at 51.4 ± 2.46 cm (X ± SD). The overall depth of snow cover ranged from a "trace" to 56 cm on sample sites where snow persisted (n = 343), a decline of only 2 cm from 27 May.

Frequent light snowfalls and brisk, changeable winds continued between 11 and 14 June 1992 and by 15 June, when the 1-km course was sampled for the 5th time, the snow cover had been markedly altered from 11 June. Average snow depths at 21 of the 39 active stations were still greater on 15 June than when first measured on 27 May 1992, while average snow depths had decreased from 27 May to 15 June at 17 other stations, and remained the same at 1 station. Changes in the snow cover between the current (15 Jun) and previous (11 Jun) sampling periods were prevalent with average snow depths increasing at 19 of the stations, but also decreasing at 19 other stations, and remaining the same at 1 station. Changes in the snow cover between 11 and 15 June were still strongly multi-directional with snow depths increasing on 47% (165), decreasing on 34% (121), and remaining the same on 19% (65) of the 351 active sample sites. The number of snow-free sites had increased by 5 to 24. The number of sample sites where the snow depth was ≤5 cm remained similar on a proportional basis between 11 (n = 114, 32%) and 15 (n = 104, 30%) June. Average overall snow depths at the 39 active stations changed little, however, between 11 and 15 June: 17 of the stations had snow depths that averaged ≤10 cm, 18 stations were in the >10 to ≤30 cm range, and 4 remained in the >30 to ≤60 cm class. The minimum average snow depth at a station where snow persisted on 15 June was 0.2 ± 0.67 cm (X ± SD) and the maximum average was 51.3 ± 3.04 cm (X ± SD). The overall depth of snow ranged from 1 to 57 cm, only 1 cm less than the 27 May maximum snow depth.

The deterioration of the snowpack began to excelerate noticeably from 19 June onward. By 21 June 1992, when the 1-km course was sampled for the 6th time, average snow depths at all 39 active sample stations had been essentially unidirectional, decreasing from the previous sampling period (15 Jun). Only one of those stations still had an average snow depth that was greater than when first measured on 27 May. Between 15 and 21 June, snow depths had decreased at 85% (298) of the sample sites, remained the same at 9% (33), and increased at only 6% (20). The number of snow-free sites had increased significantly to 133 (all 9 sites at 14 stations were completely snow-free). The number of sites where the snow depth was ≤5 cm had increased markedly on 21 June to 162 (46%) vs. 104 (30%) on 15 June. Average overall snow depth at the 39 active stations shifted downward between 15 and 21 June: 22 of the stations had snow depths that averaged ≤10 cm, 15 stations remained in the >10 to ≤30 cm range, and only 2 stations remained in the >30 to ≤60 cm class. The minimum average snow depth at a station where snow persisted on 21 June was 1.8 ± 1.64 cm (X ± SD) and the maximum averaged 42.9 ± 1.90 cm (X ± SD). The overall depth of snow ranged from 1 to 45 cm, a 21% decrease in the maximum depth from 15 June and 22% from 27 May.

By 23 June 1992, when the 1-km course was sampled for the 7th time, the snow pack was well into an advanced state of deterioration. Only 19 sample stations were still active. The average snow depth at each of those 19 stations had decreased from the previous sampling period (21 Jun). Snow depths at all but one of the 171 active sample sites had also decreased from 21 to 23 June. Only 7 of the active sites were snow-free and the number of sites with ≤5 cm was reduced to 29 (17%). On a proportional basis, the 8 stations with average snow depths of ≤10 cm represented a relative decline from 21 to 23 June, the 10 stations averaging >10 to ≤30 cm an increase, and the 1 station in the >30 to ≤60 cm class a decline. Minimum average snow depth at a station where snow persisted on 23 June was 2.1 ± 2.32 cm (X ± SD) and the maximum averaged 34.3 ± 2.74 cm (X ± SD). The overall depth of snow ranged from 2 to 39 cm, a 13% decline in the maximum from 21 June and 33% from 27 May.

By 25 June 1992, when the 1-km ice course was sampled for the 8th time, only 11 stations were still active. Average snow depths at all of those 11 stations and the 99 individual snow depths at all of the active sample sites had decreased markedly from 23 June. Forty percent of the 99 active sites were snow-free (including all 9 sites at each of 4 stations). The number of sites where the snow depth was ≤5 cm on 25 June (n = 70, 78%) was markedly greater than on 23 June (17%). Average overall snow depth at the 11 active stations had shifted downward between 23 and 25 June: 9 stations were at ≤10 cm; and 2 stations were at >10 to ≤30 cm. Minimum average snow depth at a station where snow persisted on 25 June was 1.1 ± 1.05 cm (X ± SD) and the maximum was 19.1 ± 2.26 cm (X ± SD). The overall depth of snow ranged from 1 to 22 cm, a 44% decline in the maximum from 23 June and 62% from 27 May.

Only one station was still active on 27 June 1992, when the 1-km course was sampled for the 9th and final time. It still retained snow on all of its 9 sites and had a station average depth of 11.9 ± 2.03 cm (X ± SD). Snow cover on the 9 sites ranged from 9 to 15 cm in depth, a 32% decline in the maximum from 25 June and 74% from 27 May.

Sixteen of the 41 stations on the 1-km course became entirely snow-free and were terminated by 21 June 1992 (App. 6). On 21 June, 6 additional stations were terminated: 2 were still partially snow covered (one had 4 snow-free sample sites the other 3) and 4 still had all 9 sample sites snow-covered. Eight of the remaining 19 stations were closed out on 23 June: 3 were partially snow-covered (with 1-4 snow-free sample sites); and 5 were totally snow-covered. Ten of the last 11 stations were closed out on 25 June: 4 were entirely snow-free; 2 were still partially snow-covered (1 & 3 snow-free sample sites); and 4 were totally snow-covered. The last station was totally snow-covered when closed out on 27 June.

2.2. Patterns of snow obliteration

The 1-km course transect was over 99% snow-covered when first measured on 27 May 1992 (Tables 14,15, App. 7,8). Fresh snowfalls between 27 and 29 May resulted in a dusting of snow on the entire 1-km course, however, and the 1-km transect was 100% snow-covered by 28 May and remained so until 31 May 1992. The snow cover was then reduced by sublimation to about nine-tenths of the 1-km transect by 1 June 1992. Sublimation and limited melting then occurred on 2 June and by 3 June the snow cover was further reduced to slightly under 85% of the 1-km course line.

The weather turned colder and blowing snow and fresh light snowfalls again caused a slight reduction and redistribution of snow-free patches along the 1-km transect but the overall snow cover remained at ca. 85% on 6 June. Between 7 and 10 June, strong winds, major changes in wind direction, and some fresh snowfalls caused a further reduction and continuing redistribution of the snow cover and by 11 June the snow cover had increased to almost 96% of the 1-km transect. Periods of snowfall and blowing snow continued from 12 June through 14 June, with both the new snowfall and the blowing snow on 14 June being heaviest since our arrival on 25 May 1992. The 1-km course was once again completely snowed in by 14 June, with a light covering of 1-3 cm of fresh snow on previously snow-free patches.

By mid afternoon of the 15th of June, snow cover had been reduced to about 89% by sublimation associated with strong sunshine. The surface of the snowpack was beginning to show the first signs of deterioration (wetting, settling, and a sun-glazed crust) by mid day on 17 June. The snow-covered portion of the 1-km transect had returned to about the 6 June level (85%) by afternoon of 18 June 1992 (86%).

The snowpack then entered an advance state of deterioration on 19-20 June and by 21 June 1992 the snow-covered portion of the 1-km course transect was reduced to slightly more than three-fifths. Increasing temperatures and 24-h continuous positive temperatures after 22 June until 26 June rapidly reduced the remaining snow cover to less than 10% by 27 June. The remaining remnant of snow cover (ca. 8%) lingered until 29 June, when positive 24-h temperatures returned with increased daily maximums. Finally, a prolonged period of light to moderate rain (27 mm) fell on 1 and 2 July and obliterated the remaining snow on the 1-km course line.

The snowpack was markedly less in depth in 1992 than in 1990 or 1991. Retention of snow cover along the 1-km transect was prolonged, however, in 1992. The 1-km line remained more than 90% snow-covered until 15 June in 1992 compared to 16 June in 1990 and only 7 June in 1991. More than 50% snow loss did not occur along the 1-km transect until 22-23 June in both 1992 and 1990 and it occurred more than a week earlier on 13 June in 1991. This condition pertained even though the snowpack was deepest in 1990, intermediate in 1991, and least so in 1992. Total obliteration of the snow cover along the 1-km transect did not occur until July in all 3 years: 1 July 1990, 7 July 1991, and 2 July 1992. Only in 1992 did rain accelerate the final obliteration of the snow cover.

2.3. Ground fast ice measurements

Ground fast ice occurred at 49% (35) of the 71 sample stations and at 43% (277) of the 639 sample sites in June 1992 (Tables 16,17, App. 5,6). The number of sample sites at each station where ground fast ice was found averaged 7.9 ± 1.7 (SD) and ranged from 3 to 9 sites per station. The formation of ground fast ice on the primary study area in June 1992 was less than when compared to June 1991 and greater than in June 1990 (Miller 1992, 1993).

7.5-km Snow/ice Course. Ground fast ice occurred at 43% of the 30 stations and 37% of the 270 sample sites in June 1992 (Table 16, App. 5). Seven of those 13 stations had ground fast ice at all 9 sample sites and the other 6 stations had ice present at only 3 to 8 (6 ± 2, X ± SD) of the 9 sample sites at each station. No ground fast ice was found at any of the 17 stations (153 sample sites) that became totally snow-free on or before 24 June 1992. Ground fast ice was detected by 22 June, on 24 June, and on 27 June, however, at all of the 13 stations that were closed out with snow cover still present. Ground fast ice averaged 6.0 cm (± 4.2 cm SD) and ranged from 1 to 14 cm in thickness (Table 16). Ice thickness progressed from 22 June (1.6 ± 0.6 cm, $\bar{X}$ ± SD; Range, 1-3 cm; n = 27) to 24 June (7.2 ± 4.0 cm, $\bar{X}$ ± SD; Range, 2-14 cm; n = 54) to 27 June 1992 (8.9 ± 2.1 cm, $\bar{X}$ ± SD; Range, 6-14 cm; n = 18).

1-km Snow/ice Course. The formation of ground fast ice occurred at 53.6% of the 41 stations and 48.2% of the 369 sample sites in June 1992 (Table 17, App. 6). No ground fast ice was found at any of the 16 stations (114 sample sites) that became totally snow-free on or before 21 June 1992. Only four more stations became entirely snow-free before being closed out on 25 June 1992, one of them had ground fast ice at all 9 sample sites and the other 3 had no ice present. Ground fast ice was detected from 21 June onward, however, at all of the remaining 21 stations and 89% of the remaining 189 sample sites. Ground fast ice averaged 3.2 cm (± 2.2 cm SD) and ranged from 1 to 11 cm in thickness (Table 17). Ice thickness progressed from 21 June (1.7 ± 0.6 cm, $\bar{X}$ ± SD; Range, 1-3 cm; n

= 41) to 23 June (2.6 ± 1.6 cm, $\bar{X}$ ± SD; Range, 1-10 cm; n = 66) to 25 June (4.2 ± 1.8 cm, X ± SD; Range, 1-9 cm; n = 62) to 27 June (8.4 ± 2.1 cm, X ± SD; Range, 5-11 cm; n = 9).

2.4. On-site weather data

Mean daily temperatures at the CWS camp remained continually below 0°C from 27 May to 20 June 1992 (App. 9). From 21 June 1992 onward, mean daily temperatures remained positive, but relatively low, compared to the same time period in June 1990, and were not significantly lower than the same period in June 1991. As June 1992 progressed, the season remained cool, with minimum daily temperatures remaining at or below 0°C until 28 June, with 3 exceptions between 23-25 June (App. 9). Most importantly, maximum daily temperatures, even though positive, usually remained low throughout June (App. 9: range -6.2 to +13.3°C; $\bar{X}$ ± SD, 1.3 ± 4.2°C). The average maximum temperature during the first 2 weeks of July 1992 (App. 9) was similar to that during the same time period in 1991 but was relatively cool compared to the same time period in July 1990.

