

# Inter-Island Water Crossings by Peary Caribou, South-Central Queen Elizabeth Islands

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**ABSTRACT.** Satellite and conventional radio telemetry were used to obtain information on daily and seasonal movements of Peary caribou (*Rangifer tarandus pearyi*) on south-central Queen Elizabeth Islands, Northwest Territories, Canada. Seventeen Peary caribou were captured in 1993 and fitted with telemetry neck collars. Seven collars housed both a Satellite Platform Transmitter Terminal package and radio telemetry package; the other 10 collars all housed only the radio telemetry package. Three of the collared caribou, along with at least 16 of their companion animals, made inter-island water crossings by swimming between Île Vanier and Massey Island or between Massey Island and Île Marc in August 1993. Of particular note is that two-month-old calves, as well as adult caribou, were involved in some of the frigid saltwater crossings. The water crossing between Île Vanier and Massey Island required a minimum straight-line swim of 2.5 km and that between Massey Island and Île Marc a minimum 1.6 km swim, depending on points of entry and exit from the water. That evidence composes the first documented account of Peary caribou swimming between any of the Queen Elizabeth Islands.

**Key words:** Peary caribou, Queen Elizabeth Islands, Northwest Territories, inter-island summertime water crossings, swimming

**RÉSUMÉ.** On a utilisé la télémétrie par satellite et la télémétrie radioélectrique traditionnelle pour obtenir de l'information sur les déplacements quotidiens et saisonniers du caribou de Peary (*Rangifer tarandus pearyi*) dans la partie centre-sud des îles de la Reine-Élisabeth situées dans les Territoires du Nord-Ouest au Canada. En 1993, on a capturé 17 caribous de Peary qu'on a équipés de colliers émetteurs pour télémétrie. Sept de ces colliers contenaient à la fois un ensemble de terminal émetteur à plate-forme satellite et un ensemble de télémétrie radioélectrique, le restant des colliers ne contenant que ce dernier. Durant le mois d'août 1993, trois des caribous équipés de colliers accompagnés d'au moins 16 de leurs congénères ont traversé à la nage les eaux séparant l'île Vanier de l'île Massey ou l'île Massey de l'île Marc. Il est à noter que certaines de ces traversées d'eaux salées glaciales ont été effectuées par des veaux de deux mois aussi bien que par des caribous adultes. La longueur minimale de la traversée de l'île Vanier à l'île Massey était de 2,5 km et celle de l'île Massey à l'île Marc de 1,6 km. Ces longueurs pouvaient être plus grandes, selon les endroits où les animaux entraient et sortaient de l'eau. Ces données démontrent pour la première fois que le caribou de Peary peut nager d'une île à une autre dans les îles de la Reine-Élisabeth.

**Mots clés:** caribou de Peary, îles de la Reine-Élisabeth, Territoires du Nord-Ouest, traversées estivales des eaux entre des îles, nage

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## INTRODUCTION

Inter-island winter movements and seasonal migrations of Peary caribou (*Rangifer tarandus pearyi*) across sea ice between the islands of the Canadian Arctic Archipelago (excluding Baffin and its satellite islands) and between the arctic coastal mainland and the southern tier of Arctic Islands, those islands south of 74°N, excluding the Baffin region, have been reviewed in some detail and appraised in terms of their apparent ecological importance to those caribou (Miller et al., 1977, 1982; Miller, 1990). To date, however, no one appears to have published a documented account of the summertime water crossings of Peary caribou between any of the Queen Elizabeth Islands. The documentation herein adds some detail to our knowledge of the ecology of Peary caribou on the Canadian High Arctic Islands. The observations indicate that Peary caribou have the ability to incorporate swimming between islands into their learned repertoire of summer

range-use, thereby providing an ecological alternative that has potential long-term survival value. The following is an account of the August 1993 movements of Peary caribou between some south-central Queen Elizabeth Islands. These findings were obtained in the initial stage of a broader study to investigate the year-round use of range by Peary caribou within the Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories.

