# ALL ABOUT ICE: PEARY CARIBOU MOVEMENTS IN THE BATHURST ISLANDS COMPLEX

Report done by the Department of Environment, Government of Nunavut

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## Highlights

*Take home message:* **The multi-year-round monitoring of Peary caribou indicates that Cameron Island hosted the majority of wintering animals of the Bathurst Island Complex, while calving areas are much wider than previously thought and cover new areas; inter-island movements between calving and wintering areas follow times when the highest quality and concentration of fast sea ice is present.**

**Background**

Since the last 5 decades, Bathurst Island Complex (BIC; 76°N-99°W) in the High Canadian Arctic is the theater of several surveys and ecological studies focused on Peary caribou (PC). This is a subspecies of *Rangifer tarandus*, classified as *Endangered* under Schedule 1 of the *Species at Risk Act*. While being considered for the establishment of a future national park, BIC is also of interest to the Mining Association of Canada due to high mineral and energy potential. Peary caribou are an important component of the Arctic ecosystem and the BIC a traditional harvesting area for the community of Resolute Bay (Cornwallis Island). Despite past monitoring efforts in this remote environment, how PC use this region year-round is still largely unclear as most information on distribution is confined to summer. Here we analyzed year-round movements of seven satellite tagged female PC from 2003-2006, as indicators of 7 seven different groups. Given the very low density in BIC, this sample is a significant proportion of the total BIC population. Our aim was to understand the seasonal use of the BIC and to track the paths across BIC islands, a small-scale perspective of the archipelago-type range.

**Methodology/Principal Findings**

Calving areas appeared much extensive than previously thought (up to 2 time larger), even when considering the core of PC home ranges. These new areas covered most of the north-east of the Bathurst Island and also occurred on one island not previously known for calving (Vanier Island); the area amounts to a third of the BIC surface.

Over the years, PC showed high fidelity to both calving and winter home ranges. All but two PC wintered on Cameron Island at the northwest tip of the BIC. These two females are also the only ones using the south portion of Bathurst Island. In terms of island use, Cameron Island hosted the majority of all locations from October to March for all years (Figure 5). Over the years, PC showed high fidelity to both calving and winter home ranges. All but two PC wintered on Cameron Island at the northwest tip of the BIC. These two females are also the only ones using the south portion of Bathurst Island. In term of island use, Cameron Island hosted the majority of all locations from October to March for all years.

Overall, the satellite tracks showed evidence that PC used most if not all islands of the BIC. Similar to previous studies located in other parts of PC range, the majority of individuals (5 of the 7 tagged) performed inter-island movements within BIC. The straight –line crossing distances ranged from 1-32 km (95% confidence interval, median=7 km). Such distances are well in the range of the first evidence of inter-island movements between Melville and Prince Patrick Islands (Northwest Territories and Nunavut) (Miller et al. 2005). While PC from BIC could perform the traveling distances needed for connecting to other regions of the High Arctic (e.g. Cornwallis ~10 km - or Melville ~ 37 km), none did such extensive dispersal during the study. Inter-island movements within BIC are shorter than random expectations, suggesting a selection for short between-island paths. Though long water crossings by PC have been recorded, most of the inter-island paths occurred during the period and in the area of the highest quality and concentration of fast ice. Overall, the peaks in movement correspond with travel to winter and spring/summer ranges.

**Conclusion/Significance**

The present study provides an additional piece in the puzzles of population dynamics and space use of an endangered mammal, relying on sea ice to complete its life cycle. Given warming climate scenarios and declining trends in PC, large and long-term approaches are needed to understand the connectivity between wintering and calving areas.

## Key-words

Home range, Peary Caribou, low density, calving areas, sea ice, telemetry, Cameron Island

## Acknowledgements

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-Nunavut Wildlife Management Board support and funding

-Habitat Stewardship Program

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-The Polar Continental Shelf Project (PCSP) for the strong and critical logistical support

-Parcs Canada

-F. Miller (Northwest Territories)

-All the numerous field crew without all this could not have been achieved

-Community consulted: Grise fjord, Resolute, Cambridge Bay

**Table 1.** Area (in km sq.) occupied by islands of the Bathurst Islands Complex, Nunavut, Canada.

| **Island name** | **Area (km sq.)** | **% of Total** |
|---|---|---|
| Bathurst | 16,030 | 81.6 |
| Cameron | 1,066 | 5.4 |
| Vanier | 1,136 | 5.8 |
| Alexander | 484 | 2.5 |
| Massey | 436 | 2.2 |
| Helena | 328 | 1.7 |
| Unnamed Bracebridge Inlet | 88 | 0.4 |
| Isle Marc | 57 | 0.3 |
| Loney | 19 | 0.1 |
| Total | 19,644 | 100.0 |

- All area calculations were completed in North Pole Lambert Azimuthal Equal Area and centered on the specific island group (CM101W; LoO75.833N projection specifics, WGS1984 datum).