Snowfall was recorded on 15 days and blowing snow on 6 of those days between 26 May and 15 June 1992; only "trace" amounts of snow fell on 12 days, and >1 cm of snow on 3 days (total 3.7 cm, 11, 12, 14 Jun). Blowing snow also occurred on 1 and 9 June, without any fresh snowfall. The first "trace" of rain fell on 26 June and relatively heavy rains totalling 30 mm fell between 1-3 July 1992. No rain subsequently fell until the end of the field season on 14-15 July, when 1 mm fell on each of those days.

The period 26-31 May 1992 was characterized by very light snowfall ("trace" amounts only) and frequent periods of blowing snow. The strongest winds (25 km · h^{-1}) were from the north and the west. Although the snow cover was less than in May 1991 or 1990, only ca. 10% of the area within sight of the CWS Walker River base camp was snow-free during this time period. Most of the snow-free patches were small (≤1000 m^2) and well-scattered. A much more open condition was reported to have prevailed on 21 April 1992, when the two remote, automatic-monitoring weather stations near the CWS camp were visited (M. Waszkiewicz, Campbell Scientific Ltd., Edmonton, pers. commun., 1992). Essentially all of the coastal area to the east of the CWS camp appeared to be snow-free up to ca. 1 km inland at that time; there were many small and moderate-sized (>1000 to ≤10 000 m^2) snow-free patches between 1-5 km inland; but the area between 5 and 10 km inland appeared to be entirely snow-covered.

There were noticeable changes in the on-site weather conditions during the first week of June 1992. Although screen temperatures were well below 0°C and there were some periods of blowing snow, 1 June was the first day that the sun caused icing around the edges of snow-free patches. Also, on 1 June, sublimation removed the fresh snow cover from the sites where only a dusting (± 1 cm) of snow cover had existed. A maximum screen temperature of 2°C was reached on 2 June and was associated with the first noticeable melting of the snow cover. Surface areas at the edges of dark snow-free sites were wet to 1-2 cm deep. Daily screen temperatures then fell back below 0°C. By 4 June, however, it appeared that 30-40% of the area near the CWS camp between 3 and 4 km inland was snow-free. The weather then deteriorated between 5-7 June, with some periods of snow flurries, snow pellets, and blowing snow.

The second week of June 1992 was also characterized by periods of changeable strong winds, blowing snow, and very light snowfalls (ca. 4 cm). The weather remained cool and cloudy. Even though screen temperatures remained below 0°C throughout 7-14 June, except on 12 June (when 0700 h and 1900 h maximum readings were 0°C and +1°C, respectively), some slight melting did occur and removal of snow by sublimation was appreciable. On 7 June, the zone ca. 5-6 km inland appeared 40-50% snow-free, but by 10 June the area was again mostly snow-covered, due to blowing snow out of the northeast. Strong winds (45-50 $km \cdot h^{-1}$) caused frequent periods of heavy blowing snow on 9 and 10 June. Periods of snow mixed with freezing rain occurred on 11 June and covered essentially all snow-free patches with snow and glaze ice. Then, on 12 June, warming temperatures removed the dusting of snow and glaze ice from the previously snow-free sites. Snow-free patches then varied from essentially none over large areas to 40% in other areas. Most of the areas with the greatest amounts of snow-free patches appeared to occur within a belt running parallel to the coast line and 2-6 km inland, mainly at 3-5 km. Some areas within 2 km of the seacoast had a high number of mostly small-sized snow-free patches, while other areas on the coast had very few snow-free patches. There still were no large (>10 000 m^2) snow-free patches in the primary study area. On 14 June, winter-like weather returned with 2 cm of snow and the heaviest blowing snow to date (the camp was completely drifted in). The area surrounding camp was reduced to <10% snow-free small patches, and all of those patches had a very thin (± 1 cm) dusting of snow on them.

The third week of June 1992 began with unstable conditions and cool weather. The blowing snow continued on the 15th of June and the countryside appeared extremely whitish, although the dark substrate could still be seen through the dusting of snow on the previously snow-free sites. These conditions were proceeded by the first substantial warming trend of the season beginning on 17 June, with markedly increased melting and sublimation of the snow cover. The 17th of June was the first day that the surface of the snowpack took on an obvious glazed and settled appearance, even though screen temperatures remained well below -1°C. There had been, however, periods of strong to partial sunlight during much of 16 and 17 June, well-punctuated with low overcast and fog banks. The surface of the snow had taken on a wet and settled deteriorated appearance by 18 June. That deterioration accelerated markedly between 18 and 21 June, with increasing temperatures and greater durations of strong sunlight.

The last 9 days of June were a period of rapid deterioration of the snowpack under steadily warming temperatures (although seasonally low) and moderate to weak winds. We had standing meltwater on the south end of the camp pond on 21 June and by 22 June the south end of the pond was ice-free. Ground fast ice around the camp had reached only 5-6 cm in thickness, about one-third as thick as in 1991 at the same time of the year. Although most (80-90%) of the lowlands surrounding the camp were snow-free by 27 June 1992, much of the high ground 10-20 km to the west of the camp was still 50-60% snow-covered and some of the highest areas were still 80-90% snow-covered. Most areas within sight of the camp were 70-80% snow-free by 30 June 1992. The heavy rains of 1 and 2 July 1992 removed essentially all of the snow off in the vicinity of the camp (and on both snow/ice courses). The camp pond was mostly open on 4 July, but ice still remained on about one-fourth of the bottom and a nearly equal amount was floating in the pond on 5 July. The camp pond was almost devoid of bottom ice and all surface ice was gone on 7 July. The pond was totally ice-free on 9 July 1992.

Heavy rains on 1 and 2 July 1992 obliterated the remaining snow cover, but the growth of vegetation seemed relatively slow compared to 1991 and similar to 1990 (the deepest snow-year from 1990-92). The remainder of the first 2 weeks of July 1992 were seasonally cool but dry until 14 July, when we again experienced periods of snow and rain.

2.5. Off-site weather data

Mean monthly daily temperature during winter 1991-92 (Sep-May) tended to be lower during September 1991-January 1992 at Mould Bay than at Resolute Bay; whereas, the reverse was true for February through May 1992 (Table 18). Mean monthly daily temperatures at Mould Bay were below long-term monthly averages in July and August 1991 and January and May 1992; and above the long-term average values in February and March 1992 (based on 30-yr (1951-80) monthly mean values and their associated 95% confidence limits). Mean monthly daily temperatures at Resolute Bay were below long-term monthly averages in August and December 1991, and January, April, May, and June 1992; and above the long-term average values in July and September 1991 and March 1992. Maximum daily temperatures remained continually below 0°C from 19 and 11 September 1991 to 2 and 18 June 1992 at Mould Bay (257 days) and Resolute Bay (281 days), respectively.

Winter snowfall at Mould Bay in 1991-92 was average for the 30-yr monthly mean values (Table 19). Total monthly precipitation at Mould Bay during September through May did, however, exceed the 30-year monthly normals in 3 out of 9 months (Nov, Mar, and May). Most importantly, total precipitation in September and October 1991 were well below the 95% C.I. for the 30-year normal in those months at Mould Bay (as were Jan and Apr 1992). The total monthly precipitation in December 1991 and in February 1992 were within the 30-year normals for those months at Mould Bay. At Resolute Bay, total monthly precipitation was about 20% greater than the long-term average during September through May. Total monthly precipitation exceeded the 30-year normals in 5 months (Nov, Jan-Mar, May) and fell below 30-year averages in 3 months (Sep, Oct, and Apr). Total precipitation in December 1991 was within the 95% C.I. of the 30-year normal for that month at Resolute Bay.

Total annual precipitation at Mould Bay from 1 July 1991 through 30 June 1992 was comparable with the 30-year (1951-80) normal (annual mean value) of the 30-year mean: 88.9 mm (1991-92) vs. 93.1 mm ± 5.17 mm (X ± SE, 1951-80). Total annual precipitation at Resolute Bay was also essentially the same as the 30-year normal: 134.3 mm (1991-92) vs. 131.4 mm ± 5.22 mm (X ± SE, 1951-80). November 1991 and May 1992 were especially wet at Mould Bay, with 12.2 mm (Nov 1991) vs. 3.7 mm ± 0.5 mm (X ± SE, 1951-80) and 13.0 mm (May 1992) vs. 6.9 mm ± 0.9 mm (X ± SE, 1951-80), respectively . Those months at Resolute Bay were also unusually wet, with 15.8 (Nov 1991) vs. 5.7 mm ± 0.8 mm (X ± SE, 1951-80) and 22.2 mm (May 1992) vs. 8.1 mm ± 0.9 mm (X ± SE, 1951-80), respectively.

Blowing snow was recorded on 93 days between 1 September 1991 and 31 May 1992 at Mould Bay and on 76 days at Resolute Bay. Between 1 September 1991 and 31 May 1992, peak daily wind speeds equalled or exceeded 16 km · h^{-1} (range 17-82 km · h^{-1}) on 249 days (X ± SD, 27.7 ± 2.9 days per month) at Resolute Bay and 204 days (X ± SD, 22.7 ± 4.8 days per month) at Mould Bay (Table 20). The strongest wind for both weather stations occurred in October 1991 with equal or nearly equal extreme maximums occurring in January-March 1992 at Resolute Bay (Table 20).

Freezing rain occurred in September 1991 and June 1992, while the ground was snow-covered, on 8 occasions at Mould Bay and on 7 occasions at Resolute Bay (Table 21). Maximum temperatures remained below 0°C on all of those 15 occasions, except on 1, 18, and 19 September at Mould Bay (Table 21).

Much of Polar Bear pass appeared to have a heavy snow cover during our first flight there on 13 June 1992. The lake and river areas on lowlands appeared solid white. Only the extreme NW, SW, and NE ends of the pass had some limited (<10%) small patches of snow-free ground. There was, however, some pooled, free-standing meltwater areas in river beds on the NW coast of Bracebridge Inlet beyond the W end of Polar Bear Pass. While aerially searching the NEC we saw that the zone varied from 10-20% with a few 20-30% snow-free sites. Most of the NEI zone was ca. 90% or more snow-covered. Only a few major river drainages, especially the Stewart River drainage, had >10% snow-free areas occurring in small-sized patches. The NCW zone had some appreciable (20-30%) areas of snow-free ground at the south end of May Inlet. Most of the NWI zone was snow-covered, except for a few river drainages with 10-20% snow-free areas occurring in small patches.

Aerial searches on 16 June 1992 revealed that southern Bathurst Island appeared to be ca. 95% or more snow-covered with essentially 100% snow cover on the SW corner of the island. It appeared that strong winds had, however, opened up relatively large areas on the S end (60-80%) and W side (40-60%) of May Inlet (the area is largely unvegetated, however, and very few caribou were seen there). The NWI and NEI zones remained heavily snow-covered (ca. 95%, with few local exceptions).

When Alexander, Marc, Massey, and Vanier islands were first aerially searched on 17 June 1992, they appeared heavily (90-95%) snow-covered with few local exceptions. Because of that heavy snow cover, Alexander, Marc, and Massey islands seemed less attractive for calving than sections of northern Bathurst Island. Only a small section of the NE end of the north coast of Ile Vanier was relatively snow-free with 40-60% snow cover. The interior and N coast of Cameron Island were heavily snow-covered (95% or more) on 20 June. Also, some areas of 5-10% snow-free sites were seen on the SE and NE coasts of Cameron Island. The northern section of the NWI (the Stokes Range - the highest ground on Bathurst Island) was nearly 100% snow-covered on 20 June 1992, except on a few coastal sites where there were 20-40% snow-free patches.

