



SPACE USE AND MOVEMENT PATTERNS OF NORTH BAFFIN CARIBOU

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Barren-ground caribou are an important game species and Inuit hunters in 6 communities historically harvested caribou across the north western portion of Baffin Island. There is little documented information on the caribou population(s) in this area and community consultation in Igloolik, Hall Beach, Pond Inlet, and Clyde River has provided meaningful current local knowledge on caribou occurrence and movement, but also, input on program design and implementation. Collar deployment will occur across northern Baffin Island, centering on a concentration of lakes south of the Mary River mine site. Up to 30 GPS collars will be deployed on adult female caribou in March/April 2008. Only one female per group will be collared and samples, including feces and hair, will be collected. This GPS based collaring program is well suited for remotely tracking caribou movements and space use with limited disturbance to the animals.

Introduction:

The spatial and temporal organization of animals is central to the understanding of wildlife ecology. Population dynamics are directly linked to the spatial arrangement and movement of individuals and the knowledge of these spatial dimensions provide the foundation for management decisions. Little information has been documented about the caribou herd(s) in north Baffin. A review of historical information by Hall (1980) highlights the almost exclusive focus of studies on south and central Baffin Island. For example, a south Baffin caribou survey in 1960 included only one flight line along the Gifford River to the Inuktorfik and Angajurjualuk Lake area in North Baffin. A concentration of caribou in the lakes area was noted. Rippin (1972) also reported that the core of north Baffin caribou inhabited the Steensby Inlet-Inuktorfik Lake area. Rippin suggested that this herd moved to the Ravn River drainage area to calve and may have divided into groups which moved south to Steensby Inlet and north, northwest towards Tay Sound and Milne Inlet. Further, in a 1974 ITK Land Use and Occupancy Study, hunters and elders for communities across Qikiqtalluk described seasonal ecological patterns for caribou herds. In general, they identified separate herds in north and south Baffin but indicated the likely mixing or aggregation of the two groups in centrally located grouping and calving areas. It appears that scientific research has been proposed for north Baffin Island on a few occasions; however, the reallocation of funding and limited resources have left the area devoid of basic wildlife information. No population surveys have ever been conducted in north Baffin and only one preliminary nonsystematic calve survey was completed in 1997. The survey, although limited, provides evidence of calving in the lakes area (Figure 1) which is currently being investigated for mining (Figure 2).

Satellite telemetry can provide a cost-effective means of remotely monitoring the movement, space use and resource selection patterns of wildlife populations (Gunn and Fournier 2000, Erickson et al. 2001). Because north Baffin caribou may be wide ranging and mix with other herds on occasion, GPS collars are

necessary to delineate herds, identify their locations, and inform the spatial dimensions for the collection of fundamental information such as population size. Consultation with communities and the HTOs strengthens the program, providing valuable input on program design but also opportunities to expand the program through local participation.

Objectives:

- 1) Advance a meaningful consultation and information sharing program with local communities, specifically, Pond Inlet, Arctic Bay, Clyde River, Igloolik, Hall Beach, and Qikiqtarjuaq.
- 2) Develop a long-term satellite collaring program to:
 - determine the number of distinct populations or herds in the North Baffin.
 - to locate caribou herds for population surveys
 - to identify space use and movement patterns of caribou through time.
 - to characterize the nature of caribou range expansion, contraction, and shifting
 - identify hot spots of caribou use.
- 3) Collect baseline information on caribou condition, winter diet, and genetic variation and relatedness.