## Figures

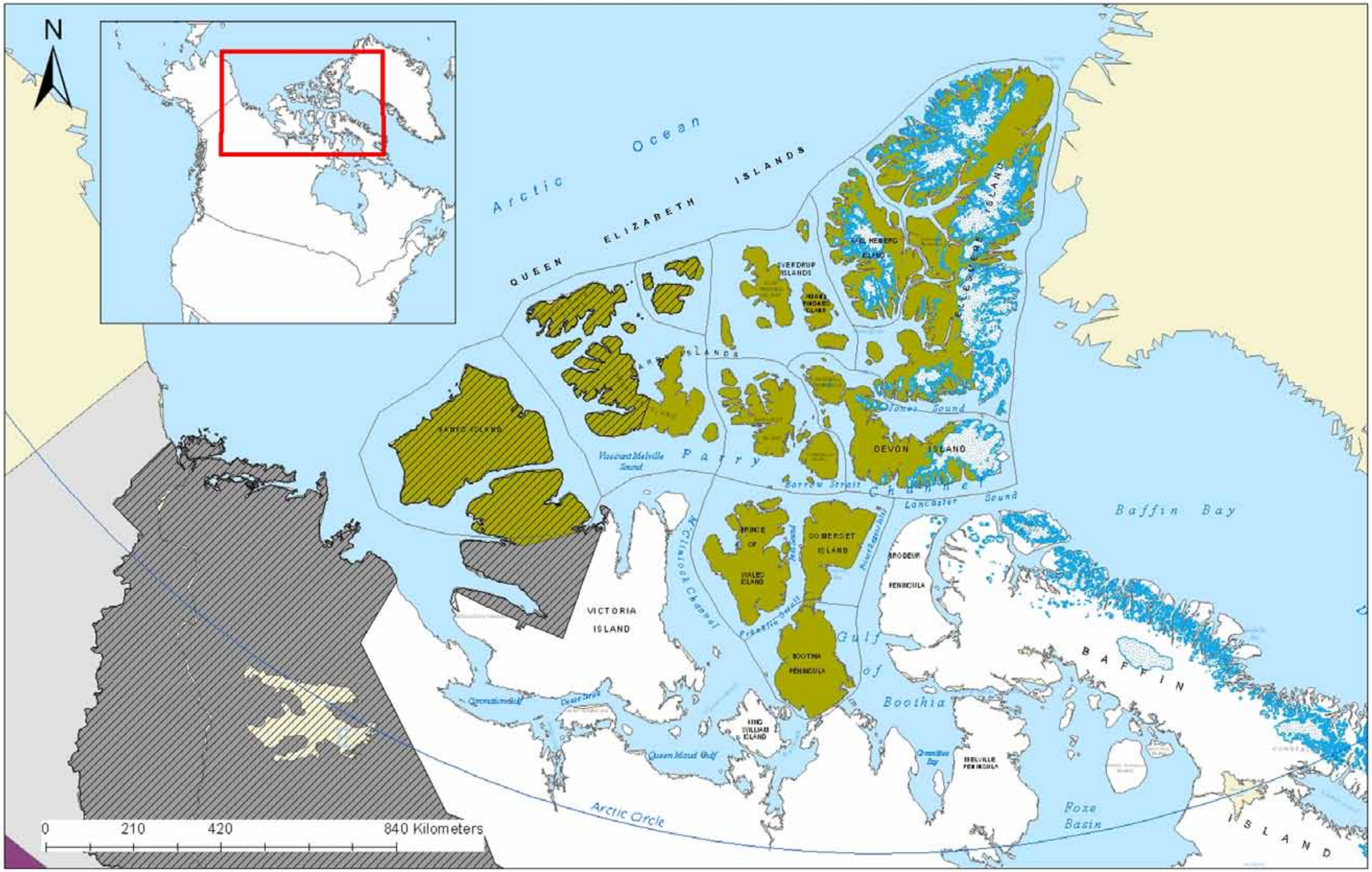
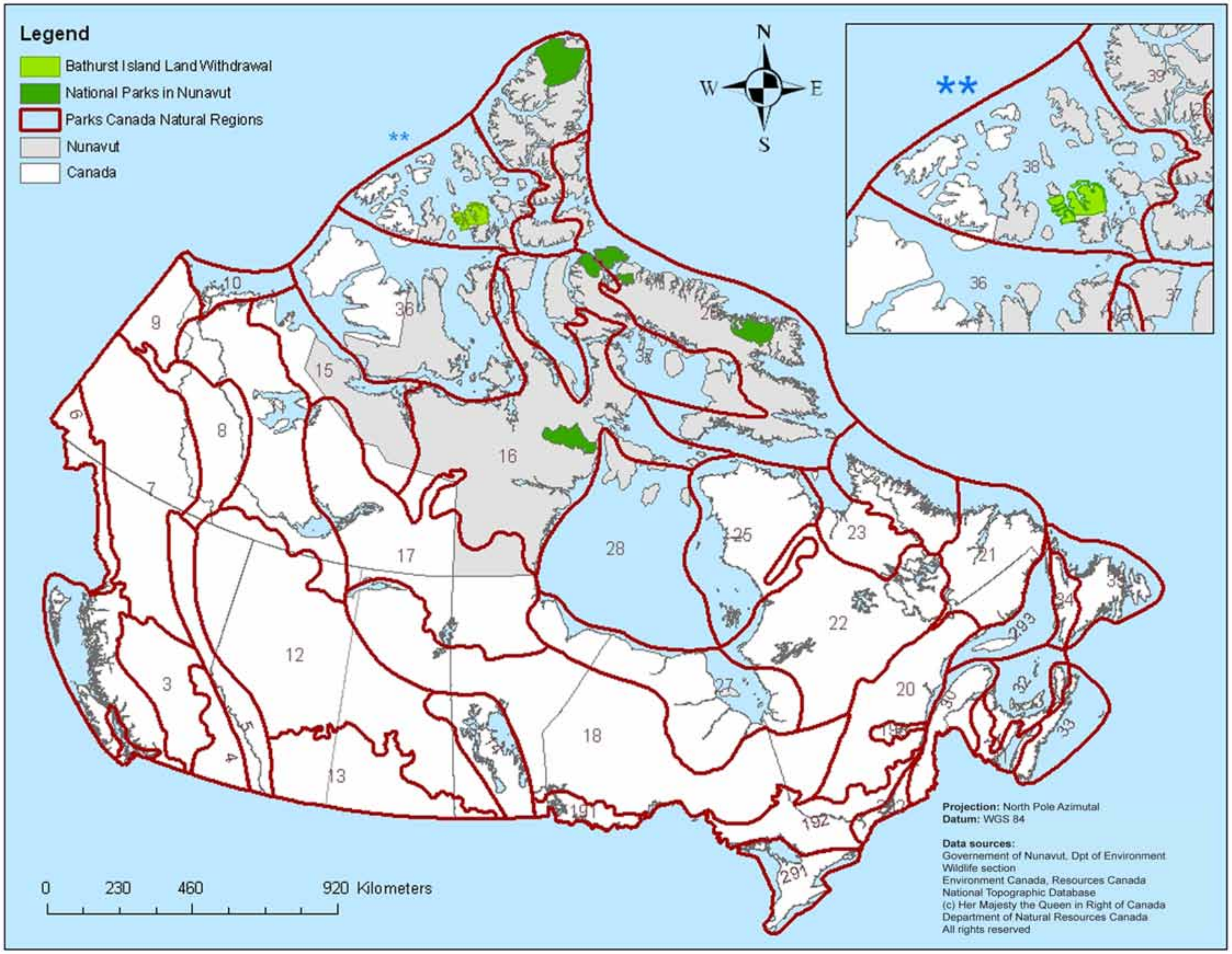

N
Arctic Ocean
QUEEN ELIZABETH ISLANDS
Baffin Bay
Parry Channel
Viscount Melville Sound
Barrow Strait
Lancaster Sound
Jones Sound
DEVON ISLAND
VICTORIA ISLAND
SOMERSET ISLAND
BOOTHIA PENINSULA
Gulf of Boothia
M'Clintock Channel
Queen Maud Gulf
Arctic Circle
Foxe Basin
BAFFIN ISLAND
0
210
420
840 Kilometers