By 21 June 1992, it was apparent, however, that the snowpack was settling in most areas and was well into decay with meltwater moving laterally through the snow cover. Large areas of the SEI and SWI were 30-50% snow-free on 22 June with all major drainages ca. 60% snow-free. The eastern section of the SC was 30-40% snow-free, while the western section of the SC remained essentially snow-covered. By 23 June, most of Bathurst Island was 30-80% snow-free, with the exception of the SW corner and the highest points of ground on the four interior search zones, particularly on the Stokes Range of the NWI. Free-standing meltwater was occurring essentially on all locations below 250 m elevation (amsl). Although snow cover remained into the first days of July 1992, essentially all areas within the BIC were open enough to support caribou by the last week of June.

2.6. Fecal pellet samples

Only seven pellet group samples were obtained on an opportunistic basis between 27 May and 7 June 1992. All of the samples were collected by snowmobile-mounted trackers following trails of caribou and locating the pellet groups in the snow. Snow-free sites hindered snowmobile travel in some directions by the end of the second week of June 1992 and essentially no snowmobile travel was feasible in the vicinity of the field base camp by the end of the third week of June.

All of the fecal samples were found within ca. 10 km of the base camp. We found no pellet groups on snow-free sites where we observed caribou foraging, even though we carried out intensive searches of those areas on foot on several occasions. Defecation appeared to be infrequent during late May and the first 2 weeks of June when forage availability was relatively restricted. It was the third week of June 1992 before caribou feces appeared as amorphous masses. Such fecal samples were not collected because it was considered that they signalled the advanced transition from the "spring pinch-period" diet to the initial summer diet, at least in terms of internal adjustment in the rumen. Our detection of amorphous fecal droppings in June 1992 was the same as in 1990 (Miller 1992) and a week later than in 1991 (Miller 1993: 2nd week).

All samples were salted and air dried in brown paper bags at the base camp. They were subsequently shipped to Edmonton and stored frozen, awaiting availability of funds for processing by the "Composition Analysis Laboratory" at Colorado State University, Fort Collins.

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Table 1. Grouped sex/age segregation counts of Peary caribou, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992

Date (month/day)	Sex/age composition								Search effort (min)	Caribou sighted (·100 min^{-1})
	Bulls	Cows	Calves	Juv.[a] males	Juv. females	Yrl.[a] males	Yrl. females	N		
Bathurst Island										
06/13	15	45	30	17	0	16	3	126	265	47.5
06/15-06/17	71	72	60	30	14	53	32	332	823	40.3
06/20-06/25	125	151	131	42	41	43	71	604	1025	58.9
06/27-06/30	175	247	222	114	58	72	90	978	1304	75.0
07/05-07/08	190	436	409	124	86	64	119	1428	1025	139.3
Vanier, Alexander, Massey, and Marc islands[b,c]										
07/06	17	66	61	15	26	4	27	216	277	78.0
Cameron										
06/20	2	0	0	2	0	1	0	5	151	3.3
Bathurst Island plus four western satellite islands										
07/05-07/08	207	502	470	139	112	68	146	1644	1302	126.3
Helena Island[c]										
06/27	10	16	13	2	1	1	3	46	66	69.7
Sherard Osborn Island[c]										
06/27	3	3	3	7	0	1	2	19	23	82.6

[a] Juv. equals juveniles and yrl. equals yearlings.

[b] Cameron Island was searched only once on 20 June in 1992.

[c] See App. 3 for data on other search dates: Alexander, Marc, Massey, and Vanier, 17 June; Vanier, 20 June; and Helena and Sherard Osborn, 20 June, 1992.

Table 2. Frequency of occurrence of Peary caribou in 12 search zones during five periods of sampling, Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Zone[a] by sampling period (month/day)	Number of different caribou sighted	Time spent searching (min)	Frequency of occurrence caribou ($\cdot$ 100 min^{-1})
<u>06/13</u>			
NEC	52	40	130.0
NEI	17	27	63.0
SEC	-	-	-
SEI	-	-	-
SC	-	-	-
SWC	-	-	-
SWI	-	-	-
NWC	34	46	73.9
NWI	0	19	0.0
NCW	22	58	37.9
NCE	1	52	1.9
PBP	0	23	0.0
<u>06/15-17</u>			
NEC	94	140	67.1
NEI	16	51	31.4
SEC	49	141	34.8
SEI	-	-	-
SC	0	31	0.0
SWC	35	70	50.0
SWI	-	-	-
NWC	0	16	0.0
NWI	0	7	0.0
NCW	7	25	28.0
NCE	99	241	41.1
PBP	32	101	31.7

Continued

Table 2. Continued

Zone[a] by sampling period (month/day)	Number of different caribou sighted	Time spent searching (min)	Frequency of occurrence caribou (· 100 min^{-1})
<u>06/20-25</u>			
NEC	84	85	98.8
NEI	196	266	73.7
SEC	64	109	58.7
SEI	0	5	0.0
SC	3	27	11.1
SWC	39	78	50.0
SWI	14	52	26.9
NWC	48	95	50.5
NWI	4	36	11.1
NCW	51	70	72.8
NCE	78	146	53.4
PBP	23	56	41.1
<u>06/27-30</u>			
NEC	69	83	83.1
NEI	307	297	103.7
SEC	56	109	51.4
SEI	6	76	7.9
SC	12	46	26.1
SWC	62	95	65.3
SWI	4	46	8.7
NWC	80	122	65.6
NWI	84	123	68.3
NCW	100	91	109.9
NCE	151	162	93.2
PBP	47	54	83.9

Continued

Table 2. Continued

Zone[a] by sampling period (month/day)	Number of different caribou sighted	Time spent searching (min)	Frequency of occurrence caribou ($\prod \text{min}^{-1}$)
<u>07/05-08</u>			
NEC	114	59	193.2
NEI	230	142	162.0
SEC	59	98	60.2
SEI	0	40	0.0
SC	16	45	35.6
SWC	47	103	45.6
SWI	4	37	10.8
NWC	102	71	143.7
NWI	9	54	16.7
NCW	261	117	223.1
NCE	564	223	252.9
PBP	22	36	61.1

[a] Search zones equal (1) northeast coast (NEC), (2) northeast interior (NEI), (3) southeast coast (SEC), (4) southeast interior (SEI), (5) south coast (SC), (6) southwest coast (SWC), (7) southwest interior (SWI), (8) northwest coast (NWC), (9) northwest interior (NWI), (10) north coast, western section (NCW), (11) north coast, eastern section (NCE), and (12) Polar Bear Pass (PBP).

Table 3. Frequency of occurrence of Peary caribou by major land divisions during five sampling periods, Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Major divisions by sampling period (month/day)	Number of different caribou sighted	Time spent searching (min)	Frequency of occurrence caribou (· 100 min^{-1})
06/13			
Coastal vs.	109	219	49.8
interior	17	46	37.0
North vs.	126	265	47.5
south	-	-	-
East vs.	70	131	53.4
west	56	134	41.8
06/15-06/17			
Coastal vs.	316	765	41.3
interior	16	58	27.6
North vs.	216	540	40.0
south	116	283	41.0
East vs.	258	640	40.3
west	74	183	40.4
06/20-06/25			
Coastal vs.	390	666	58.6
interior	214	359	59.6
North vs.	466	729	63.9
south	138	296	46.6
East vs.	429	653	65.7
west	175	372	47.0
06/27-06/30			
Coastal vs.	577	762	75.7
interior	401	542	74.0

Continued

Table 3. Continued

Major divisions by sampling period (month/day)	Number of different caribou sighted	Time spent searching (min)	Frequency of occurrence caribou (· 100 min^{-1})
<u>06/27-06/30</u> (continued)			
North vs.	811	907	89.4
south	167	397	42.1
East vs.	619	777	79.7
west	359	527	68.1
<u>07/05-07/08</u>			
Coastal vs.	1185	752	157.6
interior	243	273	89.0
North vs.	1287	685	187.9
south	141	340	41.5
East vs.	986	603	163.5
west	442	422	104.7

Table 4. Frequency of occurrence of Peary caribou on the five western major satellite islands of Vanier, Cameron, Alexander, Massey, and Marc during three sampling periods, and the two northern major satellite islands of Helena and Sherard Osborn during two sampling periods, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Island by sampling period (month/day)	Number of different caribou sighted	Time spent searching (min)	Frequency of occurrence caribou (· 100 min^{-1})
06/17			
Vanier	17	72	23.6
Alexander	44	90	48.9
Massey	22	107	20.6
Marc	14	10	140.0
06/20			
Cameron	5	151	3.3
07/06			
Vanier	18	89	20.2
Alexander	92	98	93.9
Massey	101	82	123.2
Marc	5	8	62.5
06/20			
Helena	22	38	57.9
Sherard Osborn	11	20	55.0
06/27			
Helena	46	66	69.7
Sherard Osborn	19	23	82.6

Table 5. Variation in sex/age counts, based on grouped samples[a] of individual Peary caribou (1+ yr-old), Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, 13 June-8 July 1992, data obtained by nonsystematic helicopter searches

Sex/age classes	Sample periods (N)	statistics (%)			
		Mean	± SD	95% CI	Range
Bathurst Island					
Bulls	5	22	5	17-27	16-26
Cows	5	36	8	26-46	26-46
Juvenile/yearlings	5	42	4	37-49	38-47
Four western major satellite islands[b]					
Bulls	2	16	8	0-40	11-22
Cows	2	38	7	16-50	32-43
Juvenile/yearlings	2	46	1	44-48	45-46

[a] Sample sizes of number of individuals involved by each grouped sample are given in Table 1.

[b] Cameron Island was searched only once in 1992 and is not used in this analysis.

Table 6. Approximation of sex/age composition of "precalving" and "postcalving" populations of Peary caribou within the Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, based on a grouped sample of segregation counts made between 5-8 July 1992, data obtained by nonsystematic helicopter searches

		% sex/age composition			
Search area	N	Bulls	Cows	Calves	Juvenile/ Yearlings
Precalving					
Bathurst Island	1019	18.6	42.8	-	38.6
Four[a] western major satellite islands	155	11.0	42.6	-	46.4
Bathurst island complex	1174	17.6	42.8	-	39.6
Postcalving					
Bathurst Island	1428	13.3	30.5	28.6	27.5
Five western major satellite islands	216	7.9	30.6	28.2	33.3
Bathurst island complex	1644	12.6	30.5	28.6	28.3

[a] Cameron Island only was searched on 20 June 1992, and the 5 male caribou seen there were not used in this analysis.

