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LATE WINTER ABSENCE OF CARIBOU ON PRINCE OF WALES,
RUSSELL, AND SOMERSET ISLANDS, NORTHWEST
TERRITORIES, APRIL-MAY 1996

FRANK L. MILLER

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ABSTRACT: Nonsystematic, low-level aerial searches were flown between 28 April and 3 May 1996 to determine the number and distribution of caribou (*Rangifer tarandus* spp.) within the Prince of Wales-Russell-Somerset islands complex, Northwest Territories, Canada. The search aircraft was a Bell 206L turbo-helicopter flown at 96 to 180 km • h⁻¹ and altitudes of 20 to 60 m above ground or sea ice. Search time totalled 40.5 h: 35.2 h over land and 5.3 h over sea ice. Viewing conditions during all 6 days of the searches were excellent with bright full sunlight and an essentially fresh 100% snow background. Only two caribou were found within the entire study area, both on Somerset Island (11.7 h of aerial search effort). Not a single caribou, trail, or feeding crater was seen during 16.5 h of aerial searches on Prince of Wales Island nor during 4.4 h of searches on Russell Island. Extrapolation of the mean density value of 0.2 caribou • 100 km⁻² for caribou seen on Somerset Island to the entire Prince of Wales-Russell-Somerset islands complex suggests that only ca. 120 caribou occurred there in late winter 1996. No caribou or trails were seen on the snow-covered sea ice adjacent or interjacent to the islands. I conclude that either extremely few caribou wintered in the areas that were searched in late April-early May 1996 or, less likely, that the caribou had moved well in advance of the helicopter searches.

Key words: Caribou, *Rangifer tarandus*, number, distribution, Prince of Wales Island, Russell Island, Somerset Island, nonsystematic helicopter searches

RÉSUMÉ: On a effectué des recherches aériennes non systématiques à basse altitude entre le 28 avril et le 3 mai 1996 dans le but de déterminer le nombre de caribous (*Rangifer tarandus* spp.) et leur répartition dans le complexe des îles Prince of Wales-Russell-Somerset, dans les Territoires du Nord-Ouest, au Canada. L'appareil utilisé, un hélicoptère Bell 206L turbo, volait à une vitesse de 96 à 180 km·h⁻¹, à une altitude de 20 à 60 m au-dessus du sol ou de la glace de mer. Le temps de vol a totalisé 40,5 h; c'est à dire 35,2 h au-dessus de la terre ferme et 5,3 h au-dessus de la glace de mer. Les conditions d'observation durant les 6 jours qu'ont duré les recherches ont été excellentes, un ciel radieux et un sol couvert à 100% de neige fraîche. On n'a observé que deux caribous dans toute la région à l'étude, les deux dans l'île Somerset (11,7 h de recherche aérienne). On n'a observé aucun caribou, aucune piste ni aucune fosse de broutage au cours des 16,5 h de recherches aériennes au-dessus de l'île Prince of Wales et des 4,4 h de recherches dans l'île Russell. L'extrapolation de la valeur moyenne de la densité de 0,2 caribou par 100 km⁻², pour les caribous qui ont été vus sur l'île Somerset dans tout le complexe des îles Prince of Wales-Russell-Somerset, propose qu'environ seulement 120 caribous ont passé à cet endroit à la fin de l'hiver 1996. Pas un caribou ou une piste n'a été vu sur la glace de mer couverte de neige autour et entre les îles. J'en conclus soit qu'un nombre extrêmement faible de caribous ont hiverné dans les régions qui ont fait l'objet d'une recherche vers la fin d'avril et le début de mai 1996, soit, hypothèse moins probable, que les caribous se sont déplacés bien avant les recherches en hélicoptère.

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INTRODUCTION

Caribou (*Rangifer tarandus* spp.) are the preferred staple in the diet of high arctic Inuit; therefore, accessibility from the settlement to a harvestable caribou population is of primary importance. Late winter (Mar-May) and spring (snow-covered period of Jun) hunting of caribou on Prince of Wales, Russell, and Somerset islands (including their lesser satellite islands) has yielded part of the annual caribou harvest in most years ever since shortly after the founding of the Inuit settlement of Resolute (Qausuittuq: 74.700° N latitude, 94.833° W longitude) on Cornwallis Island, Northwest Territories (NWT), in the mid 1950s. The annual caribou harvest on Prince of Wales, Russell, and Somerset islands took on a special significance, however, after the drastic decline in Peary caribou (*R. t. pearyi*) on the Queen Elizabeth Islands (all of those islands north of ca. 74° N latitude in the Canadian Arctic Archipelago) in the winter of 1973/74, when more than half the caribou on all of those islands died of extreme malnutrition (e.g. Parker *et al.* 1975, Miller *et al.* 1977a).

Prior to 1974, Bathurst Island had served Resolute hunters as a major hunting area for caribou (Fig. 1). Following the major loss of caribou on Bathurst Island in winter 1973/74 (estimated at ca. 68% of all caribou within the Bathurst Island complex, south-central Queen Elizabeth Islands, Miller *et al.* 1977a), the Resolute hunters imposed a voluntary ban on caribou hunting on Bathurst Island (Freeman 1975). Therefore, from 1975 onward, annual harvest essentially shifted solely to the harvesting of caribou on Prince of Wales, Russell, and Somerset islands (Fig. 2).

Although harvest information is incomplete, the annual caribou kill on Prince of Wales, Russell, and Somerset islands apparently ranged from 150 to 250 and possibly as high as 300 during, at least, the 1970s and the early 1980s, with most of those caribou being killed on Somerset Island (e.g., Gunn and Miller 1983, Miller 1990b). Those annual harvest rates should have been within sustainable limits of the inter-island population of caribou then on Prince of Wales, Russell, and Somerset islands: based on summertime estimates, if annual reproduction and recruitment remained high enough to compensate for all sources of mortality among 1+ yr-old individuals. Comparison of the first two aerial survey estimates, 4540 1+ yr-old caribou in 1974 and 3766 1+ yr-old

caribou in 1975 (Fischer and Duncan 1976), to the third aerial survey estimate of 5022 1+ yr-old caribou in 1980 (Gunn and Miller 1983) suggests that the inter-island population was relatively stable, or possibly, even increasing slightly during the late 1970s to at least 1980.