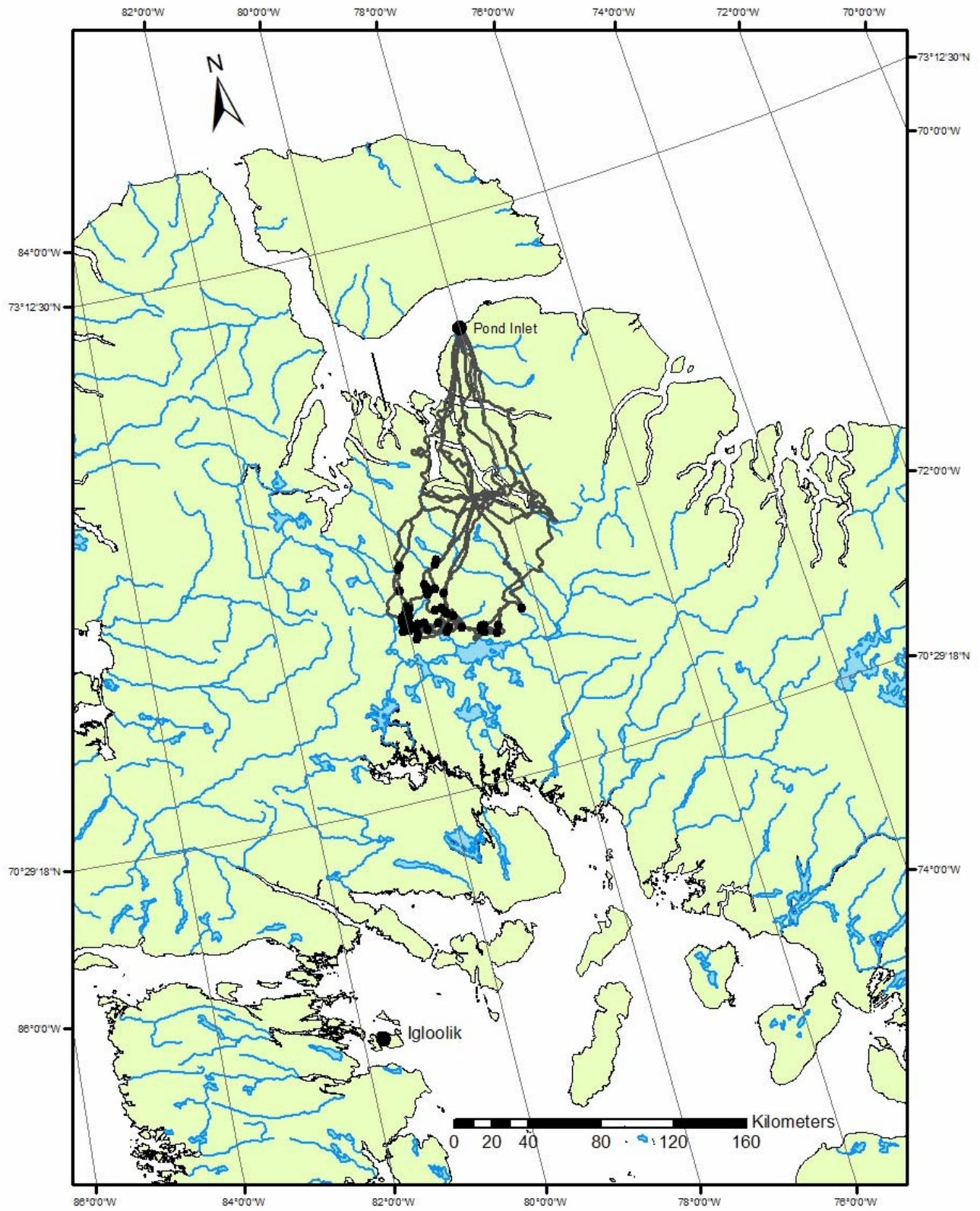


Figure 1: Calf locations and flight route 1997.



Figure 2: Mary River Mine Site and potential transportation routes.

Study Area: The study area is located on north Baffin Island (72°0'N 80°0'W), south from Pond Inlet to Steensby Inlet. The lakes area, just south of the Mary River Mine site, is a focal point (Figure 2).

Project Design: This is a multi-year project that utilizes standard scientific methods and IQ to obtain pertinent information that will be analyzed using both conventional and novel approaches.

Through a series of community meetings both historical and current information on caribou ecology and their seasonal distribution was collected. This information has been used to finalize the deployment schedule and the spatial extent of the study area. Deployment will occur in March/April 2008

GPS Collar

The TGW-3580 GPS collar with an automatic release (CR-2) and partial cast will be used for the North Baffin caribou collaring program. It is a store-on-board unit with an Argos uplink, and VHF beacon.

These light-weight GPS collars will be placed on up to 30 caribou in the northern region of Baffin Island with a focus on the lakes area south of Mary River (71° N, 79° W). The unit collects location data (latitude and longitude) with good precision (+/- 15 m) that is stored within the unit but also transmitted every 3 days for a 5 hour period using the Argos data collection system (DCLS). Specifically, information is transferred directly to the Argos DCLS on board the NOAA polar orbiting satellites. This allows access to the data while the collars are still active and secured to the caribou.

Collar Size

In order to determine collar size, neck circumference data, for female caribou capture between April 1987 and May 1993 in the southern region of Baffin Island were analyzed (n=75, Figure 3). This represents the best available information for the area.

Seventy nine (79) percent of the neck measurements occurred between 15.00 and 19.99 inches, with 28% of these occurring between 17.00 and 17.99 inches. Only one caribou, a yearling, occurred within the smallest category. Mean neck circumference for adult female caribou was 17.31 inches (n=74).