Table 7. Group statistics by search period for Peary caribou, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Search period (month/day)	Group type	Group statistics				
		N	Mean	± SD	Range	95% CI
06/13	Male-only groups	10	4.0	2.7	2-11	2.1-5.9
	All mixed sex/age groups	20	4.2	2.8	2-10	2.9-5.4
	Mixed sex/age groups with calves					
	calves included	17	4.4	2.9	2-10	2.8-5.9
	calves excluded	17	2.6	2.1	1- 8	1.5-3.6
	Mixed sex/age groups without calves	3	3.0	1.0	2- 4	0.5-5.5
	solitary individuals	3				
06/15-06/17	Male-only groups	43	3.7	2.2	2- 9	3.1-4.4
	All mixed sex/age groups	62	4.0	2.5	2-15	3.3-4.6
	Mixed sex/age groups with calves					
	calves included	47	4.0	2.5	2-15	3.3-4.8
	calves excluded	47	2.3	1.6	1- 8	1.9-2.8
	Mixed sex/age groups without calves	15	3.7	2.2	2- 9	2.4-4.9
	Solitary individuals	24				

Continued

Table 7. Continued

Search period (month/day)	Group type	Group statistics				
		N	Mean	± SD	Range	95% CI
06/20-06/25	Male-only groups	61	3.3	1.7	2- 9	2.9-3.8
	All mixed sex/age groups	103	4.0	2.3	2-13	3.5-4.4
	Mixed sex/age groups with calves					
	calves included	73	4.5	2.5	2-13	3.9-5.0
	calves excluded	73	2.6	1.7	1- 8	2.2-3.0
	Mixed sex/age groups without calves	30	2.9	1.1	2- 6	2.4-3.3
	Solitary individuals	31				
06/27-06/30	Male-only groups	95	3.3	1.4	2- 7	3.0-3.6
	All mixed sex/age groups	143	4.7	2.3	2-13	4.3-5.1
	Mixed sex/age groups with calves					
	calves included	115	5.1	2.4	2-13	4.6-5.5
	calves excluded	115	3.0	1.6	1- 8	2.7-3.3
	Mixed sex/age groups without calves	28	3.2	1.2	2- 7	2.8-3.7
	Solitary individuals	54				

Continued

Table 7. Continued

Search period (month/day)	Group type	Group statistics				
		N	Mean	± SD	Range	95% CI
07/05-07/08	Male-only groups	96	3.8	2.1	2-11	3.4-4.2
	All mixed sex/age groups	181	6.9	4.5	2-27	6.2-7.5
	Mixed sex/age groups with calves					
	calves included	162	7.3	4.6	2-27	6.6-8.0
	calves excluded	162	4.4	2.8	1-15	4.0-4.8
	Mixed sex/age groups without calves	19	2.9	1.0	2- 6	2.5-3.4
	Solitary individuals	38				

Table 8. Group statistics for Peary caribou seen during all search periods, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, 13 June to 8 July 1992, data obtained by nonsystematic helicopter searches

		Group statistics				
Island	Group type	N	Mean	± SD	Range	95% CI
Bathurst	Male-only groups	274	3.5	1.8	2-11	3.3- 3.8
	All mixed sex/age groups	457	5.2	3.5	2-27	4.8- 5.5
	Mixed sex/age groups with calves					
	calves included	368	5.6	3.7	2-27	5.3- 6.0
	calves excluded	368	3.3	2.3	1-15	3.1- 3.6
	Mixed sex/age groups without calves	89	3.2	1.4	2- 9	2.9- 3.4
	Solitary individuals	137				
Alexander	Male-only groups	7	4.1	3.1	2- 9	1.3- 7.0
	All mixed sex/age groups	14	7.4	4.8	2-16	4.6-10.1
	Mixed sex/age groups with calves					
	calves included	13	7.8	4.7	2-16	4.9-10.6
	calves excluded	13	5.0	3.2	1-12	3.1-6.9
	Mixed sex/age groups without calves	1	2.0	0.0	2- 2	2.0- 2.0
	Solitary individuals	4				

Continued

Table 8. Continued

		Group statistics				
Island	Group type	N	Mean	± SD	Range	95% CI
Marc	Male-only groups	3	5.0	3.5	3- 9	(-)3.6-13.6
	All mixed sex/age groups	2	2.0	0.0	2- 2	2.0- 2.0
	Mixed sex/age groups with calves					
	calves included	2	2.0	0.0	2- 2	2.0- 2.0
	calves excluded	2	1.0	0.0	1- 1	1.0- 1.0
	Mixed sex/age groups without calves	0				
	Solitary individuals	0				
Massey	Male-only groups	1	4.0	-	4- 4	4.0- 4.0
	All mixed sex/age groups	20	5.8	3.8	2-16	4.1- 7.6
	Mixed sex/age groups with calves					
	calves included	18	6.2	3.8	2-16	4.3- 8.1
	calves excluded	18	4.0	2.6	1-12	2.7- 5.3
	Mixed sex/age groups without calves	2	2.5	0.7	2- 3	(-)3.8- 8.8
	Solitary individuals	2				

Continued

Table 8. Continued

Island	Group type	N	Mean	± SD	Range	95% CI
		Group statistics				
Vanier	Male-only groups	9	2.6	1.7	2- 7	1.3- 3.8
	All mixed sex/age groups	4	3.3	1.0	2- 4	1.7- 4.8
	Mixed sex/age groups with calves					
	calves included	2	4.0	0.0	4- 7	4.0- 4.0
	calves excluded	2	2.5	0.7	2- 3	(-)3.8- 8.8
	Mixed sex/age groups without calves	2	2.5	0.7	2- 3	(-)3.8- 8.8
	Solitary individuals	1				
Cameron	Male-only groups	2	2.5	0.7	2- 3	(-)3.8- 8.8
	All mixed sex/age groups	0				
	Mixed sex/age groups with calves					
	calves included	0				
	calves excluded	0				
	Mixed sex/age groups without calves	0				
	Solitary individuals	0				

Continued

Table 8. Continued

Island	Group type	Group statistics				
		N	Mean	± SD	Range	95% CI
Helena	Male-only	5	3.8	1.3	2- 5	2.2- 5.4
	All mixed sex/age groups	8	5.5	3.4	2-11	2.7- 8.3
	Mixed sex/age groups with calves					
	calves included	8	5.5	3.4	2-11	2.7- 8.3
	calves excluded	8	3.4	2.7	1- 7	1.6- 5.1
	Mixed sex/age groups without calves	0				
	Solitary individuals	5				
Sherard Osborn	Male-only groups	4	4.0	3.4	2- 9	(-)1.4- 9.4
	All mixed sex/age groups	4	3.3	1.0	2- 4	1.7- 4.8
	Mixed sex/age groups with calves					
	calves included	3	3.3	1.2	2- 4	0.5- 6.2
	calves excluded	3	2.0	1.0	1- 3	(-)0.5- 4.5
	Mixed sex/age groups without calves	1	3.0	0.0	3- 3	3.0- 3.0
	Solitary inidividuals	1				

Table 9. Percent "breeding cows", percent "1+ yr-old females", and associated chronology of "calf:female ratios" for Peary caribou, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Date (month/day)	N[a]	Females as % of N: Breeding cows	Females as % of N: 1+ yr-old females	Calves:100 breeding cows	Calves:100 1+ yr-old females
Bathurst Island					
06/13	96	46.9	50.0	66.7	62.5
06/15-06/17	272	26.5	43.4	83.3	50.8
06/20-06/25	473	31.9	55.6	86.8	49.8
06/27-06/30	756	32.7	52.2	89.9	56.2
07/05-07/08	1019	42.8	62.9	93.8	63.8
Vanier, Alexander, Massey, and Marc islands[bc]					
06/17	77	32.5	42.8	80.0	60.6
Vanier, Alexander, Massey, and Marc islands[bc]					
07/06	155	42.6	76.8	92.4	51.3
Bathurst Island sample, plus four western major satellite islands					
07/05-08	1174	42.8	64.7	93.6	61.8
Helena Island					
06/20	18	4/18[d]	9/18	4/4	4/9
06/27	33	48.5	60.6	13/16	13/20
Sherard Osborn Island					
06/20	10	1/10	1/10	1/1	1/1
06/27	16	3/16	5/16	3/3	3/5

[a] Equals number of 1+ yr-old animals only.

[b] Only Vanier, Alexander, Massey, and Marc islands among the five major western satellite islands were aerially searched a second time in 1992.

[c] Cameron Island only was searched on 20 June 1992, and the 5 male caribou seen there were not used in this analysis.

[d] When n is <26, the value is presented as a fraction to allow the reader to make a better evaluation of the percentage contribution.

Table 10. Chronology of observed and "adjusted" proportions of newborn calves among all Peary caribou, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Date (month/day)	N	% calves	Adjusted[a] N	Adjusted % calves
Bathurst Island				
06/13	126	23.8	104.2	28.8
06/15-06/17	332	18.1	243.4	24.6
06/20-06/25	604	21.7	537.5	24.4
06/27-06/30	978	22.7	832.5	26.7
07/05-07/08	1428	28.6	1399.7	29.2
Vanier, Cameron, Alexander, Massey, and Marc islands				
06/17-06/20	102	19.6	71.0	28.2
Vanier, Alexander, Massey, and Marc islands[b]				
07/06	216	28.2	244.9	24.9
Bathurst Island plus four western major satellite islands[c]				
07/05-07/08	1644	28.5	1644.0	28.6

[a] Adjusted by assuming that the 64.7% 1+ yr-old females obtained in the composite sample (Bathurst, plus the four western major satellite islands: 760/1174 = 0.647) for caribou counted on 5-8 July 1992 was the true proportion of 1+ yr-old females in the BIC.

[b] Cameron island was aerially searched on 20 June and was not searched a second time in 1992.

[c] Bathurst Island grouped sample obtained on 5, 7, and 8 July; and four western major satellite islands on 6 July 1992 (Cameron Island excluded).

Table 11. Chronology of hard antler casting by Peary caribou breeding cows, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Sampling period (month/day)	N	% that had cast both hard antlers	% that had cast one hard antler only	% with both hard antlers retained
06/13	45	86.7	4.4	8.9
06/15-06/17	97	93.8	3.1	3.1
06/20-06/25	156	97.5	0.6	1.9
06/27-06/30	266	99.6	0.4	0.0
07/05-07/08	502	99.6	0.0	0.4

Table 12. Statistics for snow depth measurements made on 7.5-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, May-June 1992

Date		Snow depth (cm)				
(month/day)	N	Mean	± SD	Minimum	Maximum	95% CI
05/29	30[a]	19.8	16.7	1.1[b]	68.4[b]	13.6-26.0
	270[c]	19.8	16.7	1.0	78.0	17.8-21.8
06/03	28	19.2	16.2	1.5	67.2	12.9-25.5
	237	20.2	16.2	1.0	78.0	18.2-22.3
06/07	29	18.6	16.4	1.3	67.0	12.2-25.0
	230	20.2	16.4	1.0	78.0	18.0-22.3
06/12	30	19.2	16.8	1.4	68.0	12.9-25.5
	261	19.7	16.7	1.0	79.0	17.7-21.8
06/19	27	21.1	17.2	1.0	67.6	14.3-27.9
	223	22.8	16.9	1.0	77.0	20.6-25.0
06/22	17	22.1	15.7	4.0	63.2	14.0-30.2
	151	22.4	15.6	1.0	72.0	19.8-24.8
06/24	7	19.8	13.8	7.8	43.6	7.0-32.6
	63	19.8	13.3	2.0	50.0	16.4-23.1
06/27	2	21.7	10.2	14.4	28.9	-69.9-113.3
	18	21.7	8.4	9.0	35.0	17.5-25.9

[a] N equals the number of different stations sampled that were not entirely snow-free and the statistics are based on the mean of the summation of the mean of all snow-covered sites in each set of 9 sites at each station.

[b] These minimal and maximal values were derived from the mean of 9 sample sites at the stations where the lowest and the highest station means were calculated on that date.

[c] N equals the total number of different sites sampled that were not entirely snow-free and the statistics for each date are based on the summation of all snow-covered sites.

Table 13. Statistics for snow depth measurements made on 1-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, May-June 1992

Date (month/day)	N	Snow depth (cm)				
		Mean	± SD	Minimum	Maximum	95% CI
05/27	41[a]	13.5	11.6	1.0[b]	50.2[b]	10.1-16.9
	345[c]	14.4	11.6	1.0	58.0	13.2-15.6
05/31	41	13.6	11.7	1.0	49.9	9.9-17.3
	369	13.6	11.9	1.0	56.0	12.3-14.8
06/06	41	12.3	11.3	1.0	49.7	8.7-15.9
	340	13.0	11.4	1.0	53.0	11.7-14.2
06/11	40	14.6	11.9	1.2	51.4	10.7-18.5
	343	14.8	11.9	1.0	56.0	13.6-16.1
06/15	39	15.3	12.0	1.5	51.3	11.4-19.2
	327	16.2	12.0	1.0	57.0	14.9-17.5
06/21	39	15.7	9.9	2.7	42.9	11.6-19.8
	218	16.1	10.0	1.0	45.0	14.8-17.4
06/23	19	14.0	8.0	3.8	34.3	10.1-17.9
	164	14.4	8.1	2.0	39.0	13.1-15.6
06/25	11	7.3	5.9	1.7	19.1	3.3-11.3
	59	7.6	6.0	1.0	22.0	6.1- 9.2
06/27	1	11.9	0.0	11.9	11.9	-
	9	11.9	2.0	9.0	15.0	10.3-13.4

Continued

Table 13. Continued

[a] N equals the number of different stations sampled that were not entirely snow-free and the statistics are based on the mean of the summation of the mean of all snow-covered sites in each set of 9 sites at each station.