## STUDY AREA

The study area, the Bathurst Island complex, lies between 74–77°N latitudes and 93–107°W longitudes. For the purpose of ongoing Canadian Wildlife Service studies of Peary caribou, it includes 26 islands, with a collective landmass of ca.

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27 000 km<sup>2</sup>. Five islands are of particular pertinence to this account (Fig. 1): Bathurst Island (16 090 km<sup>2</sup>, where 10 caribou were captured in 1993); and four of Bathurst's western major satellite islands, Île Vanier (1130 km<sup>2</sup>, one caribou captured), Alexander Island (490 km<sup>2</sup>, three caribou captured), Massey Island (440 km<sup>2</sup>, three caribou captured), and Île Marc (56 km<sup>2</sup>, no caribou captured).

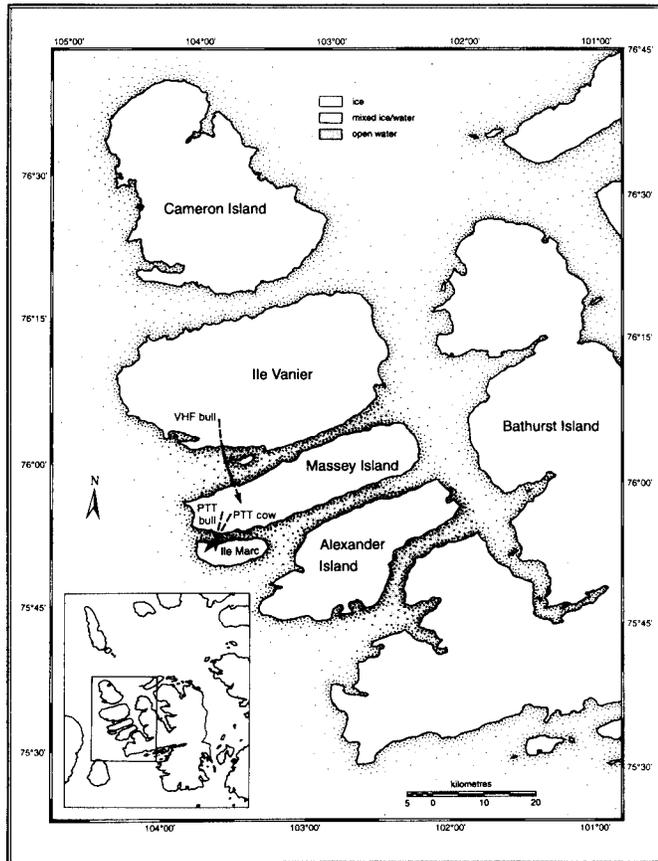


FIG. 1. Locations of six south-central Queen Elizabeth Islands, Northwest Territories, showing inter-island water crossings by telemetry neck-collared Peary caribou, and ice conditions in surrounding water bodies (i.e., approximate areas of 1) essentially continuous ice cover; 2) mixed ice pans, ice rubble, and patches of open water; and 3) continuous open water).

The annual timing and extent of ice breakup and the presence and extensiveness of open water areas vary noticeably among years within the Bathurst Island complex. Certain areas are consistently the first to be ice-free, apparently because of strong current action and upwellings. The channel between Île Vanier and Massey Island and that between Massey Island and Île Marc were essentially ice-free from the end of July throughout August 1993. The channel between Alexander Island and Bathurst Island had extensive areas of open water in late July, but was also intermittently clogged with ice pans, small blocks of ice rubble, and an extensive ice barrier along the Bathurst coast in August. The channel between Île Vanier and Cameron Island and the channels to the east of both of those islands were still essentially icebound in late July 1993 and remained so throughout August, but with open pressure leads, small open water pools, sinkholes,

and standing pools of meltwater on the ice surface, indicating an advanced state of ice deterioration. The more exposed stretches of Arctic Ocean to the west and north of the islands remained ice-covered throughout July and August, except along the shores of the islands where freshwater run-off had removed the ice.