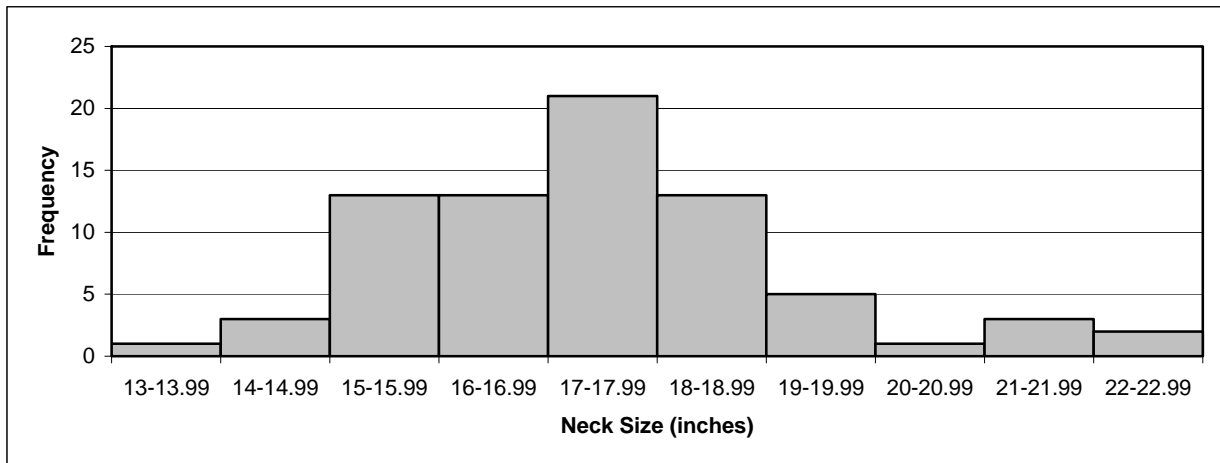


Figure 3. Neck circumference of 75 female caribou, Baffin Island, Nunavut.

Because the GPS collars have +/- 2 inches of adjustment around their center point, 2 collar sizes were necessary to capture the reported variation in adult female neck circumference. Twenty-five collars were ordered with a center point of 17.5 inches and a collar adjustment of 15.5 to 19.5; 5 additional collars will have a center point of 20.5 inches and an 18.5 to 22.5 inch adjustment.

Collar Life

Lifetime estimates for collars were provided by Telonics based on a deployment date of April 1, 2008. Given a GPS collection schedule of 2 fixes per day (one every 11 hours) and a 5 hour Argos uplink every 3 days (see above) the projected end-of life for the collars is 12 September 2010.

The VHF duty cycle, programmed at 7 hours on / 17 hours off, and 1714 msec/ 35 BPM (unsuccessful) and 1200 msec/50 BPM (successful) provides an estimated end-of-life date of October 2011 at -20 ° C and October 2010 at -40° C (50 BMP). This should permit the VHF component to operate beyond the GPS life and facilitate collar retrieval.

Reconnaissance Survey

A reconnaissance survey will begin prior to deployment and continue in parallel with deployment effort to improve efficiencies and collaring success (Figure 4). This is important due to limited distribution data on north Baffin caribou and the current low density of caribou, as reported by HTOs.