[b] These minimal and maximal values were derived from the mean of 9 sample sites at the stations where the lowest and the highest station means were calculated on that date.

[c] N equals the total number of different sites sampled that were not entirely snow-free and the statistics for each date are based on the summation of all snow-covered sites.

Table 14. Obliteration of snow cover along the 1-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, May-July 1992

Date	% bare ground	Change in amount of bare ground from previous sample date (m)	Extent of remaining snow cover (m)
27 May	0.7	-	993.2
31	0.0	+ 6.8	1000.0
01 June	9.0	- 90.1	909.9
03	15.1	- 61.1	848.8
06	14.7	+ 4.3	853.1
11	4.1	-105.5	958.6
14	0.0	+ 41.4	1000.0
15	10.6	+105.9	894.1
18	13.6	- 32.7	861.4
21	37.8	-239.2	622.2
23	53.1	-153.4	468.8
25	82.2	-291.8	177.0
27	92.2	- 99.2	77.8
29	97.0	- 47.4	30.4
30	98.0	- 10.0	20.4
01 July	99.6	- 15.9	4.5
02	100.0	- 4.5	0.0

Table 15. Snow-covered ground statistics for snow obliteration along the 1-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, May-July 1992

Date	Number of snow patches	Length of snow-covered patches (m)				
		Mean	± SD	Minimum	Maximum	Median
27 May	7	141.9	231.0	0.2	628.4	8.4
01 June	46	19.8	53.0	0.2	311.8	1.4
03	41	20.7	37.3	0.2	180.7	3.5
06	44	19.4	37.0	0.1	176.3	3.2
11	21	45.6	122.0	0.2	546.6	3.0
14	1	1000.0	0.0	1000.0	1000.0	1000.0
15	33	27.1	92.9	0.2	510.0	894.1
18	29	29.7	48.8	0.2	177.2	5.8
21	40	15.6	32.7	0.2	161.5	3.0
23	34	13.8	30.0	0.1	141.2	1.9
25	28	6.3	8.5	0.2	35.2	2.3
27	20	3.9	6.4	0.2	28.9	2.2
29	4	7.6	9.8	0.3	21.6	4.2
30	4	1.1	0.7	0.2	1.7	1.3
01 July	4	1.1	0.7	0.2	1.7	1.3
02	0					

Table 16. Statistics for ice thickness measurements made on 7.5-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, June 1992

Date		Ice thickness (cm)				
(month/day)	N	Mean	± SD	Minimum	Maximum	95% CI
06/22	4[a]	1.5	0.3	1.2	2.0	1.0- 2.0
	27[b]	1.6	0.6	1.0[c]	3.0[c]	1.3- 1.8
06/24	7	6.5	4.1	2.0	11.6	2.7-10.3
	54	7.2	4.0	2.0	14.0	6.1- 8.3
06/27	2	8.9	0.5	8.6	9.2	4.4-13.4
	18	8.9	2.1	6.0	14.0	7.8- 9.9

[a] N equals the number of different stations sampled that had ground fast ice present and the statistics are based on the mean of the summation of the mean of all sites covered with ground fast ice in each set of 9 sites at each station.

[b] N equals the total number of different sites sampled that had ground fast ice present and the statistics for each date are based on the summation of all sites with ground fast ice present.

[c] These minimal and maximal values were derived from the mean of 9 or less sample sites at the stations where the lowest and the highest station means were calculated on that date.

Table 17. Statistics for ice thickness measurements made on 1-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, June 1992

Date		Ice thickness (cm)				
(month/day)	N	Mean	± SD	Minimum	Maximum	95% CI
06/21	6[a]	1.6	0.3	1.4[b]	2.1[b]	1.3- 1.9
	41[c]	1.7	0.6	1.0	3.0	1.5- 1.9
06/23	8	2.6	1.0	1.2	4.2	1.8- 3.4
	66	2.6	1.6	1.0	10.0	2.2- 3.0
06/25	7	4.2	0.8	3.0	5.3	3.5- 4.9
	62	4.2	1.8	1.0	9.0	3.7- 4.6
06/27	1	8.4	0.0	8.4	8.4	-
	9	8.4	2.1	5.0	11.0	6.8-10.1

[a] N equals the number of different stations sampled that had ground fast ice present and the statistics are based on the mean of the summation of the mean of all sites covered with ground fast ice in each set of 9 sites at each station.

[b] These mimimal and maximal values were derived from the mean of 9 of less sample sites at the stations where the lowest and the highest station means were calculated on that date.

[c] N equals the total number of different sites sampled that had ground fast ice present and the statistics for each date are based on the summation of all sites with ground fast ice present.

Table 18. Monthly statistics for air temperature (°C) at Atmospheric Environment Service weather stations, Resolute Bay, Cornwallis Island, and Mould Bay, Prince Patrick Island, Northwest Territories, June 1991-June 1992

		Daily temperatures °C				
AES[a] weather station	Month 1991-1992	Monthly mean max.	Monthly mean min.	Monthly mean aver.	Monthly extreme high	Monthly extreme low
RB[a]	Jun	2.2	- 1.3	0.5	6.1	- 5.1
MB[a]		0.9	- 2.8	- 0.9	2.8	- 7.3
RB	Jul	7.8	2.4	5.1	15.8	- 1.6
MB		5.4	0.7	3.1	13.8	- 2.2
RB	Aug	1.9	- 0.7	1.3	11.2	- 3.4
MB		2.4	- 1.3	0.6	8.4	- 5.2
RB	Sep	- 2.2	- 5.8	- 4.0	2.9	-16.5
MB		- 4.0	- 8.4	- 6.2	0.8	-19.1
RB	Oct	-13.0	-18.9	-16.0	- 3.9	-31.4
MB		-13.5	-20.7	-17.1	- 4.2	-30.6
RB	Nov	-20.8	-28.2	-24.5	-12.9	-37.6
MB		-23.1	-31.2	-27.3	- 9.7	-41.7
RB	Dec	-26.9	-33.8	-30.3	-19.0	-39.4
MB		-28.1	-35.0	-31.6	-16.0	-44.8
RB	Jan	-30.9	-37.6	-34.3	-21.5	-42.8
MB		-32.5	-37.6	-35.1	-22.5	-43.5
RB	Feb	-31.1	-37.5	-34.2	-21.5	
MB		-24.0	-32.4	-28.2	-21.7	-43.7
RB	Mar	-24.7	-30.8	-27.8	-17.7	-39.3
MB		-24.3	-36.6	-28.0	-17.2	-39.4
RB	Apr	-22.3	-28.9	-25.6	-12.8	-36.3
MB		-21.2	-28.2	-24.7	-14.8	-34.1
RB	May	-10.7	-16.9	-13.8	- 1.3	-26.2
MB		-9.2	-14.9	-12.1	0.4	-25.5
RB	Jun	- 0.2	- 5.5	- 2.9	8.7	-12.2
MB		1.7	- 3.0	- 0.7	10.1	-10.7

[a] AES equals Atmospheric Environment Service; RB equals Resolute Bay; and MB equals Mould Bay.

Table 19. Monthly statistics for precipitation at Atmospheric Environment Service weather stations, Resolute Bay, Cornwallis Island, and Mould Bay, Prince Patrick Island, Northwest Territories, June 1991-June 1992

AES[a] weather station	Month 1991-1992	Rainfall (mm)	Snowfall (cm)	Total precipitation[b] (mm)	Depth of snow on ground[c] (cm)	Days with 1.0 cm precipitation or more
RB[a]	Jun	10.4	23.4	33.6	trace	9
MB[a]		6.6	17.9	24.5	3	9
RB	Jul	14.2	6.2	20.4	0	6
MB		3.4	8.4	11.8	trace	3
RB	Aug	19.8	9.6	29.2	trace	6
MB		12.6	14.0	26.4	trace	9
RB	Sep	trace	13.6	13.0	2	7
MB		0	4.6	4.6	2	2
RB	Oct	0.2	7.8	5.1	6	2
MB		0	3.6	3.6	9	1
RB	Nov	0	15.8	15.8	6	3
MB		0	16.0	12.2	20	7
RB	Dec	0	5.8	4.8	8	2
MB		0	3.6	3.2	15	2
RB	Jan	0	4.2	4.2	9	2
MB		0	0.6	0.6	13	0
RB	Feb	0	5.0	4.7	13	1
MB		0	2.0	1.8	14	0

Continued

Table 19. Continued

AES[a] weather station	Month 1991-1992	Rainfall (mm)	Snowfall (cm)	Total precipitation[b] (mm)	Depth of snow on ground[c] (cm)	Days with 1.0 cm precipitation or more
RB	Mar	0	9.0	8.9	14	3
MB		0	9.5	7.1	20	3
RB	Apr	0	trace	trace	12	0
MB		0	0.4	trace	13	0
RB	May	trace	32.2	22.2	28	5
MB		0	18.6	13.0	20	7
RB	Jun	trace	7.4	6.0	7	2
MB		2.0	3.2	4.6	trace	2

[a] AES equals Atmospheric Environment Service; RB equals Resolute Bay; and MB equals Mould Bay.

[b] Total precipitation (mm) can be a value equal of slightly less than "total rainfall" plus "total snowfall".

[c] On last day of each month.

Table 20. Peak daily wind recorded at Atmospheric Environment Service weather stations, Resolute Bay, Cornwallis Island, and Mould Bay, Prince Patrick Island, Northwest Territories, 1 September 1991 to 31 May 1992

Month 1991-92	N[a]	Peak daily wind speeds ($km \cdot h^{-1}$)				
		Mean	± SD	± 95% CL	Maximum	Minimum
Resolute Bay						
Sep	29	35.6	11.9	4.5	67	19
Oct	28	44.7	15.9	6.1	82	24
Nov	28	38.5	16.1	6.2	70	17
Dec	29	33.9	12.4	4.7	57	17
Jan	30	36.9	15.7	5.9	82	17
Feb	29	43.7	15.0	5.7	78	19
Mar	30	40.4	15.7	5.9	76	19
Apr	25	36.4	12.3	5.0	67	19
May	21	26.1	9.4	4.3	52	17
Mould Bay						
Sep	24	29.0	12.2	5.1	63	17
Oct	20	32.5	15.1	7.0	74	17
Nov	28	40.2	11.2	4.3	65	19
Dec	27	39.2	12.1	4.8	63	20
Jan	26	33.4	11.1	4.5	57	17
Feb	19	30.8	10.7	5.1	50	19
Mar	19	31.0	10.3	4.9	59	17
Apr	14	24.0	9.6	5.5	52	17
May	27	30.8	9.5	3.8	54	17

[a] N equals number of days per month on which the peak daily wind speeds equalled or exceeded 16 $km \cdot h^{-1}$.

Table 21. Days with freezing rain in September 1991 and June 1992 at Atmospheric Environment Service weather stations, Resolute Bay, Cornwallis Island, and Mould Bay, Prince Patrick Island, Northwest Territories.