**Figure 1.**


Legend
Bathurst Island Land Withdrawal
National Parks in Nunavut
Parks Canada Natural Regions
Nunavut
Canada
N
W
E
S
**
0 230 460 920 Kilometers
Projection: North Pole Azimutal
Datum: WGS 84
Data sources:
Governement of Nunavut, Dpt of Environment
Wildlife section
Environment Canada, Resources Canada
National Topographic Database
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Department of Natural Resources Canada
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**Figure 2.**

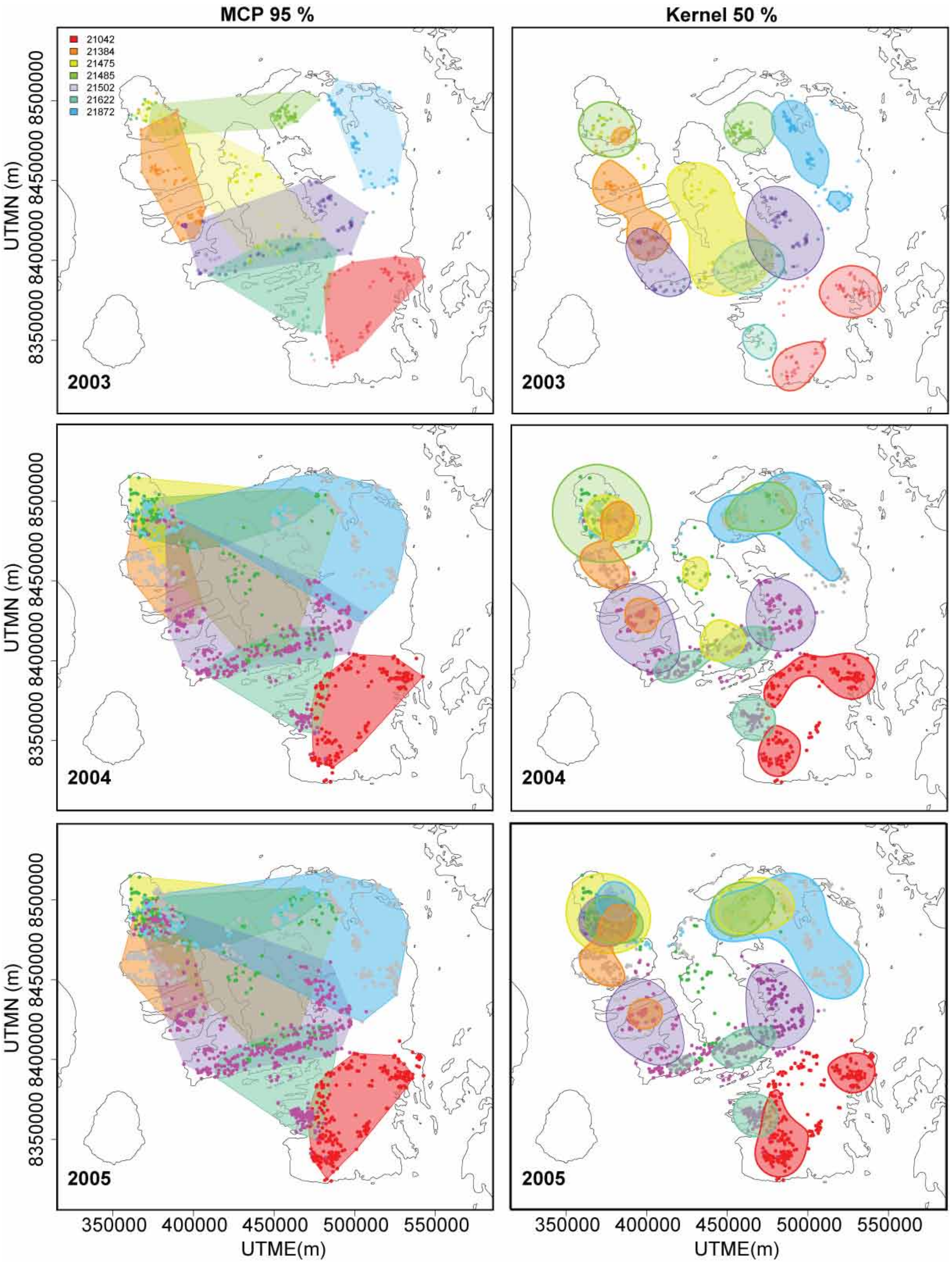

MCP 95 %
Kernel 50 %
21042
21384
21475
21485
21502
21622
21872
UTMN (m)
8350000 8400000 8450000 8500000
2003
2004
2005
350000 400000 450000 500000 550000
UTME(m)