Unfortunately, 15 years passed before the next range-wide aerial survey for caribou was conducted. In July 1995, the Government of the Northwest Territories (GNWT), Department of Renewable Resources (DRR) Wildlife Management Division (WMD), repeated the 1980 aerial survey design to obtain an estimate that could be compared directly to the 1980 aerial survey results (A. Gunn and J. Dragon, GNWT, DRR, WMD, Yellowknife, unpubl. data, 1995). The survey results were startling, however, with only five caribou seen on Prince of Wales Island, two caribou on Somerset Island, and none seen on Russell Island. In comparison to the seven caribou seen in 1995, 1558 caribou were counted on those three islands in July 1980, with essentially equal effort expended in each survey. The near total lack of caribou on this large collective landmass (ca. 60 000 km²) potentially has serious consequences for all caribou populations within the region and for the Inuit hunters of Resolute who seek to annually harvest from those caribou populations.

This study is an initial step into the investigation of the perceived loss of caribou from Prince of Wales, Russell, and Somerset islands. Concerns being addressed, at least in part or indirectly, are whether the observed absence of caribou on those islands in July 1995 was the result of (1) a disastrous population die-off, (2) a major shift in summer seasonal range use, or (3) only an aberrant seasonal range shift that will correct itself (or some combination of the above three possibilities).

The following reports the field activities in late April through early May 1996 to investigate the current use of late winter ranges on Prince of Wales, Russell, and Somerset islands. The observations were made by low-level nonsystematic helicopter searches mainly of ranges previously known to be used by caribou during late winter and spring (e.g. Miller *et al.* 1982). Observations of muskoxen (*Ovibos moschatus*) also were made between 28 April and 3 May 1996 (App. 1).

STUDY AREA

The study area encompassed land and sea ice areas between 71° and 74° N latitude and 90° and 102° W longitude. It included some of the ice-bound waters of Baring Channel, Barrow Strait, Peel Sound, Bellot Strait, and Franklin Strait. The collective landmass within the study area is slightly over 60 000 km²; the largest island is Prince of Wales, 33 340 km²; followed by Somerset, 24 790 km²; Russell, 940 km²; and Prescott, 410 km² (Fig 2). There are also over 50 lesser (<400 km² each) named and unnamed satellite islands (a potential southward extension of the study area also included the northwestern Boothia Peninsula, ca. 26 000 km², north of 71° N latitude). The study area in this report will hereafter be termed the "Prince of Wales-Russell-Somerset islands complex."

Soils, vegetation, and caribou (and muskox) habitats within the study area have been described by Fischer and Duncan (1976), Thomas *et al.* (1976, 1977), Woo and Zoltai (1977), Russell *et al.* (1978), Thomas and Broughton (1978), and Miller *et al.* (1982). Caribou seasonally move among the islands within the Prince of Wales-Russell-Somerset islands complex, and the Boothia Peninsula (Macpherson 1959, Manning and Macpherson 1961, Bissett 1968, Miller and Gunn 1978, 1980, Miller and Kiliaan 1980, 1981, Thompson and Fischer 1980, Thomas and Everson 1982, Gunn and Miller 1983, and Miller 1990a). Climatic patterns for the region have been described by Maxwell (1980, 1981): the two nearest Atmospheric Environment Service weather stations are at Resolute, Cornwallis Island, south-central Queen Elizabeth islands; and Taloyoak (Spence Bay: 63.533° N latitude, 93.517° W longitude) at the base (isthmus) of the Boothia Peninsula, District of Keewatin.

METHODS

Research hypothesis: The premise in this study is that "the number of caribou has declined on late winter/spring ranges within the Prince of Wales-Russell-Somerset islands complex since the late 1970s and early 1980s".

Test consequences: I would expect to see few caribou per hour of aerial search effort.

Therefore, the statistical hypotheses to be tested are as follows.

H_0 = The number of caribou seen on late winter/spring ranges within the Prince of Wales-Russell-Somerset islands complex will be ≥ 5 caribou $\cdot h^{-1}$ of aerial search effort.

H_1 = The number of caribou seen on late winter/spring ranges within the Prince of Wales-Russell-Somerset islands complex will be < 5 caribou $\cdot h^{-1}$ of aerial search effort.

I chose the number of caribou expressed as a rate of sighting per unit of time during an aerial search effort (≥ 5 caribou $\cdot h^{-1}$ vs. < 5 caribou $\cdot h^{-1}$) that would allow rejection of the null hypothesis and acceptance of the alternative hypothesis as follows.

(1) I calculated a mean density of 8.4 caribou $\cdot 100 \text{ km}^{-2}$ based on the 1980 estimate of 5022 1+ yr-old caribou within the Prince of Wales-Russell-Somerset islands complex (Gunn and Miller 1983).

(2) I then assumed (based on previous harvest information and the current number of Inuit families living in Resolute, Gunn and Miller 1983, Miller 1990b, Northwest Territories Data Book 1990) that a maximum sustainable harvest of 150 caribou could be sought yearly, if essentially all the caribou hunting was shifted to those islands.

(3) I selected the 150 caribou maximum value as the basis for calculation of the separation point because I wanted my judgments to be conservative (biologically safe).

(4) I then calculated that an annual sustained harvest of 150 caribou would require a current caribou population of 3000 1+ yr-old animals (at a maximum rate of harvest of 5% of the standing population of 1+ yr olds).

(5) A population of 3000 caribou is equivalent to ca. 60% of the 1980 estimate with a mean density of ca. 5 caribou $\cdot 100 \text{ km}^{-2}$.

(6) Therefore, I could assume that if significantly < 5 caribou $\cdot h^{-1}$ of aerial search effort were counted (when 5 caribou $\cdot h^{-1}$ would approximate a mean density of 5 caribou $\cdot 100 \text{ km}^{-2}$) that the existing number of caribou within the Prince of Wales-Russell-Somerset islands complex could not safely sustain a maximum annual level of harvest of 150 caribou.

