Species Status Report

Peary Caribou

Rangifer tarandus pearyi

Tuktu (Kangiryuarmiut)
Tuktuinak (Inuinnaqtun)
Tuktuaraaluit (Siglitun)
Tuttunguluurat (Ummarmiutun)

IN THE NORTHWEST TERRITORIES

NORTHWEST TERRITORIES SPECIES AT RISK COMMITTEE

RE-ASSESSMENT – THREATENED

May 2022

Species at Risk Committee status reports are working documents used in assigning the status of species suspected of being at risk in the Northwest Territories (NWT).

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The drafts of this report were prepared by Golder Associated Ltd. (Indigenous and community knowledge component) and Deborah Cichowski (Scientific Knowledge component), under contract with the Government of the Northwest Territories, and edited by Michele Grabke, Species at Risk Implementation Supervisor, Species at Risk Secretariat. This report is an update of the Species Status Report for Peary Caribou (*Rangifer tarandus pearyi*) in the Northwest Territories (SARC 2012).

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ABOUT THE SPECIES AT RISK COMMITTEE

The Species at Risk Committee was established under the *Species at Risk (NWT) Act*. It is an independent committee of experts responsible for assessing the biological status of species at risk in the NWT. The Committee uses the assessments to make recommendations on the listing of species at risk. The Committee uses objective biological criteria in its assessments and does not consider socio-economic factors. Assessments are based on species status reports that include the best available Indigenous knowledge, community knowledge, and scientific knowledge of the species. The status report is approved by the Committee before a species is assessed.

ABOUT THIS REPORT

This species status report is a comprehensive report that compiles and analyzes the best available information on the biological status of Peary caribou in the NWT, as well as existing and potential threats and positive influences. Full guidelines for the preparation of species status reports, including a description of the review process, may be found at www.nwtspeciesatrisk.ca.

Environment and Natural Resources, Government of the Northwest Territories, provides full administrative and financial support to the Species at Risk Committee.

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RE-ASSESSMENT OF PEARY CARIBOU

The Northwest Territories Species at Risk Committee met on May 2-5, 2022 and assessed the biological status of Peary caribou in the Northwest Territories. The assessment was based on this approved status report. The assessment process and objective biological criteria used by the Species at Risk Committee are based on Indigenous and Community Knowledge (ICK) and Scientific Knowledge (SK) and are available at: www.nwtspeciesatrisk.ca.

Assessment: Threatened in the Northwest Territories

Threatened – The species is likely to become Endangered in the NWT if nothing is done to reverse the factors leading to its extirpation or extinction.

Reasons for the assessment: Peary caribou fit criterion ICK (e) for Threatened and SK (a) and (b) for Special Concern.

Status Category	**Criterion**	
Threatened	ICK(e)	There is concern expressed by knowledge holders that the species is likely to experience severe declines in the NWT, in its abundance, habitat quality/quantity, movements, and/or range, within their grandchildren's lifetimes.
Special Concern	SK(a)	The species has declined to a level of abundance at which its persistence is increasingly threatened by genetic, demographic, or environmental stochasticity, but the decline is not sufficient to qualify the species as Threatened.
	SK(b)	The species may become Threatened if factors suspected of negatively influencing the persistence of the species are neither reversed nor managed with demonstrable effectiveness.

The Species at Risk Committee determined that Peary caribou fit ICK criterion for Threatened, and SK criterion for Special Concern. In their application of the Precautionary Principle, which states that a lack of certainty will not be used as a reason to delay measures to alleviate a threat to a species at risk, the Species at Risk Committee determined an overall assessment of Threatened for Peary caribou.

Main factors (ICK):

- Peary caribou remain a preferred source of food for residents of Sachs Harbour and Ulukhaktok. Knowledge holders understand that Peary caribou populations naturally fluctuate widely.

- Sachs Harbour knowledge holders are reporting more caribou as well as signs of productivity including healthy caribou, large groups, big bulls and twins – suggesting that numbers are increasing. In recent years, Ulukhaktok knowledge holders are reporting relative stability at low densities. Increased numbers of Peary caribou are being observed however the population has yet to reach historic levels.
- Knowledge holders express concern that the species' medium- to long-term future may be uncertain. Based on these concerns Peary caribou may experience severe declines in the future.
- Knowledge holders noted that climate change could have negative effects on Peary caribou. For example, a warming climate and changing wind-ice regime could impede their ability to access important habitat and affect the way they cope with severe weather conditions.
- Knowledge holders have concerns about the negative effects of future industrial development and expanded shipping activities on Peary caribou. These threats, including climate change effects, are expected to increase within their grandchildren's lifetimes.
- Peary caribou require vast amounts of land and connectivity between and within islands, and habitat use depends on their annual life cycle and forage accessibility. Caribou may be less able to cope with severe weather events when sea-ice conditions are less robust.
- Sustained interventions are required to support Peary caribou recovery.