All of the coastal areas of Vanier, Cameron, Alexander, Massey, and Marc islands are low-lying, usually with broad coastal slopes grading from circa 30 m to sea level. Most of the Bathurst Island seacoast opposing these five islands is also low-lying but often with a relatively narrower coastal slope, which tends to rise more abruptly to higher inland elevations than on the five smaller islands. There are also some restricted stretches with acute rises from the water's edge and some near-vertical cliff areas, particularly on the inner bays of northwestern Bathurst Island. Even some of the cliff areas could, however, accommodate caribou travel along the talus, if caribou chose to use such areas. Thus, egress or ingress by caribou swimming or crossing on the sea ice between these islands is highly feasible at most locations.

In August 1993 shorefast ice was essentially absent from the shorelines where caribou crossed between islands: the north coast of Île Marc, the north and south coasts of Massey Island; and the south coast of Île Vanier. Quantified details on surface wind action and the influence of currents in the channels where the caribou crossed are lacking.

## METHODS

A Bell 206L-1 turbo-helicopter on high skid gear, equipped with a Global Positioning System, was used as the search aircraft during July and August 1993. Between 27 July and 1 August 1993, 17 Peary caribou were captured using an aerial net-gun technique (cf. Barrett et al., 1982), and fitted with telemetry neck collars (Telonics, Mesa, Arizona, U.S.A.) each housing a very high frequency (VHF) radio package. Seven collars also housed a Satellite Platform Transmitter Terminal (PTT) package. The weight of the entire package with collar and external housing is estimated at 630 g (VHF) and 850 g (PTT) (estimated <2% of adult female caribou live weight and <1% of adult male caribou live weight); the neck collar band is ca. 5.1 cm wide; and the housing dimensions are 6.9 cm long, 4.8 cm wide, and 5.6 cm high. The PTT collars are located at intervals during "duty cycles" by polar-orbiting, National Oceanic and Atmospheric Administration (NOAA) satellites and the location data are retrieved by a Service Argos station (Landover, Maryland, U.S.A.) and sent monthly on computer disk to the author. The duty cycle for the seven PTTs during July-August was on a 5-day interval (12 h on/108 h off). PTT collars were activated on 22 July 1993 and during our time in the field, until 31 August, Service Argos sent location data printouts by fax. Precision of the satellite locations used herein is assumed to be within several hundred metres of the "target" PTT.

VHF radio-tracking helicopter flights with three or four observers (including the pilot) were made on seven days (21.9

h) during August 1993. We used the previous location of the 10 VHF-collared animals and the most recent Argos location data printout for the seven PTT-collared caribou to initiate subsequent helicopter searches. The helicopter was flown at 300 to 1500 m above ground level and cruising speed (ca. 180 km·h<sup>-1</sup>) while searching for VHF signals. When a collared caribou was detected close by, we descended to 30 to 60 m above ground level to make visual identification of the collared animal and to determine the sex/age composition of companion animals.

## RESULTS

We were able to carry out VHF radio-tracking flights only on 5, 10, 11, 15–17, and 21 August 1993, because of persistent bad weather (flat light, low overcast, and extensive fog) throughout much of the month. Also, VHF radio-tracking flights had to be restricted to Bathurst Island until 16 August, as unsuitable flying conditions prevented us from flying over any of Bathurst's western major satellite islands before then. We received Service Argos satellite location data printouts for the seven PTT-collared caribou for 1, 6, 11, 16, 21, 26, and 31 August 1993. Three of the collared caribou, together with at least 16 companion animals, swam between islands during August 1993 (Table 1).