A Bell 206L "Jet Long Ranger" turbo-helicopter on skid gear was used as the search aircraft. Daily flights were originated from and ended at Polar Continental Shelf Project, Resolute. The helicopter was flown at 20 to 60 m above ground level (agl) or above the sea ice (m above mean sea level [amsl]) but mainly at 30 to 50 m agl/amsl. Helicopter airspeeds ranged from 96 to 180 km • h⁻¹ (mostly at ca. 140-160 km • h⁻¹), depending mainly on the lay of the land or the presence of animals or their sign (trails and/or feeding craters in the snow). The search team had two crew members: the pilot in the right front seat (who also acted as an observer) and myself in the left front seat as the second observer. Both observers searched constantly for animals and animal trails or feeding craters in the snow. The location of each observation was recorded by latitude and longitude, using the onboard Global Positioning System. I recorded all pertinent information in a field notebook: date, location, and sex/age composition of the animals sighted along with any additional remarks. Caribou were to be classified as bulls, cows, calves, juveniles, or yearlings. The sex of juvenile and yearling animals also would have been determined.

RESULTS

The helicopter was flown for 40.5 hours between 28 April and 3 May 1996 to look for caribou within the study area: 35.2 hours over land and 5.3 hours over sea ice (mostly to the north over Barrow Strait). It was easy to see animals and their trails and feeding areas because viewing conditions were excellent, with bright full sunlight (no cloud cover) against a fresh snow background, and the helicopter was flown at low levels above the ground or the sea ice (20-60 m agl over land or amsl over sea ice).

The entire island complex was essentially 100% snow-covered, although patches of dark substrate showed through the thin snow cover on exposed areas such as knolls, beach ridges and other prominences. Only the protrusive boulder fields along the west coast of Somerset Island (and the northwestern coast of the Boothia Peninsula north of 71° N latitude) offered extensive contrast to the prevailing white mantle of snow. On the last day of the searches (3 May) we noted that some patchy sections of the red soil areas along the east-central lowlands

of Prince of Wales Island from Back Bay south to Inner Browne Bay (and on the eastern satellite islands of Prescott and Pandora) were snow-free but those overall areas remained more than 95% snow-covered.

Extremely few caribou wintered in the areas that were searched by helicopter or, less likely, they possibly had moved well in advance of the helicopter searches in late April-early May 1996. We easily saw many ptarmigan (*Lagopus* sp.), arctic hares (*Lepus arcticus*), and muskoxen and their trails and feeding holes in the snow as we looked from the helicopter for caribou or their sign. Trails made by arctic foxes (*Alopex lagopus*) and a few wolves (*Canis lupus* spp.) also were easy to see in the snow. Therefore, we most likely would have seen any caribou, their trails or their feeding areas particularly those animals or their sign within 0.5 km of either side of the aircraft (and much further beyond).

We were able, however, only to find two caribou and both of them were on Somerset Island, one on the northwestern coast (73.483° N, 95.617° W) and the other was on the north-central interior (73.600° N, 92.667° W) of the island, about 100 km apart. The two caribou were adult males (bulls) and each animal and its sign were initially seen at ca. 3 km distance from the oncoming helicopter. Not one additional caribou trail or caribou feeding area was seen on Somerset Island during the 11.7 hours of helicopter flying there (Fig. 3). We flew 16.5 hours over Prince of Wales Island and did not see any caribou there or even a single caribou trail or caribou feeding area (Fig. 3). Also, no caribou, their trails, or their feeding areas were seen on Russell Island during 4.4 hours of searches (Fig. 3). or on the northwestern coastal area of the Boothia Peninsula during 2.6 hours of searches (Fig. 3). Not a single caribou or caribou trail was seen on the snow-covered sea ice adjacent or interjacent to the land areas.

Not finding caribou on Prince of Wales and Russell islands, and finding only two caribou on Somerset Island obviously allowed me to reject the null hypothesis and accept my alternative hypothesis without reservation. The two caribou seen on Somerset Island in 11.7 h of aerial searches yields a frequency of occurrence of only 0.2 caribou • h⁻¹ or 25-fold below the separation point value of 5 caribou • h⁻¹. Even when a mean density value of 0.2 caribou • 100 km⁻² is extrapolated to the entire

60 000 km² island complex, it suggests that at most only ca. 120 caribou occurred there in late winter 1996.

DISCUSSION

From an ecological point of view, there are two primary temporal periods for caribou on the Canadian Arctic Archipelago, the short "snow-free period" (Jun breakup-Aug) of revival and growth and the long "snow-covered period" (Aug-Sep to May-Jun) of maintenance and stressful negative nutritional energy balances. Late winter/spring (Mar-through the snow-covered part of Jun) represents the pinnacle of the snow-covered period, when environmental stresses are usually at their worst and the fate of the next calf crop and the survival of some 1+ yr-old caribou generally are hanging annually in the balance.

Information now exists from both of those temporal periods, the July 1995 systematic aerial survey (A. Gunn and J. Dragon, GNWT, DRR, WMD, unpubl. data, 1995) and the April-May 1996 nonsystematic aerial searches (this study), that indicates that only a remnant of the former (1980) caribou population still ranges within the Prince of Wales-Russell-Somerset islands complex. Only 100 - 200 caribou now occur within the Prince of Wales-Russell-Somerset islands complex where *at least* several thousand ranged in the late 1970s and early 1980s. I do not know, nor is anyone ever likely to know, how or why this condition came about. Perhaps, the most important consideration at this time is not why this change occurred but how long will it be before a population of caribou large enough to sustain annual harvests of 100 or more 1+ yr-old animals once again range over this island complex. There is no evidence to even suggest that the current absence of caribou within the Prince of Wales-Russell-Somerset islands complex was induced by human activities. The possibility that anthropogenic climatic change has played a role cannot be ruled out, however.

Fifteen years between aerial surveys (1980-1995) is much too long a time span to allow objective evaluation of the cause or causes of this marked decline in the number of caribou within the Prince of Wales-Russell-Somerset islands complex. The probabilities for the decline are several, the most likely, seemingly, are as follows. (1) The caribou experienced slow, insidiously increasing levels of mortality over

annual rates of recruitment (due to persistent unfavourable environmental conditions) that over the course of a decade or more have brought the caribou population to its current low point. (2) The caribou experienced one or a few years with extremely harsh winters (due to severely unfavourable snow/ice conditions) leading to cataclysmic losses of 1+ yr-old caribou, followed by failure or near failure of one or more subsequent calf crops. (3) The caribou abandoned their traditional seasonal ranges as a result of a major range shift, most likely in response to extremely severe snow/ice conditions that resulted in extensive forage unavailability. That caribou on the Canadian Arctic Islands decline in number at exceptionally high rates in some winters and that their subsequent calf crops are very low or totally fail in those years (and in some other years) has been relatively well-documented (e.g., McEwen 1955, Manning and Macpherson 1958, Parker *et al.* 1975, Fischer and Duncan 1976, Thomas *et al.* 1976, 1977, Miller *et al.* 1977a, 1977b, Morrison 1978, Thomas and Broughton 1978, Vincent 1979, 1980, Vincent and Gunn 1981, Thomas 1982, and Miller 1992). Seasonal inter-island migrations/movements of caribou have been relatively well-documented within the Prince of Wales-Russell-Somerset islands complex (e.g., Miller *et al.* 1982, Miller 1990a) and also elsewhere on the Canadian Arctic Archipelago (e.g., Miller *et al.* 1977a, 1977b, Miller 1990a).