Day/ Month 1991-92	Freezing rain (mm)	Associated snowfall (cm)	Daily temperatures °C			Snow-depth on ground (cm)
			Maximum	Minimum	Mean	
Resolute Bay						
15 Sep	trace	1.0	-2.8	- 5.1	- 4.0	6
19	trace	0.0	-0.2	- 2.0	- 1.1	6
20	trace	trace	-0.4	- 1.7	- 1.1	5
04 June	trace	trace	-2.4	-10.6	- 6.5	26
07	trace	0	-6.9	-10.5	- 8.7	23
15	trace	trace	-5.5	- 8.2	- 6.9	26
18	trace	trace	-0.6	- 6.0	- 3.3	26
Mould Bay						
01 Sep	trace	0.6	0.2	- 4.7	- 2.3	3
08	trace	trace	-6.3	- 7.8	- 7.1	trace
13	trace	1.4	-3.0	- 6.2	- 4.6	trace
14	trace	trace	-3.7	- 8.9	- 6.3	1
15	trace	trace	-3.2	- 7.4	- 5.3	1
18	trace	0	0.8	- 4.4	- 1.8	1
19	trace	trace	0.0	- 4.2	- 2.1	1
04 June	trace	0.6	-2.9	- 7.6	- 5.3	17

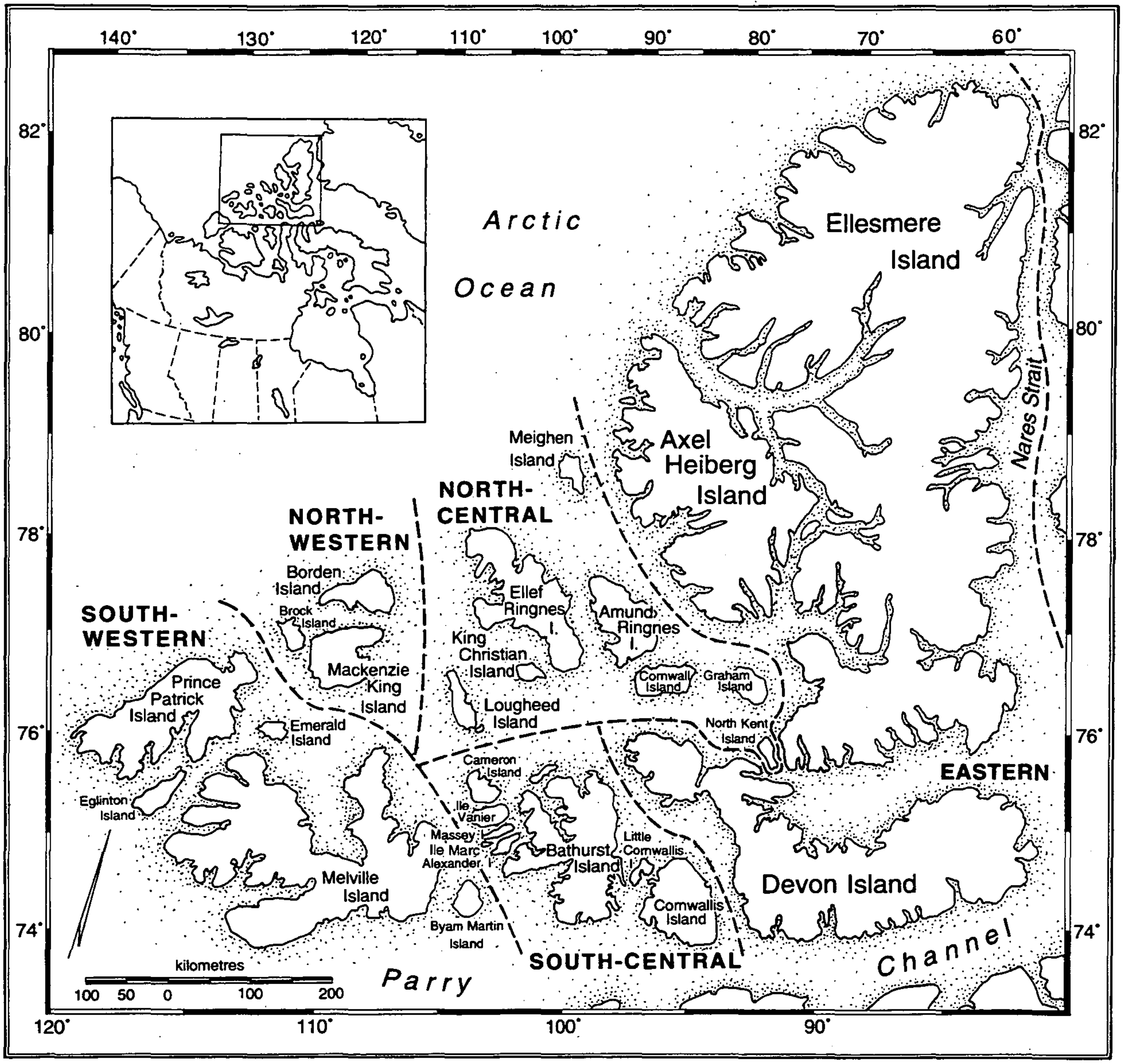

Fig. 1. Queen Elizabeth Islands of the Canadian Arctic Archipelago

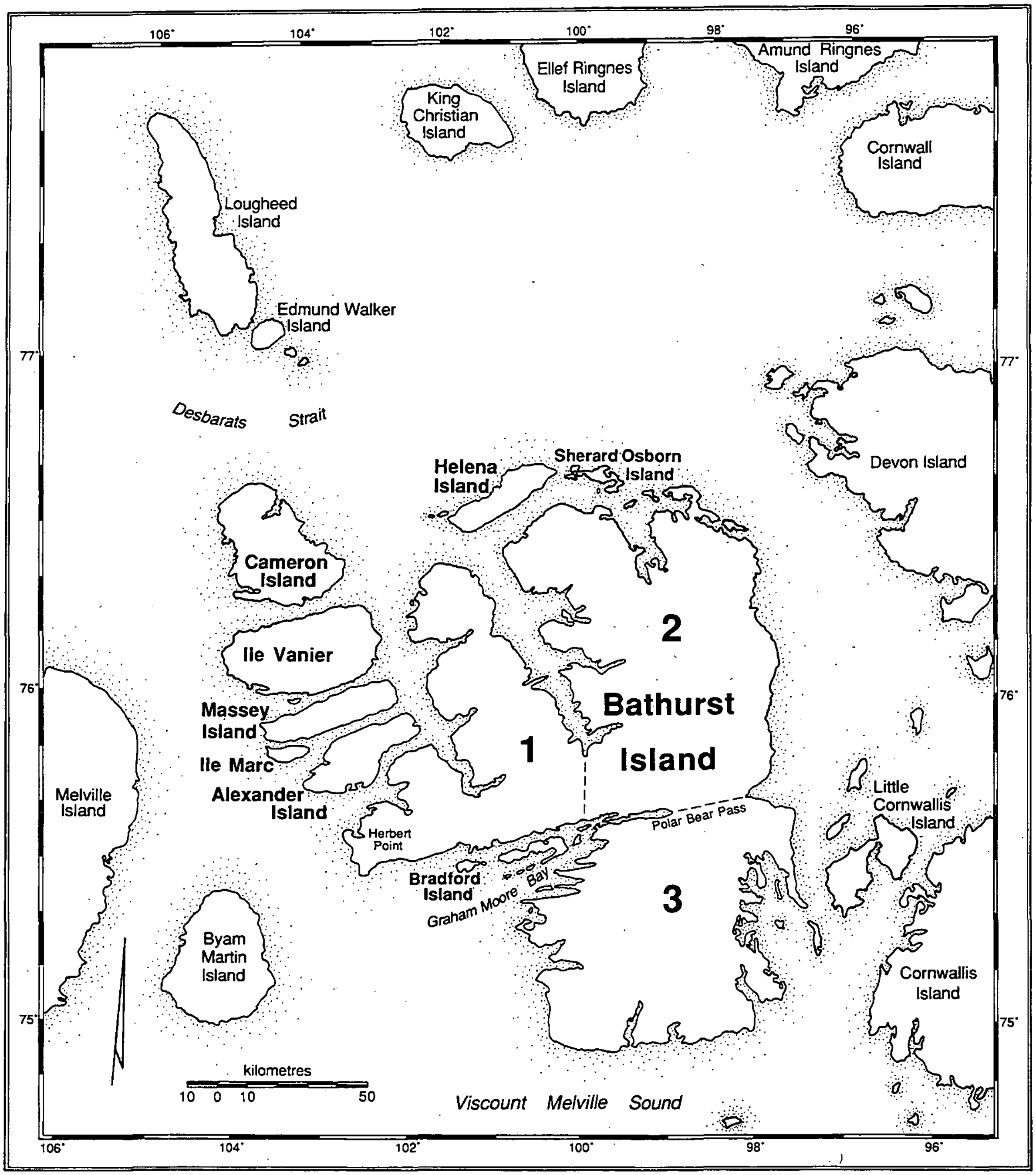

Fig. 2. Locations of nine of the 26 islands within the Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories: the principal island, Bathurst; the five western major satellite islands, Alexander, Marc, Massey, Vanier, and Cameron; the two northern major satellite islands, Helena and Sherard Osborn; and the one western secondary satellite island, Bradford

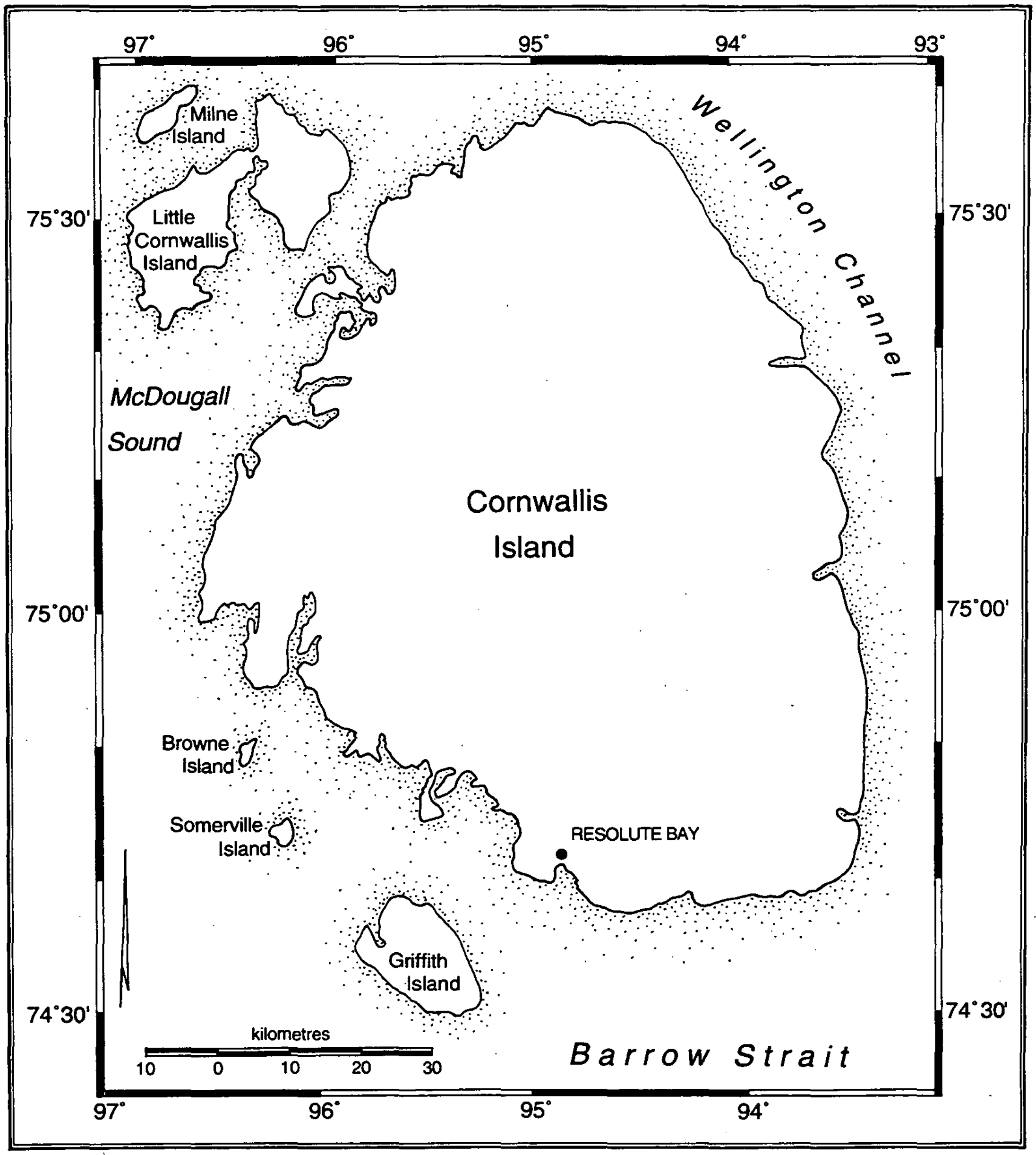

Fig. 3. Locations of two of the 26 islands within the Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories: the two eastern major satellite islands, Cornwallis and Little Cornwallis