### *PTT-Collared Bull*

A prime bull caribou was captured on the west end of Massey Island on 29 July 1993, fitted with a PTT collar and released (Table 1, Fig. 1). The bull was in a social grouping of five prime bulls (probably 5–8 years old) and one juvenile male (3–4 years old). Satellite location data for 1, 6, and 11 August indicated that the bull was still on western Massey Island. On 16 August 1993, however, the bull was radio-tracked and visually located by us on Île Marc. The bull's social grouping was the same as when captured 18 days earlier. Thus, the group of five bulls and one juvenile male had made the water crossing between the south shore of Massey Island and the north shore of Île Marc some time between 12 and 16 August. The water crossing required a minimum swim of 1.6 km (the straight-line for shortest possible water crossing between the two closest points of entry and exit from the water along opposite shores in the channel). The bull also was placed by satellite location data 4.9 h later only 2.5 km east/southeast of where we saw him on 16 August. We last relocated and saw the collared bull on 21 August and he was still on Île Marc. He also was placed by satellite location data 1.6 h later on that date only 2.3 km south/southwest of where he was last seen. The bull was still on Île Marc on 26 and 31 August 1993, according to the satellite location data.

### *PTT-Collared Cow*

A cow, with her calf at heel, was also captured on 29 July 1993 on the west end of Massey Island, fitted with a PTT

collar and released (Table 1, Fig. 1). The cow was in a social grouping of three cow/calf pairs at the time of capture. Satellite location data indicated that the cow had crossed from Massey Island to Île Marc some time between 7 and 11 August. We radio-tracked and visually relocated the cow on Île Marc on 16 August. Her social grouping was the same as when she was captured 18 days earlier. Thus, the group of three cow/calf pairs had crossed from the south shore of Massey Island to the north shore of Île Marc. The crossing required a minimum swim of 1.6 km. The cow was placed by satellite location data 1.9 h later only 3.8 km east/southeast of where we saw her on 16 August. The collared cow was last relocated and seen by us on Île Marc on 21 August. She was placed by satellite location data 3.6 h later only 2.0 km south/southeast of her earlier location. The collared cow was still on Île Marc on 26 and 31 August, according to satellite location data.

TABLE 1. Locations and movements of three collared Peary caribou, Bathurst Island complex, south-central Queen Elizabeth Islands, Northwest Territories, July–August 1993

Date 1993	Time (CDST)	Island	Caribou location <sup>1</sup>		Distance travelled <sup>2</sup>		Location method <sup>4</sup>
			Lat.°N	Long.°W	(km)	Direction <sup>3</sup>	
<b>PTT-collared bull</b>							
29 July	1102	Massey	75.930	103.670	—	—	GPS
01 Aug	1516		75.904	103.403	7.8	E/SE	PTT
06 "	1829		75.899	103.447	1.3	W/SW	PTT
11 "	1156		75.902	103.810	9.9	W/NW	PTT
16 "	1245	Marc	75.880	103.452	10.1	E/SE	VHF
16 "	1740		75.889	103.368	2.5	E/NE	PTT
21 "	1450		75.876	103.688	8.8	W/SW	VHF
21 "	1624		75.861	103.745	2.3	S/SW	PTT
<b>PTT-collared maternal cow</b>							
29 July	1318	Massey	75.926	103.614	—	—	GPS
01 Aug	1832		75.939	103.354	7.2	E/NE	PTT
06 "	1507		75.932	103.612	7.0	W/SW	PTT
11 "	1704	Marc	75.839	103.698	10.6	S/SW	PTT
16 "	1255		75.850	103.720	1.4	N/NW	VHF
16 "	1452		75.835	103.593	3.8	E/SE	PTT
21 "	1445		75.869	103.764	6.0	W/NW	VHF
21 "	1822		75.851	103.763	2.0	S/SE	PTT
<b>VHF-collared bull</b>							
30 July	1519	Vanier	76.098	103.735	—	—	GPS
16 Aug	1215	Massey	75.985	102.788	26.1	E/SE	VHF
21 "	1500		75.940	103.534	8.5	W/SW	VHF

<sup>1</sup> Measured in 1000ths of a degree of latitude and longitude. The first location given for each caribou is the capture site of that animal.

<sup>2</sup> Straight-line, horizontal plane distances—calculated by taking the square root of the summation of the latitudinal displacement north or south plus the longitudinal displacement east or west.