Those inter-island migrations/movements could have originated as "ecological manoeuvres" through environmentally-forced responses to stresses caused by expanding populations or widespread forage unavailability and then perpetuated by tradition (e.g., Miller *et al.* 1977a, 1977b, Miller 1990a). Vibe (1967) reported that a traditional migration of caribou (*R. t. groenlandicus*) in Greenland originated due to a chance event, "a sudden icing-up of the country...". Possibly the observed increases in caribou during the 1980s on eastern Victoria Island (Gunn 1990) and the Boothia Peninsula (Gunn and Ashevak 1990) resulted from annual recruitments exceeding mortalities during that time period. It is also possible, however, that all or part of those increases came about from large-scale ingress from the Prince of Wales-Russell-Somerset islands complex. In the past, large numbers of caribou migrated annually from northern Boothia Peninsula to Somerset Island and/or Prince of Wales and Russell islands and then they usually returned to the Boothia Peninsula in early winter after freeze-up (e.g., Miller and Gunn 1978, 1980, Miller *et al.* 1982, Miller 1990a). Not knowing what

proportion of the Boothia Peninsula caribou population is represented by those seasonal migrants seriously hinders, if not prevents, any meaningful evaluation of changes in numbers of caribou within the Prince of Wales-Russell-Somerset islands complex in the past decade (or at any time past, present, or future).

The extremely small number of caribou within the Prince of Wales-Russell-Somerset islands complex in July 1995 (A. Gunn and J. Dragon, GNWT, DRR, WMD, unpubl. data, 1995) and then in late April-early May 1996 (this study) represent only remnants of the populations sizes estimated there in 1974, 1975, and 1980 (Fischer and Duncan 1976, Gunn and Miller 1983). Whether this apparent drastic decline in the size of the caribou population resulted from excessive mortality, emigration, or a combination of both remains unanswered and likely is unanswerable. Thus, the main concern should now be - will this drastic decline in the number of caribou using seasonal and/or annual home ranges within the Prince of Wales-Russell-Somerset islands complex be short- or long-lived.

Conservation Implications

The nearly complete loss of caribou from the Prince of Wales-Russell-Somerset islands complex together with the drastically reduced size of the caribou population within the Bathurst Island complex, south-central Queen Elizabeth Islands, creates a most unfavourable situation for caribou hunters from the settlement of Resolute on Cornwallis Island. All of the caribou that are relatively easily accessible to Resolute hunters occur within those two complexes: both areas are several hours distance from Resolute by snowmobile, the first to the south and the second to the west. There are no viable caribou populations within reasonable travel distance to the north or to the east of Resolute. Under the apparent current conditions only aircraft-transported hunters could travel far enough to obtain a dependable (harvestable) supply of caribou and feasibly haul even the processed carcasses back to Resolute. If the current lack of accessible caribou persists over an extended number of years, and the Resolute people do not freely switch to utilizing muskoxen for the fresh red meat in their diet, they most likely will have to get caribou from either Baffin Island or the mainland. Resolute caribou hunters will have to carry out aircraft supported "organized hunts" on Baffin Island

and/or coastal mainland areas. Otherwise, the people of Resolute will have to barter or purchase caribou meat from hunters on Baffin Island or from mainland settlements.

The absence of a substantial harvestable caribou population within the Prince of Wales-Russell-Somerset islands complex is, however, only part of the concern from an overall view of a need for the conservation of these caribou. That is, from a "pure" management standpoint the sole major concern (goal) is to maintain a large and readily accessible population of caribou that can sustain the desired (required) level of annual harvest. There is no real concern, however, for the genetic makeup or probable uniqueness of the particular caribou population being harvested.

The Canadian Federal Government as part of the international community concerned with global environmental issues has accepted the maximization of "biodiversity" as their ultimate conservation goal, which automatically includes the promotion of maximal "genetic diversity", as a necessary step in achieving their desired goal. Therefore, due consideration must be given also to the probable need to conserve the caribou within the Prince of Wales-Russell-Somerset islands (Boothia Peninsula) complex because of their possible uniqueness.

We know that many of the caribou within the Prince of Wales-Russell-Somerset islands (Boothia Peninsula) complex function as an "inter-island/peninsula caribou population" (e.g., Miller *et al.* 1982, Miller 1990a). Many of those caribou winter on Somerset Island, then move across the sea ice of Peel Sound: the timing of these movements vary among years but some caribou usually move in late winter, sometime after early March, while most usually move relatively close to calving in late May and/or early June (mimicking the springtime seasonal migration of migratory barren-ground caribou). Our knowledge of these seasonal migrations and/or environmentally-forced movements and the associated seasonal range use is complicated, however, by the involvement of a large and possibly periodic or sporadic varying number of caribou from the Boothia Peninsula. It appears that many caribou that winter on the Boothia Peninsula also move in late winter/spring from the Boothia Peninsula across the sea ice of Bellot Strait to Somerset Island, some then continue onward from Somerset Island across the sea ice of Peel

Sound to Prince of Wales Island, and some of them even travel to the north coast of Prince of Wales Island and cross on the sea ice of Baring Channel to Russell Island (e.g., Miller and Gunn 1978, 1980, Miller and Kiliaan 1980, 1981). Those caribou calve and use summer range within the Prince of Wales-Russell-Somerset islands complex, then return to the Boothia Peninsula via Somerset island across Bellot Strait after freeze-up during the following winter, apparently, usually in early winter (Oct -Nov). Other caribou leave winter ranges on the Boothia Peninsula and travel across the sea ice of Franklin Strait directly onto Prince of Wales Island to calve and summer there and then apparently return directly to the Boothia Peninsula in early winter to repeat the annual cycle of seasonal inter-island/peninsula range use. It now appears, however, that this inter-island/peninsula population of caribou essentially no longer exists, except likely still in a vestigial form. Thus, the annual inter-island/ peninsula seasonal migrations between and/or among seasonal ranges have slowed to a trickle or have stopped altogether. Whether this condition came about through excessive mortalities among the caribou of this inter-island/peninsula population from previous environmental stresses or by those caribou, while under environmental stresses or for other reason(s), abandoning traditional seasonal ranges in favour of new, but as yet unknown ranges, or the previously migratory caribou simply remaining relatively sedentary on the Boothia Peninsula (or some other new range) is not known, nor will the cause(s) likely ever be known. The end results are the same regardless of the causes(s) - the near loss of all of the caribou from a large geographic region that provided a valuable renewable resource to the people of Resolute and enhanced the genetic diversity of caribou in Canada.