**Figure 3.**

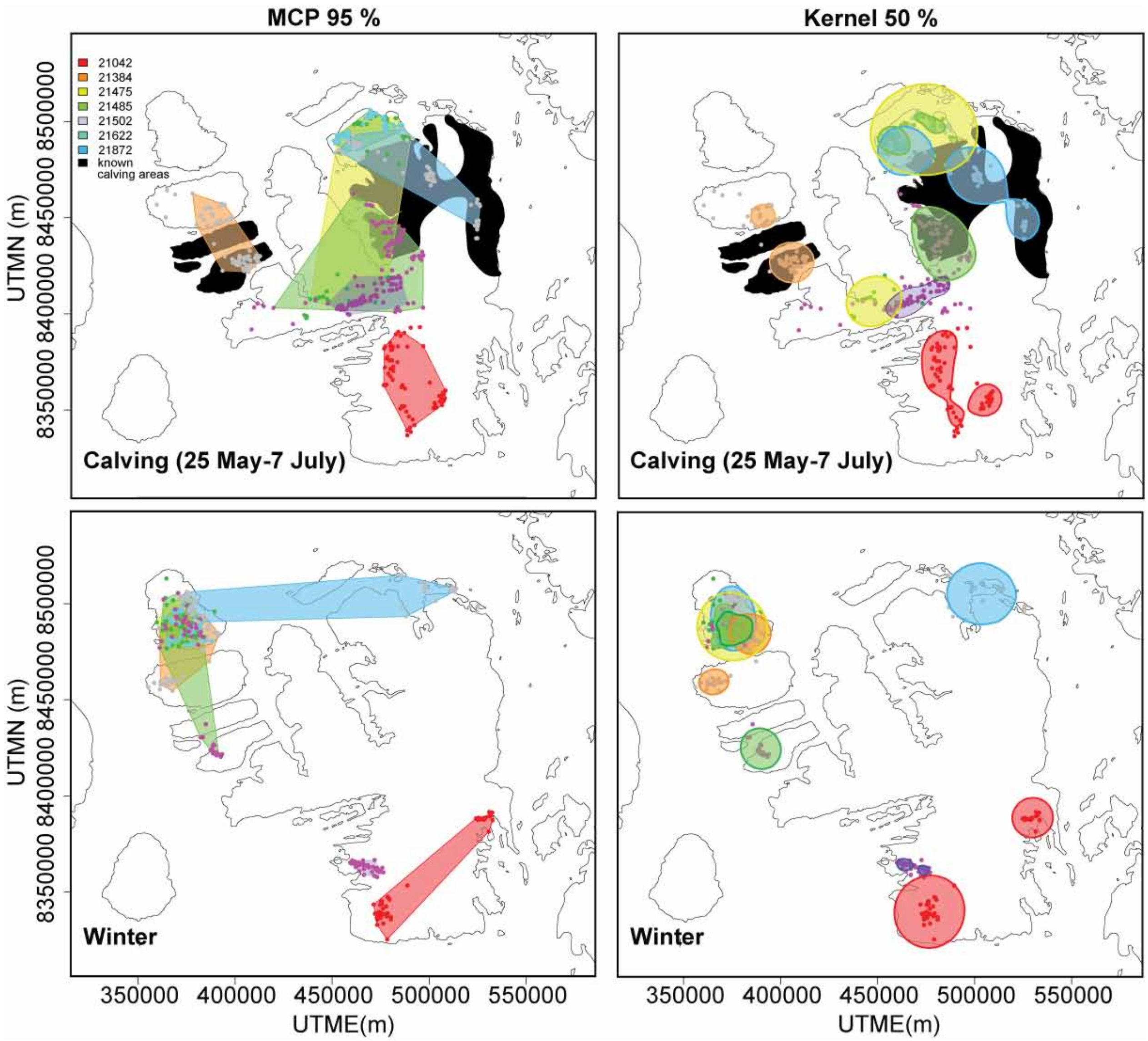

MCP 95 %
Kernel 50 %
21042
21384
21475
21485
21502
21622
21872
known calving areas
UTMN (m)
8350000 8400000 8450000 8500000
Calving (25 May-7 July)
Calving (25 May-7 July)
Winter
Winter
350000 400000 450000 500000 550000
UTME(m)

**Figure 4.**

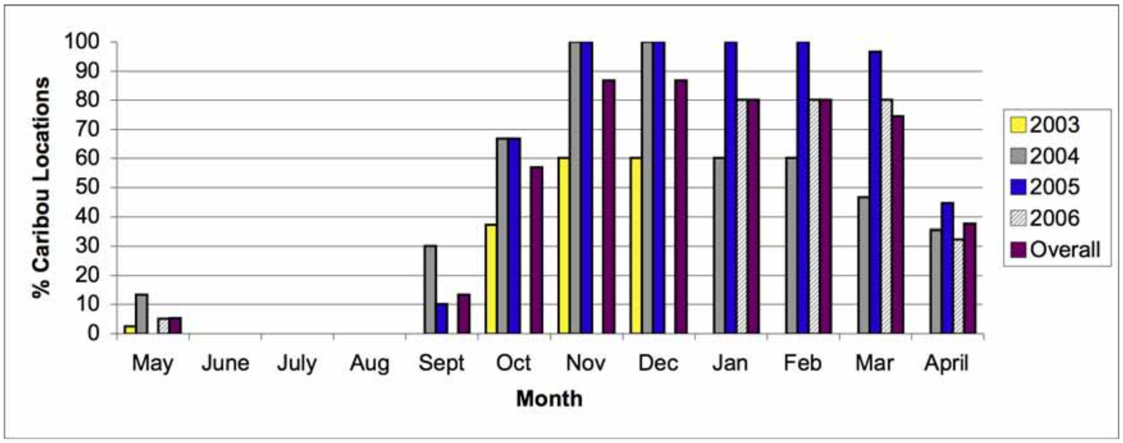

100
90
80
70
60
50
40
30
20
10
0
% Caribou Locations
May
June
July
Aug
Sept
Oct
Nov
Dec
Jan
Feb
Mar
April
Month
2003
2004
2005
2006
Overall