North Baffin Caribou: Reconnaissance Survey - Area & Fuel Caches

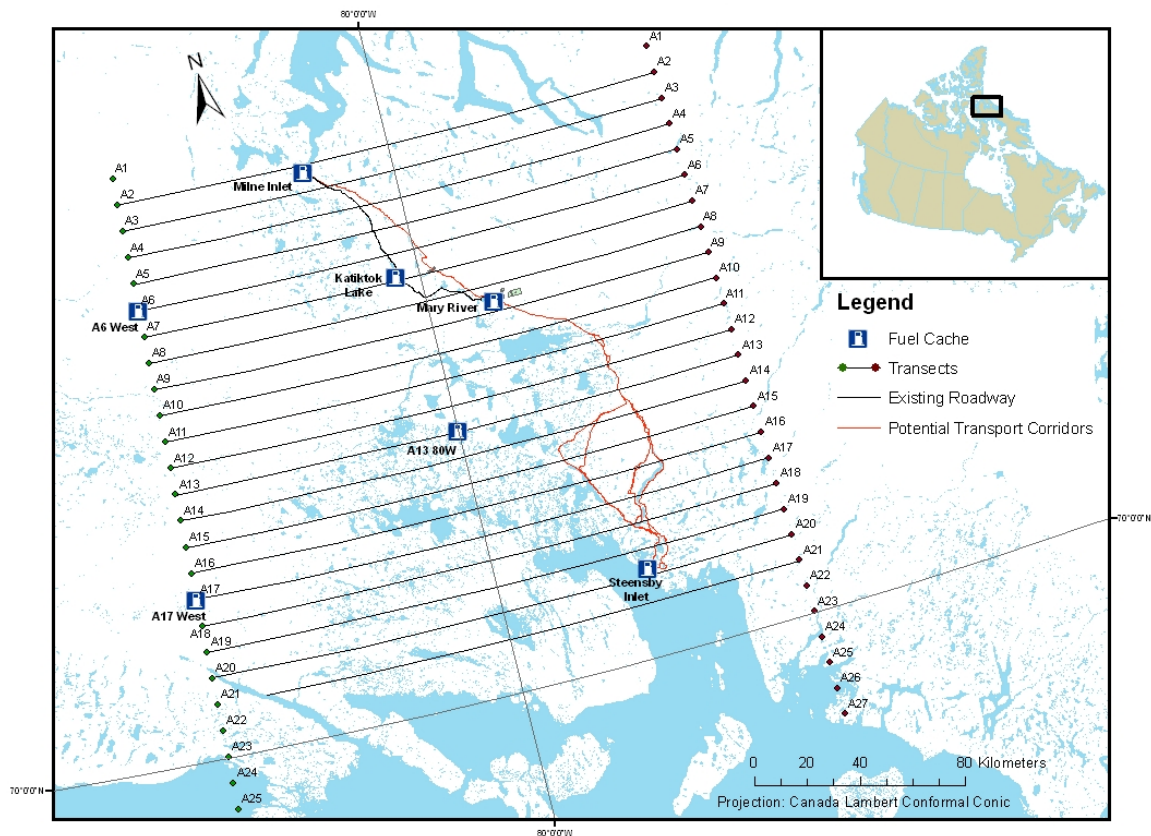


Figure 4: Survey transects and proposed fuel cache locations

Using a net gun, caribou will be captured from a turbo helicopter. A collar will be fitted to the animal once it is hobbled and blindfolded. Data, including body condition, size, tooth wear and location, will be recorded. Handling will be limited to less than 10 minutes; restraints removed and the animal released.

Five to ten collars may be added in 2009 and 2010, to provide a sufficient sample for each herd(s). This multi-year approach ensures the deployment of sufficient collars, adequate representation of the north Baffin herd or herd(s), and data collection over an ecologically meaningful time frame.

Data Analysis

ARGOS will provide location data on CD's to the Department of Environment on a monthly basis. The data will be evaluated in a GIS system and used to delineate space use and movement using both conventional and novel methods. Kernel based home range estimators (Fixed or Adaptive) will be used to determine annual, seasonal and core ranges. As well, site fidelity will be

explored and will encompass the evaluation of movement, including 1) migration (round-trip movement of individuals between two or more areas), 2) dispersal (one way movement away from an area that has been occupied for some time), and 3) localized movement (daily movement patterns of an individual). Resource selection will also be evaluated at multiple spatial scales using the Euclidean distance method (Conner and Plowman 2001, Jenkins 2005).

Novel approaches to characterize ecological patterns through space and time, have also been developed and will be used for spatially explicit investigations of the GPS caribou location data. These methods may include the space-time string (STS: Nelson *et al.* in press) which can be used to characterize the temporal use of habitat by caribou (i.e. identifying hot-spots of use: Nelson and Boots, 2005), and the spatial-temporal analysis of moving polygons (STAMP: designed for quantifying temporal changes in the range of moving phenomena i.e. range expansion and contraction).

Through the identification of spatial patterns, resource use and selection patterns can be determined. This information is necessary to identify critical habitat and to assess the potential impacts of development. All data will provide a baseline against which all new information can be measured.

Management Implications:

Project results will be documented in a Government of Nunavut file report and will lead to the development of an IQ- and scientific-based management plan for North Baffin Caribou. As well, the delineation of populations and herds through the analysis of space use patterns and genetics will help refine population boundaries. In combination, our results will be used to evaluate and manage industrial development, assess the requirement for Total Allowable Harvest and Non-Quota Limitations, and inform conservation measures.

Community Consultation and Reporting:

Consultation with HTOs in Igloolik, Hall Beach, Clyde River, and Pond Inlet, occurred in September and October 2007. Meetings in Qikiqtarjuaq and Arctic Bay had to be rescheduled for Jan/feb 2008, due to poor weather and flight cancellations.

Interim reports, news letters, and maps will be provided to participating communities to document progress and initial results. Community workshops will be conducted in order to discuss and interpret results. All display material and verbal communication will be translated to ensure understanding and informed debate. A DoE file report will follow the completion of all phases of this project, and the results published in a peer reviewed journal(s).

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