There is a supposed need for, or an unexplained desire by many, to place geographic populations at a subspecific level to better justify the concern for the population's conservation (particularly its preservation). In the case of the inter-island/peninsula caribou population within the Prince of Wales-Russell-Somerset islands (Boothia Peninsula) complex, such an action creates a misleading impression of what the caribou within this region truly represent and, thus, the caribou population's true importance in terms of its contribution to the genetic diversity of all caribou in Canada. Caribou from one or more populations within the Prince of Wales-Russell-Somerset islands (Boothia Peninsula) complex have been identified as four taxonomical types: ranging from

(1) *R. t. groenlandicus* to (2) *R. t. groenlandicus* > *pearyi* to (3) *R. t. pearyi* > *groenlandicus*, and (4) *R. t. pearyi* (e.g., Banfield 1961, Manning and Macpherson 1961, Thomas and Everson 1982, Røed *et al.* 1986). Based on the currently recognized subspecies of North American caribou (cf. Banfield 1961), however, it would have to be concluded that even if you are a "taxonomical lumpers," at least two subspecific forms of caribou exist or existed within the Prince of Wales-Russell-Somerset islands (Boothia Peninsula) complex - *R. t. groenlandicus* and *R. t. pearyi*. If, however, you are a "taxonomical splitter", you would have to conclude that four forms of caribou exist or existed within this inter-island/peninsula complex, two currently recognized subspecies (*R. t. groenlandicus* and *R. t. pearyi*), regionally each possessing a poorly known but possibly unique genetic makeup, and two forms (*R. t. groenlandicus* > *pearyi* and *R. t. pearyi* > *groenlandicus*) with different and, most likely unto themselves, unique genetic makeups. Although these two forms appear taxonomically to be the products of distant past intergradation, there is no implication of currently ongoing intergradation or direct hybridization.

The primary question is whether all four of these forms actually collectively originated from one genome or from more than one genetically distinct relatively recent progenitor that periodically or sporadically shared overlapping seasonal ranges within this inter-island/peninsula complex. Whatever the case may be, the region's caribou represented an important utilizable renewable resource and at least some of them likely represented unique genetic stock and, thus, warrant recognition and special protection as a distinct geographic population of caribou that is in great danger because of its current low number.

Thus, when a trinomial scientific name is used, it would require the use of at least two subspecific names to accurately describe the two currently recognized types of caribou that could be found within the Prince of Wales-Russell-Somerset islands (Boothia Peninsula) complex. No matter how this matter is dealt with, when a trinomial scientific name is used - two names must be used - or you would be deliberately presenting a misleading account and willingly forsaking scientific rigour and biological accuracy at the level of the current state of knowledge. That is, all of the measurements obtained for all of the taxonomic diagnostic characteristics from these caribou would not fall

within the extremes currently established for any one single subspecies. If a greater accuracy of identification (classification) is sought, it would require the listing of the two currently recognized subspecific forms and also the two other forms currently not recognized at the subspecific level for *Rangifer*.

Perhaps what best points out the weakness of using a "less-than-perfect" taxonomical system without also giving due thought to the specific situation at hand is that, if the matter was being debated in 1902, (when J.A. Allen (1902) classified, "A new caribou from "Ellesmereland" as *Rangifer pearyi*) the debate would have to start at the species level. The argument would be whether we had *Rangifer pearyi* or *Rangifer groenlandicus* (or *R. arcticus*) - or whether we had *R. pearyi*, and *R. groenlandicus*, and two other, then as yet, unidentified species[!] of *Rangifer*. Therefore, I believe that the current state of knowledge best supports the tentative conclusion that within the Prince of Wales-Russell-Somerset islands (Boothia Peninsula) complex there probably is one or more unique gene pool(s) that collectively exhibit(s) as many as four morphological forms of *Rangifer*.

Accordingly, I suggest that this inter-island/peninsula caribou population warrants protection (preservation) in its own right. This becomes especially important as essentially all of the caribou populations, particularly on the southern tier of Arctic Islands on the Canadian Arctic Archipelago, are hunted populations with different Inuit settlements dependent upon them. This condition means that preserving these caribou populations at low population levels is not truly satisfactory or necessarily feasible, particularly if the Inuit continue to exercise their "rights" to an essentially unrestricted harvest of caribou.

The best approach to the harvest management, with an equal emphasis on conservation and preservation of regional caribou "populations" on the Canadian Arctic Archipelago, is to maximize their protection through emphasising each caribou population's differences (and regional value to local people as a renewable resource) and minimizing their possible similarities until hard data indicates that on a biologically sound basis we should [must] do otherwise.