**Figure 5.**

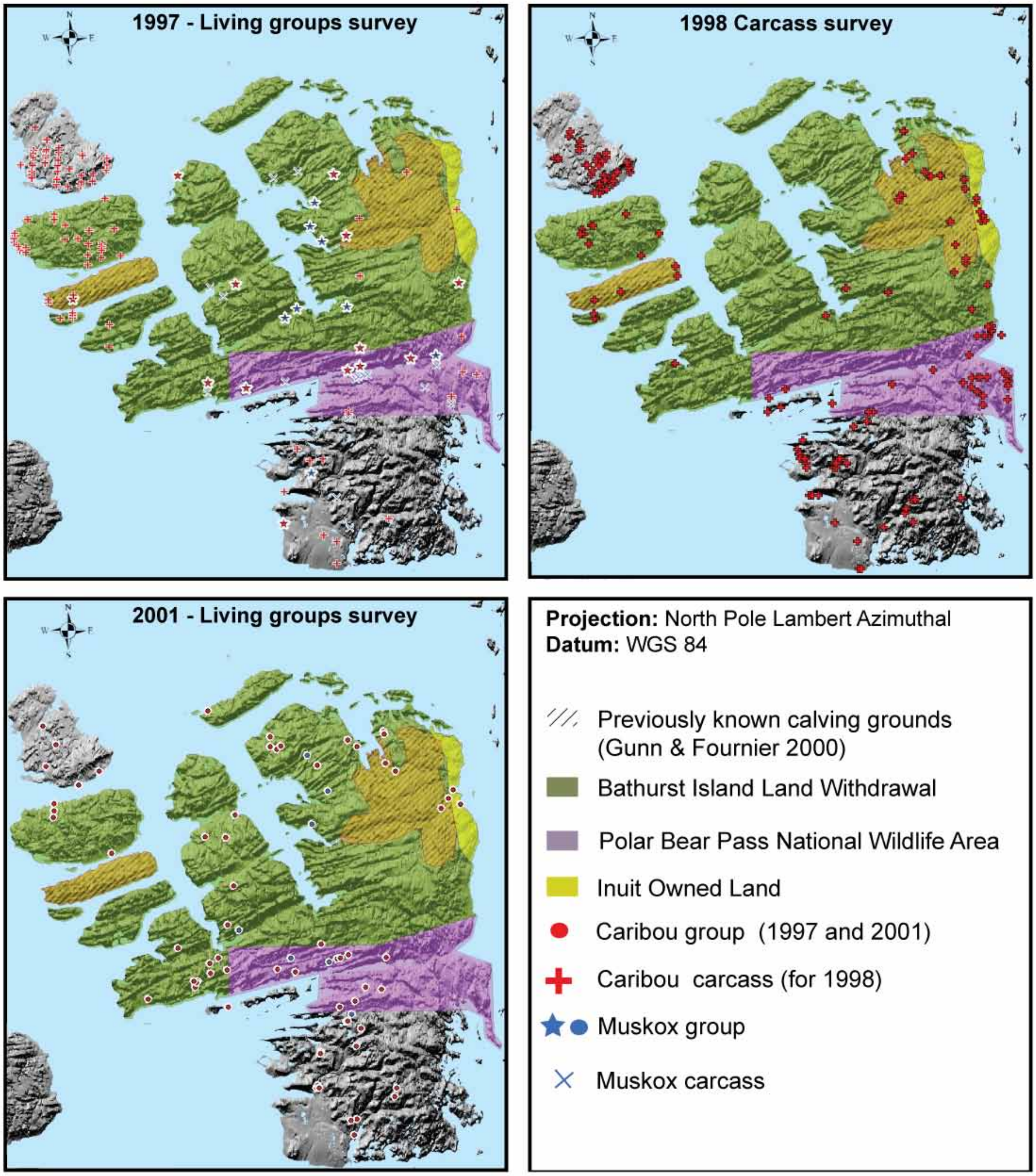

1997 - Living groups survey
1998 Carcass survey
2001 - Living groups survey
Projection: North Pole Lambert Azimuthal
Datum: WGS 84
Previously known calving grounds (Gunn & Fournier 2000)
Bathurst Island Land Withdrawal
Polar Bear Pass National Wildlife Area
Inuit Owned Land
Caribou group (1997 and 2001)
Caribou carcass (for 1998)
Muskox group
Muskox carcass

**Figure 6.**

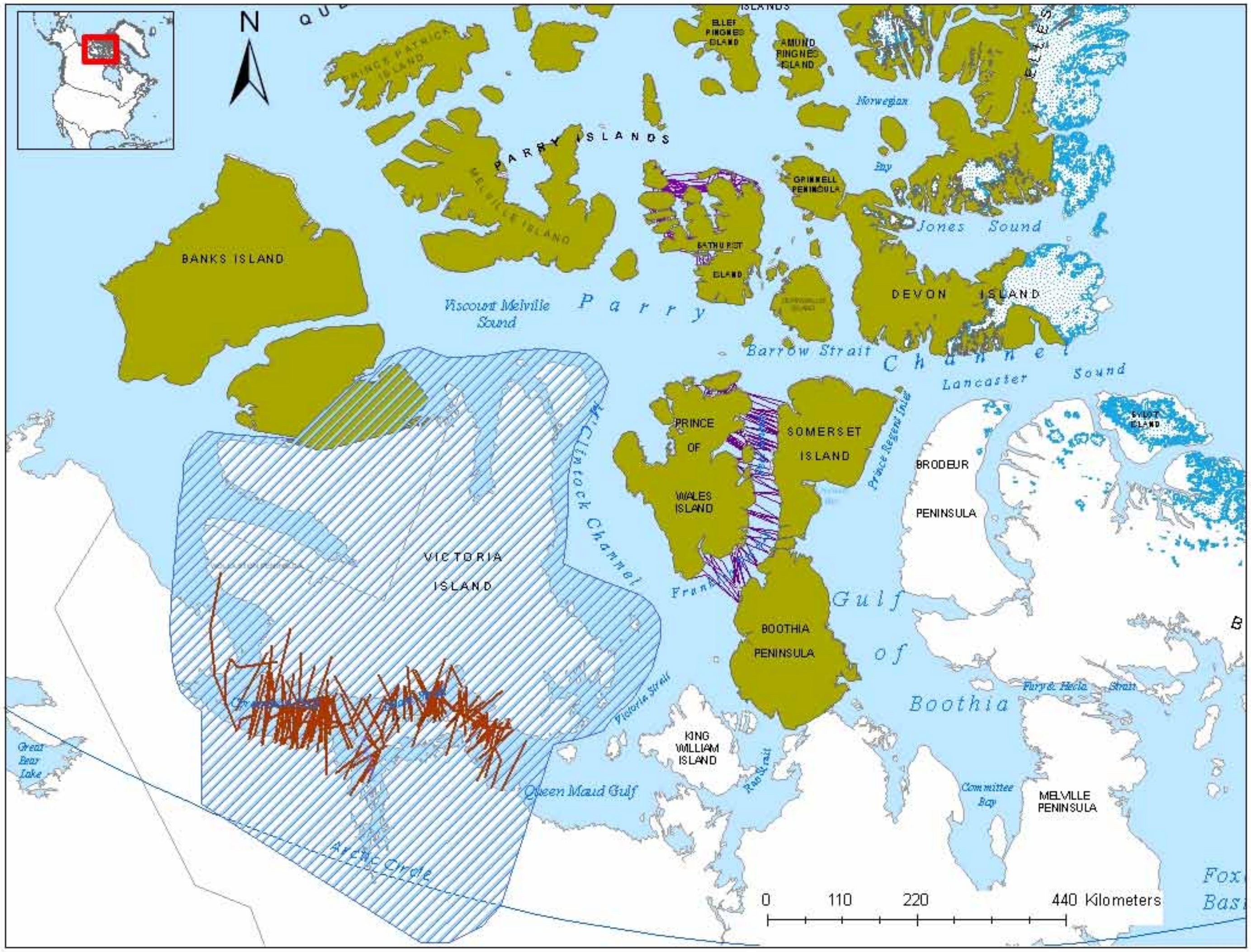

N
BANKS ISLAND
PARRY ISLANDS
DEVON ISLAND
PRINCE OF WALES ISLAND
SOMERSET ISLAND
BRODEUR PENINSULA
VICTORIA ISLAND
BOOTHIA PENINSULA
KING WILLIAM ISLAND
MELVILLE PENINSULA
Viscount Melville Sound
Parry Channel
Barrow Strait
Lancaster Sound
Jones Sound
Gulf of Boothia
Queen Maud Gulf
Committee Bay
Arctic Circle
0 110 220 440 Kilometers