<sup>3</sup> The approximate vector derived from latitudinal and longitudinal direction of movement from the previous location (primary axis/secondary axis of movement).

<sup>4</sup> Location methods: GPS, Global Positioning System on board the helicopter; VHF, detected by VHF radio signal and actually located by on-board GPS; PTT, Satellite Platform Transmitter Terminal location data from Service Argos.

### VHF-Collared Bull

On 30 July 1993, we radio-collared a second prime bull on south-central Île Vanier (Table 1, Fig. 1). The bull was in a social grouping of seven prime bulls and one juvenile male at the time of capture. Subsequently, the collared bull from Île Vanier and his seven companions were relocated by VHF radio telemetry and seen by us on south-central Massey Island on 16 August 1993. The entire group of eight caribou had swum from the south shore of Île Vanier to the north shore of Massey Island some time between 30 July and 16 August. The water crossing required a minimum swim of 2.5 km. The collared bull was still on Massey Island when last relocated and seen by us on 21 August.

### DISCUSSION

At least 19 caribou swam between south-central Queen Elizabeth Islands in late summer 1993, suggesting that such water crossings may be a common event. The caribou probably swam much longer distances than those suggested by the minimum swim required to cross between the narrowest opposing points of entry and exit from the water in each channel (1.6 and 2.5 km). Actual distances swam would have been influenced by the caribou's selection of points of entry and exit from the water, currents and wave action experienced during each crossing, and how rigidly the swimming caribou maintained its "target image" of the distant landing point. Water crossings likely occur between or among relatively small satellite islands separated by narrow (< 10 km) channels that commonly remain ice-free during mid and late summer.

It is possible that some caribou could have successfully crossed on the ice between eastern Île Vanier or eastern Cameron Island and northwestern Bathurst Island at any time during July or August 1993. Such ice crossings might have required short swims by the caribou from shore to the ice or from the ice edge to shore. It is unlikely that a two-month-old calf could swim to an ice shelf of more than 25–30 cm above water level and pull itself out of the water and onto the ice. However, older caribou, especially bulls, could execute such a manoeuvre often, without much difficulty.

Arctic-island caribou likely redistribute themselves between or among islands as a result of 1) traditional seasonal inter-island migrations; 2) environmentally-forced winter-time movements in search of more favourable foraging conditions; and 3) on occasion by chance or because of the innate "restlessness" of the species (cf. Miller, 1990). It is possible that the documented late summer inter-island water crossings were simply part of a seasonal redistribution of Peary caribou (Miller, 1982) comparable to August and fall movements made by mainland barren-ground caribou (*R. t. groenlandicus*) (e.g., Kelsall, 1968; Skoog, 1968; Bergerud, 1974). Arctic-island caribou on small islands are more apt to sometimes make inter-island movements by chance or are required to do so because of the small sizes of the islands. However, one collared cow remained on Massey Island and three collared

cows remained on Alexander Island throughout August 1993. Also, all 10 caribou collared on Bathurst Island remained on Bathurst throughout August 1993. That condition suggests that the inter-island water crossings by caribou in 1993 were more by chance or, if traditional, more on an individualistic or social group basis, rather than caused by a population-wide response or need.

August is a time of relative forage abundance. Thus, there is no basis for believing that the caribou needed to improve their foraging conditions by moving to another island at that time of the year. That is especially true in these instances, as Île Marc is nearly eight times smaller than Massey Island and Massey Island is less than half as large as Île Vanier. The third type of inter-island movement, involving mere chance or the drive to remain continually on the move, seems to best explain these late summer inter-island water crossings. We cannot, however, rule out learned behaviour or traditional seasonal inter-island movements as the catalyst for those caribou swimming between south-central Queen Elizabeth Islands in August 1993. That caribou, even with young calves, freely swim long distances in cold freshwater is well known (e.g., Kelsall, 1968; Skoog, 1968; Miller, 1982). Therefore, the swimming of Peary caribou in frigid seawater is not necessarily unexpected, but its documentation does add extra detail to our knowledge of the ecology of Peary caribou.

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