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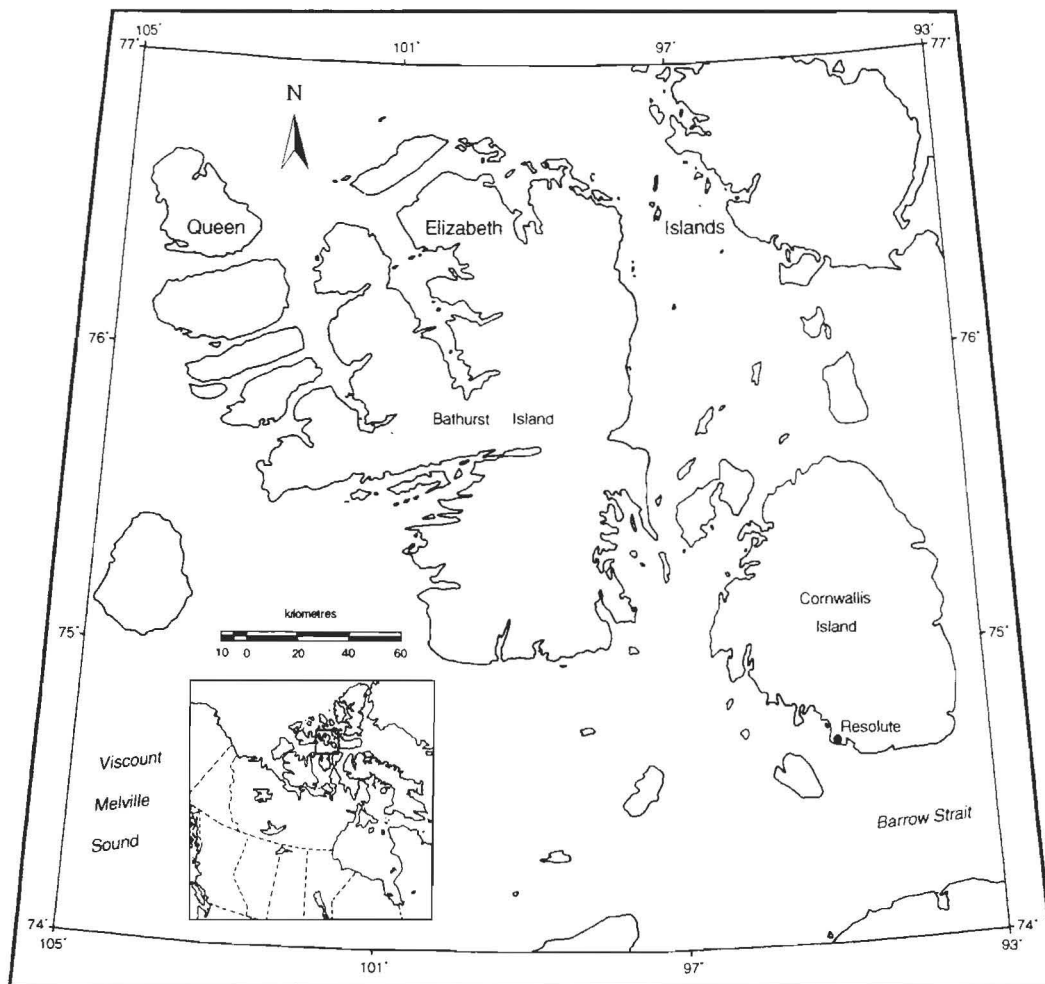


Figure 1. South-central Queen Elizabeth Islands: the major Island of Bathurst, the principle caribou hunting area in the Queen Elizabeth Islands used by Inuit from the settlement of Resolute on Cornwallis Island, Northwest Territories.

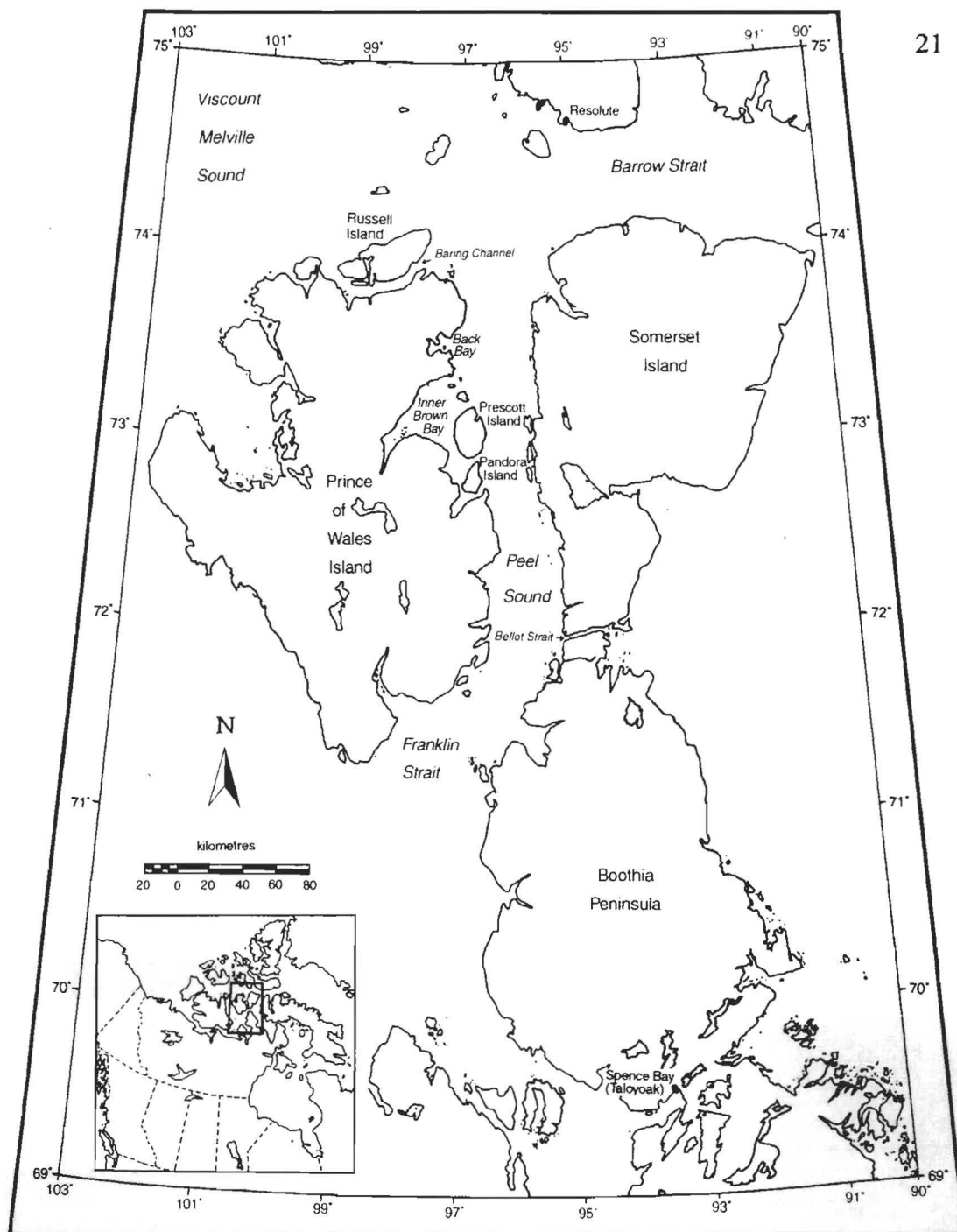


Figure 2. Prince of Wales, Russell, and Somerset islands and the Boothia Peninsula to Taloyoak (Spence Bay) at the isthmus between the Boothia Peninsula and the mainland, Northwest Territories.