**Figure 7.**

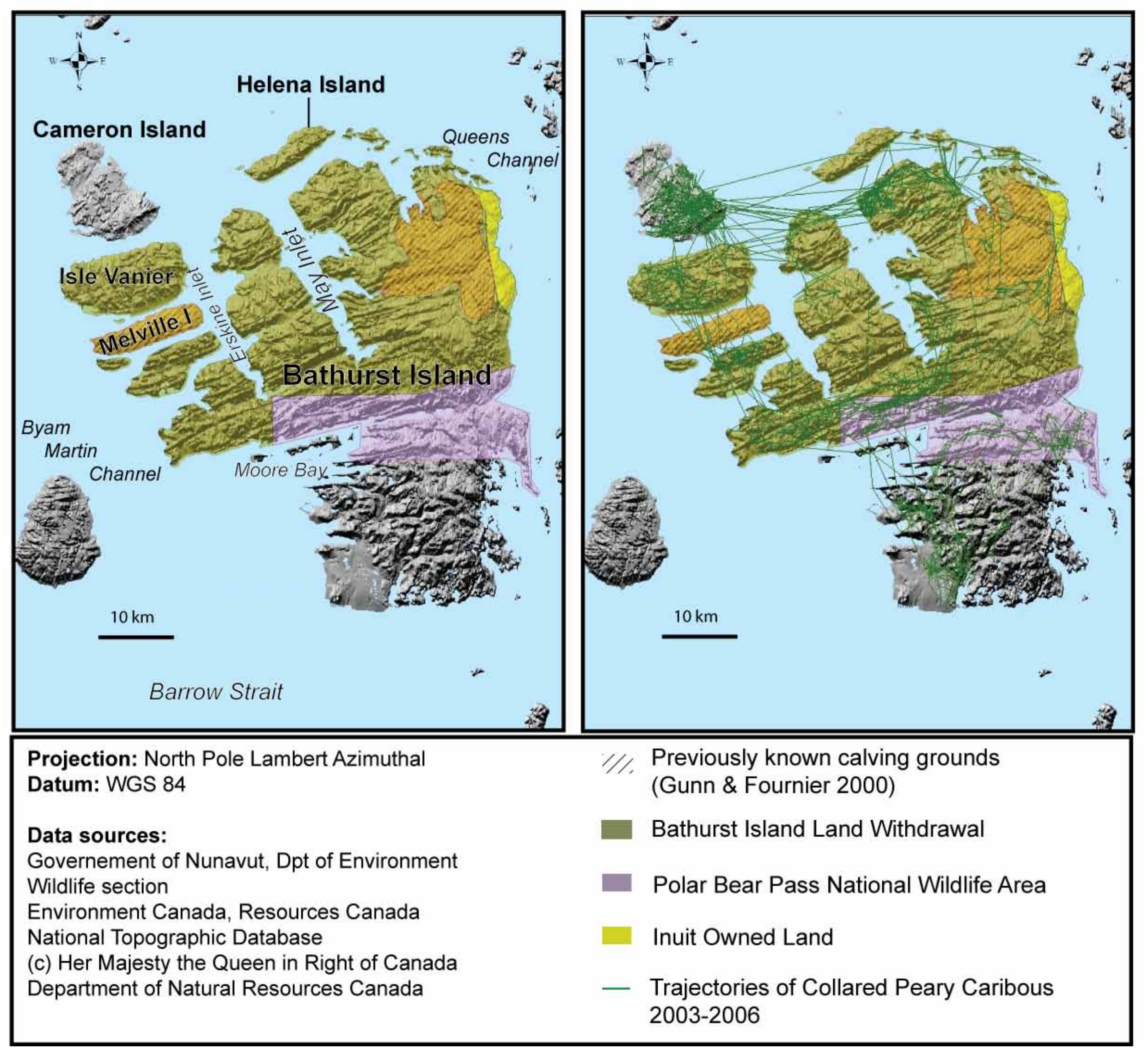

Helena Island
Cameron Island
Queens Channel
Isle Vanier
May Inlet
Erskine Inlet
Melville I
Bathurst Island
Byam Martin Channel
Moore Bay
10 km
Barrow Strait
10 km
Projection: North Pole Lambert Azimuthal
Datum: WGS 84
Data sources:
Governement of Nunavut, Dpt of Environment
Wildlife section
Environment Canada, Resources Canada
National Topographic Database
(c) Her Majesty the Queen in Right of Canada
Department of Natural Resources Canada
Previously known calving grounds (Gunn & Fournier 2000)
Bathurst Island Land Withdrawal
Polar Bear Pass National Wildlife Area
Inuit Owned Land
Trajectories of Collared Peary Caribous 2003-2006