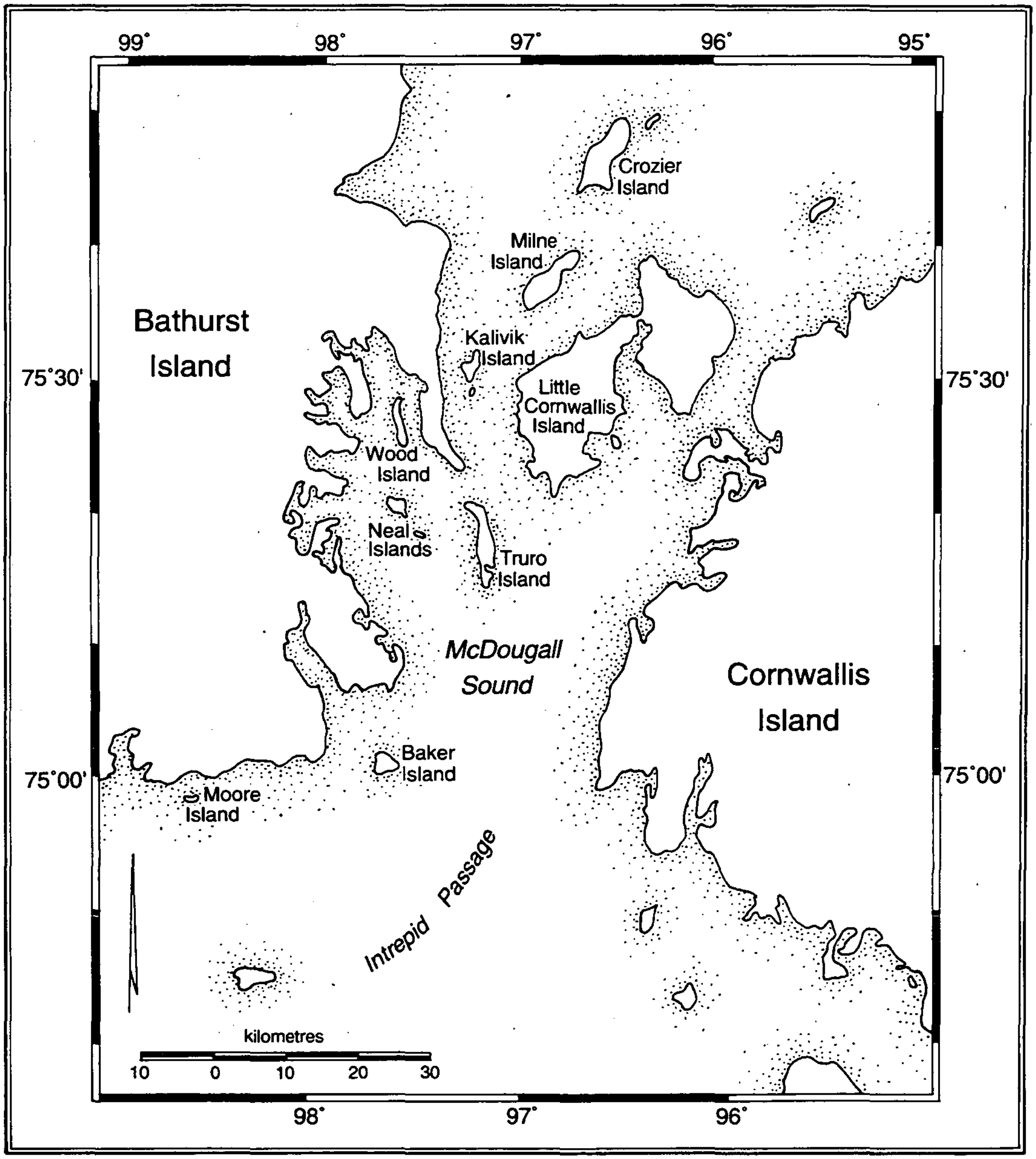

Fig. 4. Locations of eight of the 26 islands within the Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories: the six secondary satellite islands in McDougall Sound, Crozier, Kalivik, Milne, Neal, Truro, and Wood; and the two secondary satellite islands in Intrepid Passage, Baker and Moore

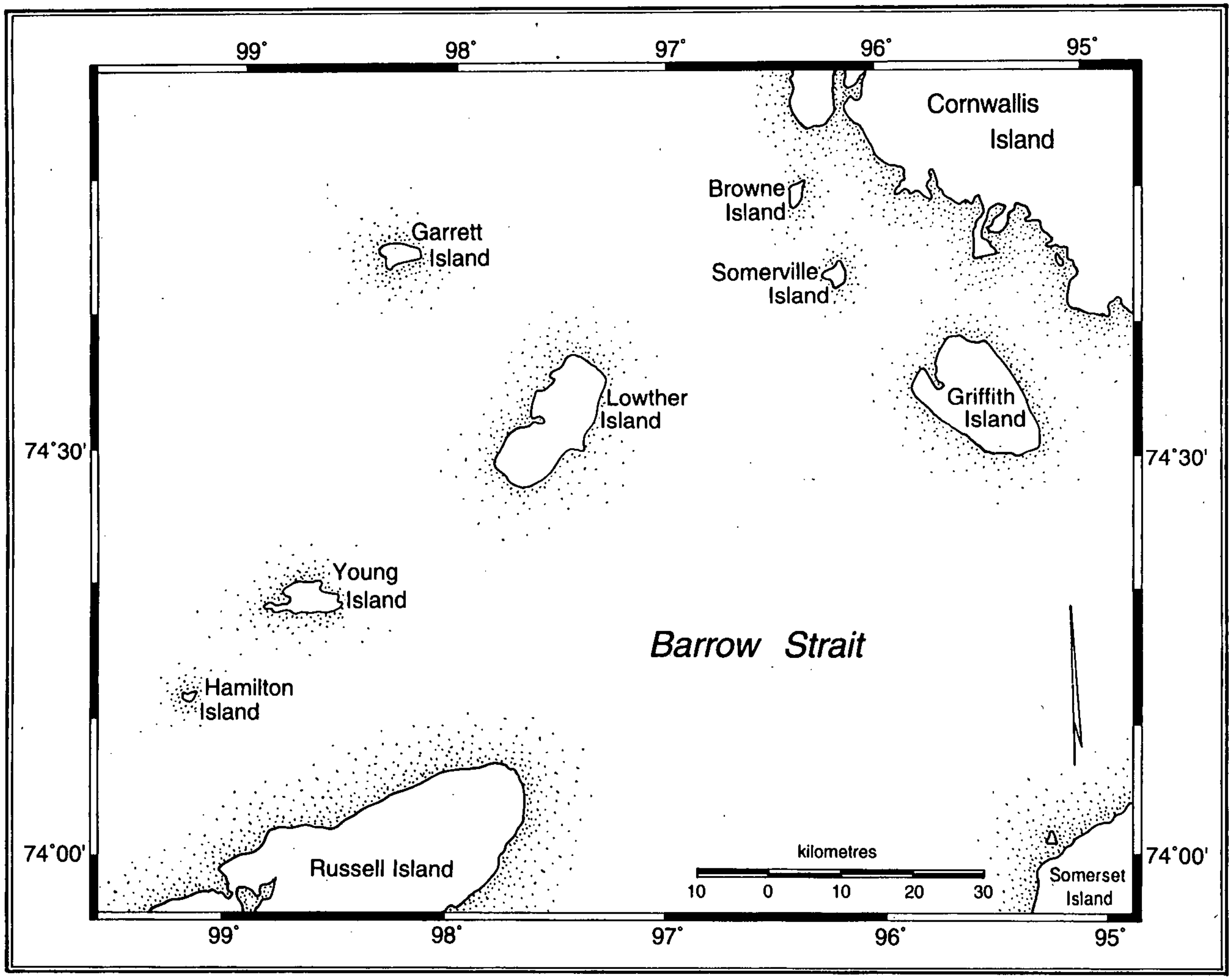

Fig. 5. Locations of seven of the 26 islands within the Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories: the seven secondary satellite islands in Barrow Strait, Browne, Garrett, Griffith, Hamilton, Lowther, Somerville, and Young

Appendix 1. Time spent carrying out nonsystematic aerial sex/age segregation counts of Peary caribou, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992

Search zone	Minutes by date (month/day)										
	06/13	06/15	06/16	06/17	06/20	16/22	06/23	06/24	06/25	06/27	06/28
NEC	40	81	59	0	6	18	51	0	10	62	0
NEI	27	0	9	42	61	7	151	37	10	32	265
SEC	0	99	42	0	0	109	0	0	0	0	0
SEI	0	0	0	0	0	5	0	0	0	0	0
SC	0	0	31	0	0	27	0	0	0	0	0
SWC	0	0	70	0	0	12	0	0	66	0	0
SWI	0	0	0	0	0	36	0	0	16	0	0
NWC	46	0	0	16	0	0	0	95	0	0	0
NWI	19	0	0	7	18	0	0	18	0	0	0
NCW	58	0	0	25	44	0	0	26	0	0	0
NCE	52	45	178	18	66	0	78	2	0	162	0
PBP	23	6	95	0	0	5	0	12	39	0	0
Alexander	0	0	0	90	0	0	0	0	0	0	0
Marc	0	0	0	10	0	0	0	0	0	0	0
Massey	0	0	0	107	0	0	0	0	0	0	0
Vanier	0	0	0	72	18	0	0	0	0	0	0
Cameron	0	0	0	0	151	0	0	0	0	0	0
Helena	0	0	0	0	38	0	0	0	0	66	0
Sherard Osborn	0	0	0	0	20	0	0	0	0	23	0
Totals	265	231	484	387	422	219	280	190	141	345	265

Continued

Appendix 1. Continued

Search zone	Minutes by date (month/day)						Total time by search zone (min)
	06/29	06/30	07/05	07/06	07/07	07/08	
NEC	9	12	0	0	15	44	407
NEI	0	0	0	0	35	107	783
SEC	0	109	0	0	98	0	457
SEI	0	76	0	0	40	0	121
SC	0	46	10	0	35	0	149
SWC	23	72	103	0	0	0	346
SWI	0	46	34	0	3	0	135
NWC	122	0	71	0	0	0	350
NWI	123	0	0	0	54	0	239
NCW	91	0	0	0	117	0	361
NCE	0	0	0	0	15	208	824
PBP	54	0	34	0	2	0	270
Alexander	0	0	0	98	0	0	188
Marc	0	0	0	8	0	0	18
Massey	0	0	0	82	0	0	189
Vanier	0	0	0	89	0	0	179
Cameron	0	0	0	0	0	0	151
Helena	0	0	0	0	0	0	104
Sherard Osborn	0	0	0	0	0	0	43
Totals	422	361	252	277	414	359	5314

[a] For the purpose of nonsystematic aerial searches Bathurst Island was divided into 12 "search zones": NEC = northeast coast; NEI = northeast interior; SEC = southeast coast; SEI = southeast interior; SC = south coast; SWC = southwest coast; SWI = southwest interior; NWC = northwest coast; NWI = northwest interior; NCW = north coast, western section; NCE = north coast, eastern section; and PBP = Polar Bear Pass.