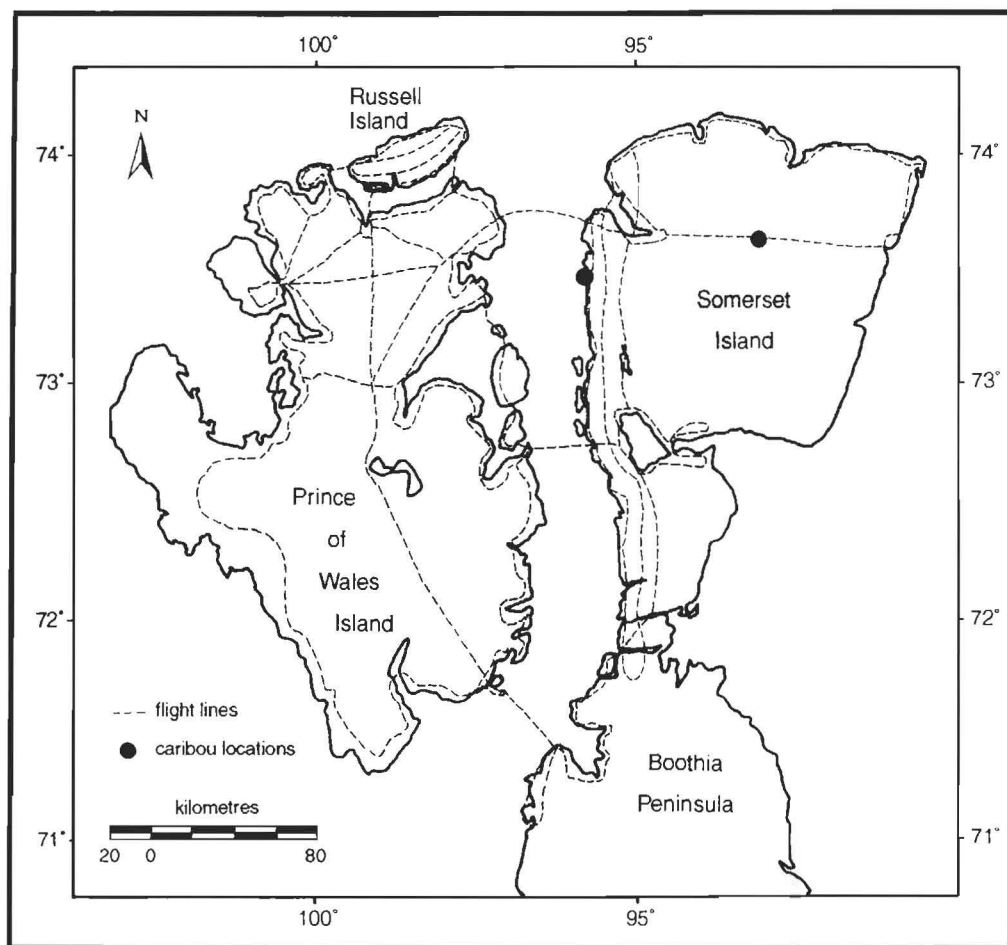


Figure 3. Flight paths for helicopter searches for caribou within the Prince of Wales-Russell-Somerset islands complex, Northwest Territories, 28 April-3 May 1996.

Appendix 1. Observations of muskoxen (*Ovibos moschatus*) within the Prince of Wales-Russell-Somerset islands complex, Northwest Territories, 28 April-3 May 1996

We made 136 sightings of 1013 muskoxen (mean number of muskoxen seen per observation 7.4 ± 0.55 SE, range 1-40) within the Prince of Wales-Russell-Somerset islands complex (and two sightings of four muskoxen [1 herd of 3 bulls and 1 single bull] on two northwestern coastal sites on the Boothia Peninsula) between 28 April and 3 May 1996 (Appendix 1: Tables 1-3). Over 98% (997) of the 1013 muskoxen occurred in 120 herds of two or more individuals each, with a mean herd size of 8.3 ± 0.58 SE, and a range of 2-40 animals per herd.

Nearly 96% (953) of those 997 muskoxen in herds were in 103 mixed sex/age herds (mean 9.2 ± 0.63 SE, range 2-40). Only 38% (39) of the 103 mixed sex/age herds had calves seen (detected) in them (Appendix 1: Tables 1-3). All of the calves seen appeared small, shorthaired, and awkward, indicating that they were recently dropped. Newborn calves represented ca. 6% (66) of all muskoxen counted (Appendix 1: Tables 1-3). Although I did not determine the sex/age of all of the 1+ yr-old members of each mixed sex/age herd, my impression was that there still were many cows that possibly could give birth later in May 1996 (if they had not already calved and lost their neonates at about the time of their calving). No dead muskox calves were seen, however, and only one dead cow was found (she was lying among a group of 16 1+ yr olds and 2 calves). Thus, it appeared most likely that calving had not yet peaked in early May 1996.

Bulls not associated with mixed sex/age herds were not numerous. Bulls in bull-only herds represented ca. 4% and single bulls only slightly more than 1% of all the muskoxen seen (Appendix 1: Tables 1-3). Although we did not always determine the total number of bulls in each mixed sex/age herd, I did not abandon our inspection of each mixed sex/age herd until it had been determined that there was at least one bull present in each of those herds.

Nearly 64% of the 1013 muskoxen seen were on Prince of Wales Island, 31% were on Somerset Island, and the remaining 5% were on Russell Island (Appendix 1: Tables 2-3). The proportion of mixed

sex/age herds with calves present was essentially the same, between Prince of Wales and Somerset islands (41% vs. 42%, respectively). No newborn calves were seen on Russell Island. Newborn calves represented ca. 6% (41) of the muskoxen seen on Prince of Wales Island and ca. 8% (25) of the muskoxen seen on Somerset Island ($\chi^2 = 0.78$, 1df; $P > 0.10$).