**Figure 8.**

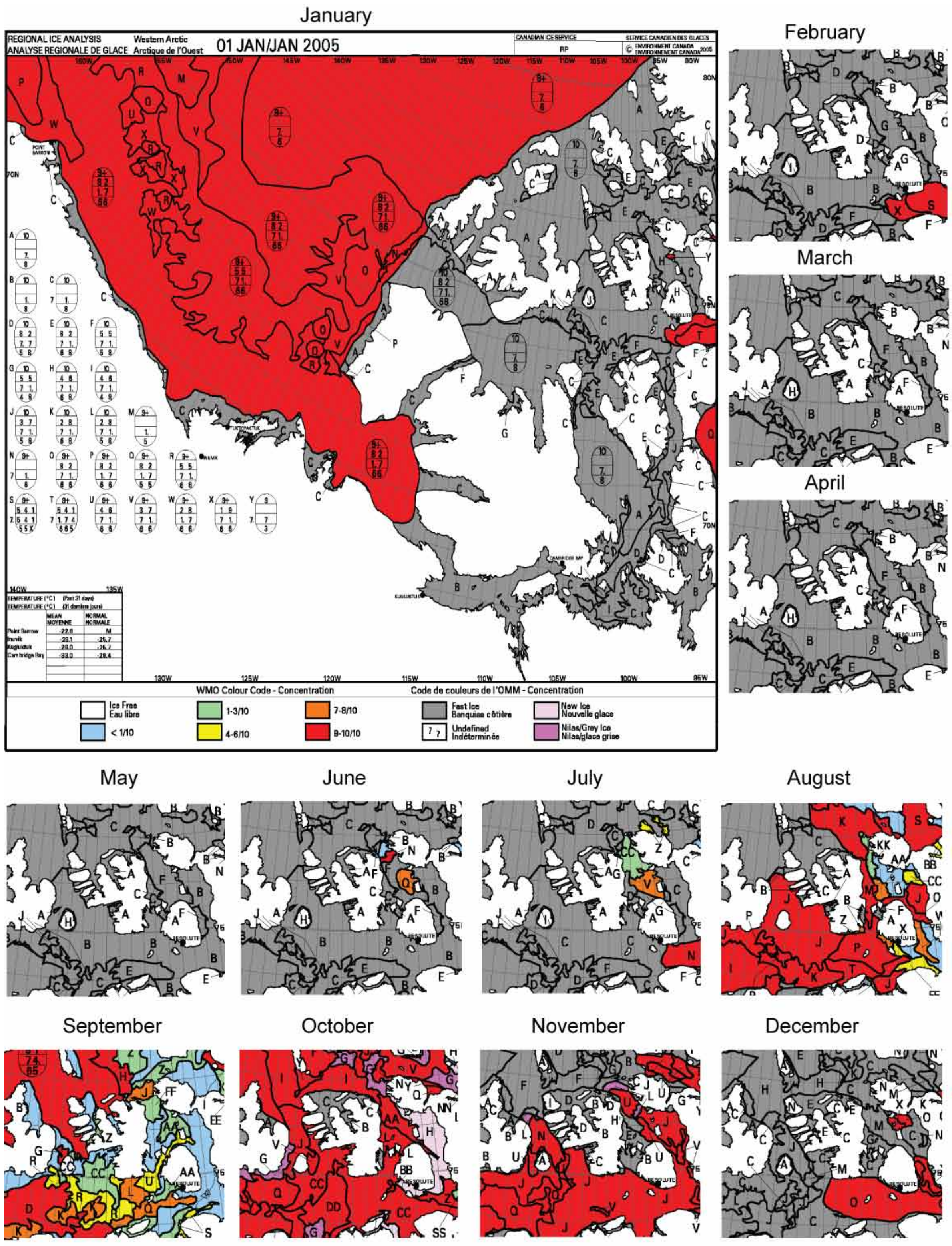

January
REGIONAL ICE ANALYSIS
ANALYSE REGIONALE DE GLACE
Western Arctic
Arctique de l'Ouest
01 JAN/JAN 2005
CANADIAN ICE SERVICE
SERVICE CANADIEN DES GLACES
WMO Colour Code - Concentration
Code de couleurs de l'OMM - Concentration
Ice Free
Eau libre
< 1/10
1-3/10
4-6/10
7-8/10
9-10/10
Fast Ice
Banquise côtière
Undefined
Indéterminée
New Ice
Nouvelle glace
Nilas/Grey Ice
Nilas/glace grise
February
March
April
May
June
July
August
September
October
November
December