Appendix 2. Sex/age structure of samples of Peary caribou by sample day, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Search date (month/day)	N	Sex/age composition						
		Bulls	Cows	Calves	Juv.[a] males	Juv. females	Yrl.[a] males	Yrl. females
06/13	126	15	45	30	17	0	16	3
06/15	110	21	26	21	14	4	15	9
06/16	194	48	36	30	16	9	36	19
06/17	125	19	35	29	12	5	17	8
06/20	150	16	40	36	10	16	8	24
06/22	105	40	11	10	14	10	13	7
06/23	218	14	84	71	9	7	7	26
06/24	104	27	16	14	8	9	13	17
06/25	67	40	5	5	8	1	8	0
06/27	290	33	75	66	41	18	26	31
06/28	299	3	129	116	2	19	2	28
06/29	351	103	59	55	52	22	30	30
06/30	103	49	3	1	28	0	16	6
07/05	175	89	14	14	33	3	20	2
07/06	216	17	66	61	15	26	4	27
07/07	500	69	137	129	56	28	35	46
07/08	753	32	285	266	35	55	9	71

[a] Juv. equals juvenile animals and Yrl. equals yearling animals.

Appendix 3. Sex/age structure of samples of Peary caribou by island and search zone, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

			Sex/age composition						
Island	Zone	N	Bulls	Cows	Calves	Juv.[a] males	Juv. females	Yrl.[a] males	Yrl. females
Bathurst	NEC	413	52	112	100	39	28	28	54
	NEI	766	12	332	295	6	42	11	68
	SEC	228	91	16	12	44	9	49	7
	SEI	6	2	1	1	0	0	0	2
	SC	31	19	1	0	7	1	2	1
	SWC	183	114	2	2	39	0	26	0
	SWI	22	5	1	1	7	1	5	2
	NWC	264	113	16	16	47	15	36	21
	NWI	97	1	34	31	2	8	4	17
	NCW	441	39	118	105	58	32	41	48
	NCE	893	49	317	288	58	62	27	92
	PBP	124	79	1	1	20	1	19	3
Alexander	-	136	11	41	36	18	16	5	9
Marc	-	19	5	2	2	3	0	7	0
Massey	-	123	2	44	40	1	13	4	19
Vanier	-	37	18	4	3	5	1	3	3
Cameron	-	5	2	0	0	2	0	1	0
Helena	-	68	16	20	17	4	3	2	6
Sherard Osborn	-	30	5	4	4	10	0	5	2

[a] Juv. equals juvenile animals and Yrl. equals yearling animals.

Appendix 4. Chronological listing of hard antler casting by Peary caribou breeding cows, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992, data obtained by nonsystematic helicopter searches

Date (mo./d)[a]	N	Number that cast both hard antlers	Number that cast one hard antler only: Left	Number that cast one hard antler only: Right	Number with both hard antlers retained
06/13	45	39	2	0	4
06/15	26	24	0	0	2
06/16	36	33	1	1	1
06/17	35	34	0	1	0
06/20	40	37	0	1	2
06/22	11	11	0	0	0
06/23	84	84	0	0	0
06/24	16	15	0	0	1
06/25	5	5	0	0	0
06/27	75	74	0	1	0
06/28	129	129	0	0	0
06/29	59	59	0	0	0
06/30	3	3	0	0	0
07/05	14	14	0	0	0
07/06	66	66	0	0	0
07/07	137	136	0	0	1
07/08	285	284	0	0	1

[a] (mo./d) equals (month/day).

Appendix 5. Termination dates for 30 snow/ice stations (270 sample sites) and the number of sample sites at each of those stations with or without ground fast ice present when the station became inactive on the 7.5-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, June 1992

Station number	Date station became inactive (month/day)	Number of sample sites	
		No. with ice	No. without ice
0.5	06/19	0	9
3.0	06/19	0	9
4.0-N	06/19	0	9
1.0	06/22	0	9
1.0-N	06/22	0	9
2.0-N	06/22	0	9
3.0-S	06/22	0	9
3.5	06/22	7	2
4.0	06/22	7	2
4.0-S	06/22	0	9
4.5	06/22	0	9
5.0-N	06/22	0	9
5.0-S	06/22	0	9
5.5	06/22	0	9
6.0	06/22	9	0
6.0-S	06/22	0	9
7.0-S	06/22	4	5
0.0	06/24	7	2
1.0-S	06/24	9	0
1.5	06/24	9	0
2.0-S	06/24	0	9
2.5	06/24	9	0
3.0-N	06/24	0	9
5.0	06/24	0	9
6.0-N	06/24	8	1
6.5	06/24	3	6
7.0	06/25	0	9
7.5	06/24	9	0
2.0	06/27	9	0
7.0-N	06/27	9	0

Appendix 6. Termination dates for 41 snow/ice stations (369 sample sites) and the number of sample sites at each of those stations with or without ground fast ice present when the station became inactive on the 1-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, June 1992

Station number	Date station became inactive (month/day)	Number of sample sites: No. with ice	Number of sample sites: No. without ice
23	06/06	0	9
37	06/11	0	9
1	06/21	0	9
7	06/21	5	4
10	06/21	8	1
11	06/21	0	9
12	06/21	9	0
19	06/21	0	9
22	06/21	5	4
24	06/21	0	9
25	06/21	0	9
26	06/21	0	9
27	06/21	0	9
28	06/21	0	9
29	06/21	0	9
34	06/21	5	4
35	06/21	9	0
36	06/21	0	9
38	06/21	0	9
39	06/21	0	9
40	06/21	0	9
41	06/21	0	9
3	06/23	8	1
4	06/23	9	0
5	06/23	9	0

Continued

Appendix 6. Continued

Station number	Date station became inactive (month/day)	Number of sample sites	
		No. with ice	No. without ice
6	06/23	9	0
8	06/23	9	0
16	06/23	9	0
18	06/23	8	1
33	06/23	5	4
2	06/25	9	0
9	06/25	9	0
13	06/25	9	0
14	06/25	9	0
15	06/25	8	1
17	06/25	9	0
20	06/25	0	9
21	06/25	0	9
31	06/25	9	0
32	06/25	0	9
30	06/27	9	0

Appendix 7. Chronology of when profile of 25-m segments between the centres of each pair of stations on the 1-km snow/ice course became 100% snow-free, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, June-July 1992

Station pair	Date[a]	Station pair	Date	Station pair	Date	Station pair	Date
37-38	6/21	33-34	6/25	35-36	6/25	13-14	6/29
26-27	6/21	6- 7	6/25	4- 5	6/25	2- 3	6/29
38-39	6/21	10-11	6/25	40-41	6/25	14-15	6/29
27-28	6/21	18-19	6/25	9-10	6/27	31-32	6/29
36-37	6/21	34-35	6/25	17-18	6/27	8- 9	6/29
25-26	6/23	3- 4	6/25	21-22	6/27	20-21	6/29
22-23	6/23	7- 8	6/25	12-13	6/27	32-33	6/29
39-40	6/23	11-12	6/25	16-17	6/27	29-30	7/01
24-25	6/23	19-20	6/25	1- 2	6/29	30-31	7/02
28-29	6/23	23-24	6/25	5- 6	6/29	15-16	7/02

[a] Month/day.

Appendix 8. Bare ground (snow-free) statistics for the 1-km snow/ice course, northeastern Bathurst Island, south-central Queen Elizabeth Islands, Northwest Territories, May-July 1992

	Number of bare-ground	Length of bare-ground patches (m)				
Date	patches	Mean	± SD	Minimum	Maximum	Median
27 May	7	1.0	0.9	0.3	3.0	0.8
31	0	-	-	-	-	-
01 June	47	1.9	2.2	0.2	12.8	1.2
03	42	3.6	4.7	0.2	21.8	1.8
06	45	3.3	3.8	0.2	18.5	2.0
11	20	2.1	3.5	0.2	13.1	0.6
14	0	-	-	-	-	-
15	33	2.4	3.2	0.2	13.7	1.1
18	29	4.8	6.9	0.2	24.2	1.4
21	41	9.2	19.8	0.2	98.4	1.7
23	35	15.2	33.2	0.3	184.8	3.7
25	29	28.4	59.1	0.3	230.8	2.3
27	21	43.9	70.3	0.3	234.5	12.1
29	5	193.9	181.7	0.4	362.8	253.1
30	4	180.8	207.8	0.2	366.8	178.0
01 July	5	194.1	186.5	0.5	377.4	257.8
02	1	-	-	1000.0	1000.0	-

Appendix 9. Summary of maximum, minimum, and mean temperatures recorded at the Canadian Wildlife Service "Walker River" base camp, northeastern Bathurst Island (76°00'N, 97°40'W), south-central Queen Elizabeth Islands, Northwest Territories, 27 May to 14 July 1992

Date	Temperature[a] °C		
(month/day)	Maximum	Minimum	Mean
5/27	- 6.5	- 9.3	- 7.9
5/28	- 5.4	- 9.1	- 7.3
5/29	- 5.4	- 8.4	- 6.9
5/30	- 7.6	-11.6	- 9.6
5/31	- 5.7	-13.1	- 9.4
6/01	- 2.3	- 6.9	- 4.6
6/02	+ 2.1	- 8.8	- 5.5
6/03	- 0.5	- 8.3	- 4.4
6/04	- 0.5	- 6.2	- 3.4
6/05	- 1.0	- 6.7	- 3.9
6/06	- 3.9	- 9.0	- 6.5
6/07	- 6.2	-11.7	- 9.0
6/08	- 2.1	- 7.5	- 4.8
6/09	- 0.2	- 4.5	- 2.4
6/10	- 0.6	- 3.6	- 2.1
6/11	- 1.2	- 3.5	- 2.4
6/12	+ 1.0	- 4.2	- 1.6
6/13	- 1.0	- 9.4	- 5.2
6/14	- 1.0	- 5.4	- 3.4
6/15	- 0.8	- 8.5	- 4.7
6/16	- 0.1	- 8.9	- 4.5
6/17	- 1.0	- 7.5	- 4.3
6/18	+ 1.7	- 2.7	- 0.5
6/19	+ 1.5	- 2.6	- 0.6
6/20	+ 2.7	- 3.6	- 0.5

Continued

Appendix 9. Continued

Date (month/day)	Temperature[a] °C Maximum	 Minimum	 Mean
6/21	+ 3.3	- 1.2	+ 1.1
6/22	+ 8.0	- 1.9	+ 3.1
6/23	+ 9.0	+ 3.1	+ 6.1
6/24	+ 8.2	+ 2.5	+ 5.4
6/25	+ 3.3	+ 0.1	+ 1.7
6/26	+ 2.4	- 1.8	+ 0.3
6/27	+ 6.5	- 0.5	+ 3.0
6/28	+ 3.5	- 1.0	+ 1.3
6/29	+ 9.4	+ 1.5	+ 5.5
6/30	+13.3	+ 3.5	+ 8.4
7/01	+12.7	+ 1.9	+ 7.3
7/02	+ 4.8	+ 0.5	+ 2.7
7/03	+ 6.3	+ 1.0	+ 3.7
7/04	+ 7.5	+ 0.3	+ 3.9
7/05	+ 7.5	+ 1.0	+ 4.3
7/06	+ 9.3	+ 0.3	+ 4.8
7/07	+10.9	+ 3.0	+ 7.0
7/08	+ 9.4	+ 2.1	+ 5.8
7/09	+ 3.5	+ 1.1	+ 2.3
7/10	+ 6.5	+ 2.3	+ 4.4
7/11	+ 9.3	+ 4.4	+ 6.9
7/12	+ 9.3	+ 4.0	+ 6.7
7/13	+ 4.4	0.0	+ 2.2
7/14	+ 5.4	- 0.1	+ 2.7

[a] Temperatures were recorded at ca. 0700 and 1900 each day; therefore, temperatures for each date actually range from 1900 the previous day to 1900 that day.