Bulls not associated with mixed sex/age herds were significantly overrepresented on Somerset Island compared to Prince of Wales Island where they were underrepresented and Russell Island where they occurred about as expected by chance alone ($\chi^2 = 14.73$, 2 df; $P < 0.005$). That significant difference resulted mainly from bulls in bull-only herds being significantly overrepresented on Somerset Island compared to Prince of Wales Island ($\chi^2 = 21.33$, 1df; $P < 0.005$: no bull-only herds were seen on Russell Island). There was no significant difference in the rate of occurrence for solitary bulls on Somerset Island vs. Prince of Wales Island ($\chi^2 = 0.45$, 1df; $P > 0.5$) but solitary bulls were proportionately overrepresented on Russell Island compared to on Somerset and Prince of Wales islands ($\chi^2 = 7.39$, 2df; $P < 0.025$).

Appendix 1: Table 1. Statistics for muskox social groupings, Prince of Wales-Russell-Somerset islands complex, Northwest Territories, 28 April-3 May 1996

Social groupings	Number of groups	Total muskoxen in herds	Mean herd size	\pm SD	\pm SE	Range
Mixed sex/age herds with calves	39	491	12.6	5.86	0.94	2-25
1+ yr-old muskoxen only		425	10.9	5.54	0.89	2-23
calves only		66	1.7	0.89	0.14	1-4
Mixed sex/age herds without calves	64	462	7.2	5.93	0.74	2-40
Bull-only herds	17	44	2.6	0.80	0.19	2-4
Solitary bulls	15	15				
Solitary cows	1	1				

Appendix 1: Table 2. Statistics for muskox social groupings by island, Prince of Wales-Russell-Somerset islands complex, Northwest Territories, 28 April-3 May 1996

Social groupings by island	Number of groups	Number of muskoxen	Mean group size	± SD	± SE	Range
Prince of Wales Island						
All mixed sex/age herds	63	619	9.8	6.87	0.87	2-40
Mixed sex/age herds with calves	26	316	12.2	5.53	1.08	2-25
Mixed sex/age herds without calves	37	303	8.2	7.31	1.20	2-40
Bull-only herds	6	15	2.5	0.84	0.34	2-4
Solitary bulls	9	9				
Solitary cows	1	1				
Total herds	69	634	9.2	6.89	0.83	2-40
Total observations	79	644	8.2	6.99	0.79	1-40

cont.

Appendix 1: Table 2. Continued

Social groupings by island	Number of groups	Number of muskoxen	Mean group size	± SD	± SE	Range
Somerset Island						
All mixed sex/age herds	31	286	9.2	6.02	1.08	2-25
Mixed sex/age herds with calves	13	175	13.5	6.63	1.84	2-25
Mixed sex/age herds without calves	18	111	6.2	3.05	0.72	2-13
Bull-only herds	11	29	2.6	0.81	0.24	2-4
Solitary bulls	3	3				
Total herds	42	315	7.5	5.94	0.92	2-25
Total observations	45	318	7.1	5.96	0.89	1-25

cont.

Appendix 1: Table 2. Continued

Social groupings by island	Number of groups	Number of muskoxen	Mean group size	± SD	± SE	Range
Russell Island						
All mixed sex/age herds	9	48	5.3	2.50	0.83	2-9
Mixed sex/age herds without calves	9	48	5.3	2.50	0.83	2-9
Solitary bulls	3	3				
Total herds	9	48	5.3	2.50	0.83	2-9
Total observations	12	51	4.2	2.90	0.96	1-9

cont.

Appendix 1: Table 3. Summary of individual muskox observations, Prince of Wales-Russell-Somerset islands complex, Northwest Territories, 28 April-3 May 1996

Individual observations by island	Mixed sex/age				
	Mixed sex/age herd with calves			herds without calves	Bull-only herds
	1+ yr olds	Calves	All members		
Prince of Wales	1	1	2	2	2
(plus 10 solitary individuals:	5	1	6	3	2
9 bulls and 1 cow)	6	1	7	3	2
	6	1	7	3	2
	7	1	8	4	3
	8	1	9	4	4
	8	1	9	4	
	9	1	10	4	
	10	1	11	5	

cont.

Appendix 1: Table 3. Continued

Individual observations by island	Mixed sex/age herd with calves			Mixed sex/age herds without calves	Bull-only herds
	1+ yr olds	Calves	All members		
Prince of Wales continued	12	1	13	5	
	12	1	13	5	
	12	1	13	5	
	13	1	14	5	
	17	1	18	5	
	18	1	19	5	
	4	2	6	6	
	6	2	8	6	

cont.

Appendix 1: Table 3. Continued

Individual observations by island	Mixed sex/age herd with calves			Mixed sex/age herds without calves	Bull-only herds
	1+ yr olds	Calves	All members		
Prince of Wales continued	6	2	8	6	
	8	2	10	6	
	10	2	12	6	
	13	2	15	7	
	16	2	18	7	
	19	2	21	7	
	23	2	25	7	

cont.

Appendix 1: Table 3. Continued

Individual observations by island	Mixed sex/age herd with calves			Mixed sex/age herds without calves	Bull-only herds
	1+ yr olds	Calves	All members		
Prince of Wales continued	9	4	13	8	
	17	4	21	8	
				8	
				9	
				9	
				9	
				10	
				11	
				11	
				11	

cont.

Appendix 1: Table 3. Continued

Individual observations by island	Mixed sex/age herd with calves			Mixed sex/age herds without calves	Bull-only herds
	1+ yr olds	Calves	All members		
Prince of Wales continued				19	
				30	
				40	
Somerset	2	1	3	2	2
(plus 3 single bulls)	4	1	5	3	2
	7	1	8	3	2
	16	1	17	4	2
	17	1	18	4	2
	5	2	7	5	2
	8	2	10	5	3
	9	2	11	5	3
	14	2	16	5	3

cont.

Appendix 1: Table 3. Continued

Individual observations by island	Mixed sex/age herd with calves			Mixed sex/age	
	1+ yr olds	Calves	All members	herds without calves	Bull-only herds
Somerset continued	23	2	25	5	4
	13	3	16	6	4
	15	3	18	6	
	17	4	21	6	
				8	
				9	
				11	
				11	
				13	
Russell				2	
(plus 3 single bulls)				3	
cont.					

Appendix 1: Table 3. Continued

Individual observations by island	Mixed sex/age herd with calves			Mixed sex/age herds	Bull-only herds
	1+ yr olds	Calves	All members	without calves	
Russell continued				4	
				4	
				5	
				5	
				7	
				9	
				9	