**Figure 9.**

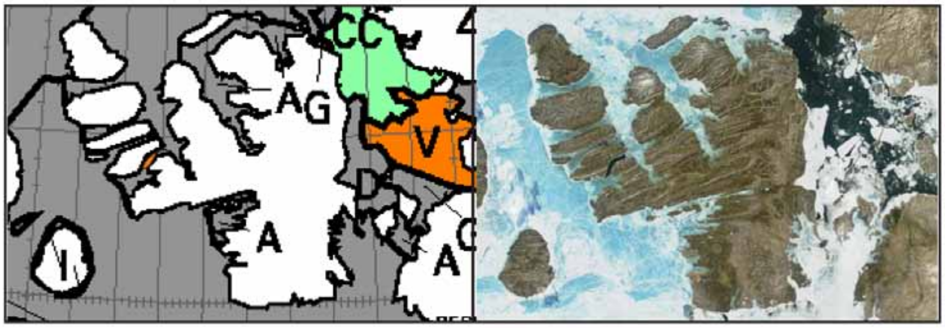



**Figure 10.**

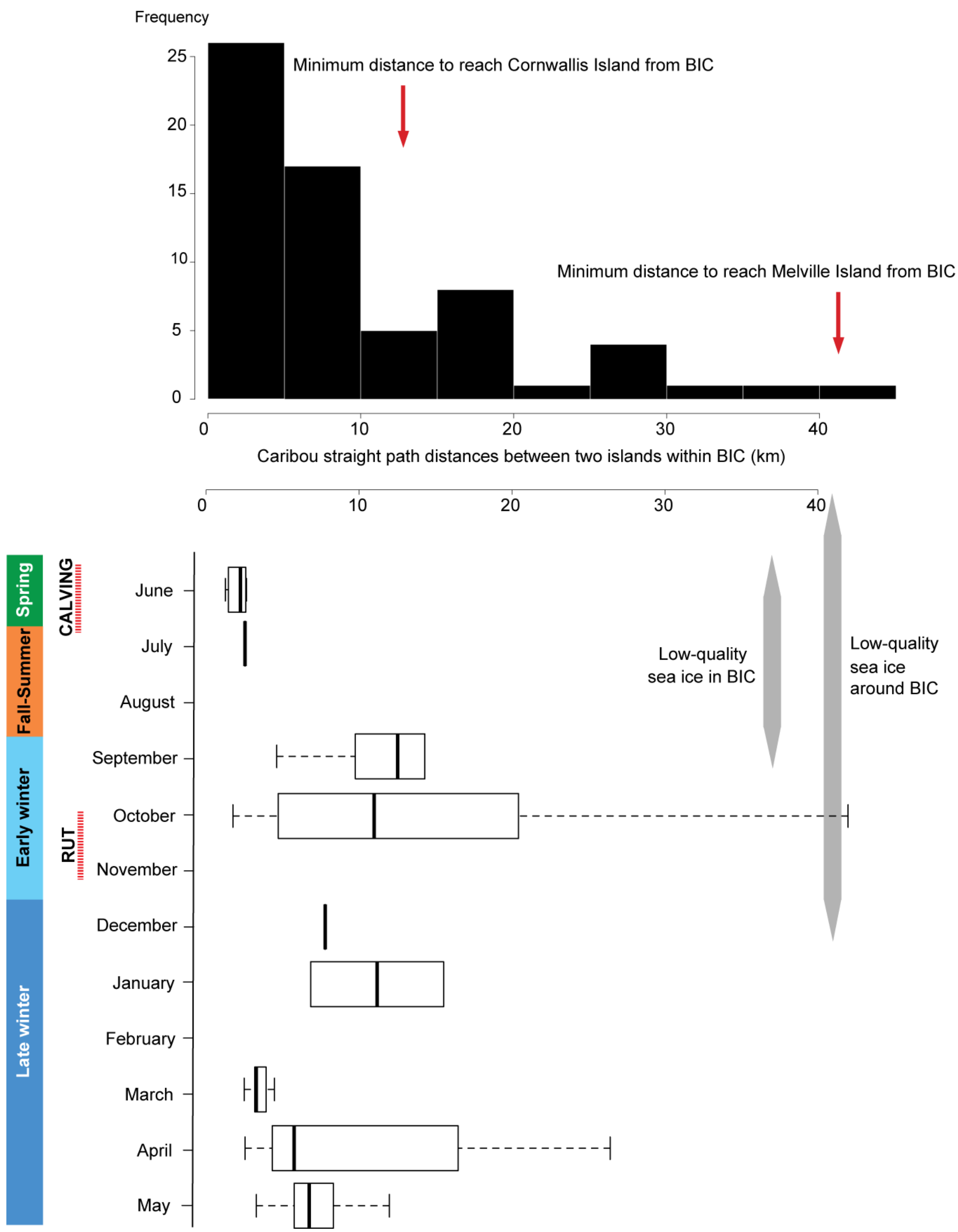
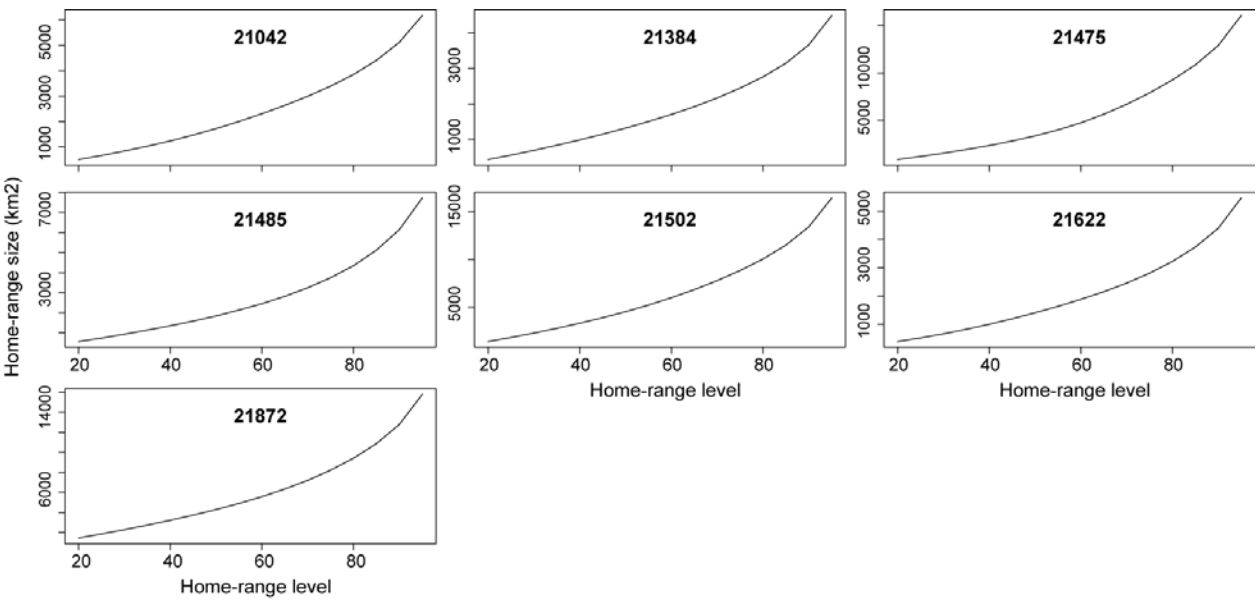

Frequency
25
20
15
10
5
0
Minimum distance to reach Cornwallis Island from BIC
Minimum distance to reach Melville Island from BIC
0
10
20
30
40
Caribou straight path distances between two islands within BIC (km)
0
10
20
30
40
Spring
Fall-Summer
Early winter
Late winter
CALVING
RUT
June
July
August
September
October
November
December
January
February
March
April
May
Low-quality
sea ice in BIC
Low-quality
sea ice
around BIC

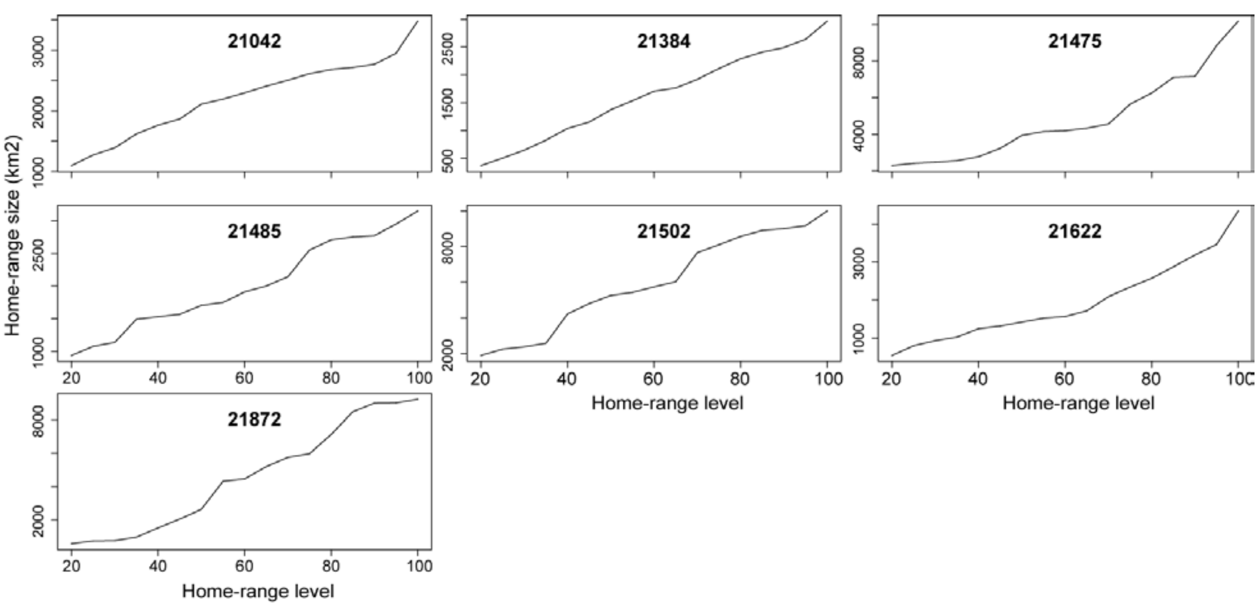
**Figure 11.**

# Appendix

Kernel




MCP



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