Main factors (SK):

- Subpopulations of Peary caribou in the NWT have increased, however they are still at lower levels than they were 40-60 years ago.
- Over the last three generations (1992 to 2019), Peary caribou on Banks Island have increased from an estimated 1,015 caribou to 1,913 caribou at an average annual rate of 3.3%.
- Primary factors believed to have contributed to declines in the past were over harvesting, predation, reduced forage availability caused by deep snow and icing/freezing rain events, and competition with high numbers of muskoxen.
- While some of the threats from the past have been mitigated, some are ongoing and continue to be a concern such as climate change, grizzly bear range expansion, industrial development and marine traffic.

- Although the population is currently showing signs of recovery, the lingering threats suggest that Peary caribou populations could decline in the future.

Additional factors:

- Inuvialuit Elders have seen a correlation between high muskoxen populations and low caribou populations, suggesting that muskox and caribou naturally cycle opposite to each other.
- Currently Peary caribou numbers are on the rise and muskoxen numbers are decreasing.
- Earlier green-up of vegetation related to climate change is potentially beneficial to the forage available for Peary caribou.

Positive influences to Peary caribou and their habitat:

- Voluntary restrictions and harvest quotas for Peary caribou have greatly reduced hunting pressure on both Banks and Northwest Victoria Islands.
- A proposed *Recovery Strategy for Peary Caribou in Canada* was posted for public comment in 2021. In the proposed recovery strategy, sea ice crossings were included in the identification of candidate critical habitat for Peary caribou.
- Community Conservation Plans include specific land management guidelines for some areas important for Peary caribou and designate the highest degree of protection to calving areas.

Assessment History:

- The NWT Species at Risk Committee met in December 2012 and assessed Peary caribou as Threatened in the NWT because of concerns with low population numbers and variable population size indicating that Peary caribou are vulnerable to random catastrophic events.
- In 2014, Peary caribou were listed Threatened in the NWT under the *Species at Risk (NWT) Act.*
- A national recovery strategy is being finalized and will be adopted by the NWT.

Recommendations:

- Continue harvest reporting and current co-management regime.
- Continue monitoring population numbers of Peary caribou, muskoxen and predators, habitat quality/quantity, sea ice changes, and understand how threats impact Peary caribou on the landscape.

- Support and encourage Indigenous and community knowledge systems that provide information about Peary caribou and their ecosystem.
- Enhance capacity to monitor weather changes on the NWT Arctic islands.
- Encourage implementation and enforcement of the *Inuvialuit Settlement Region – Cruise Ship Management Plan 2022-2025* which proactively sets standards to manage cruise ships and avoid travel when sea ice is crucial for Peary caribou migration/movement.
- Canada and the NWT must uphold and, if possible, exceed international climate change agreements including reducing greenhouse gas emissions at the local level. Climate change in the NWT must be addressed by implementing the *2030 NWT Climate Change Strategic Framework* and Action Plan.

Executive Summary

Indigenous and Community Knowledge	Scientific Knowledge
About the Species	
Tuktuk (singular: *Tuktu*, Peary caribou, or *Rangifer tarandus pearyi*) are recognized by Inuvialuit based on their smaller size, lighter colour, and different taste and texture of the meat compared to other groups of caribou. Inuvialuit have historically used them as a primary source of food and clothing while living and traveling on Banks Island and Northwest Victoria Island. They remain a preferred source of food for residents of Sachs Harbour and Ulukhaktok.	**Description** Peary caribou (*Rangifer tarandus pearyi*) are small in stature and have noticeably short legs and faces. The distinctive winter coat is white with a pale brown back in early winter. In summer, the coat is slate grey on the back and does not have the pronounced flank stripe typical of barren-ground caribou. The pale gray antler velvet is a striking distinguishing characteristic compared to the brown velvet of barren-ground, boreal or northern mountain caribou. Unlike other members of the deer family, both males and females grow antlers. **Habitat** Peary caribou use a relatively wide variety of terrain and vegetation types; available habitat is mostly composed of creeping dwarf-shrubs, lichens and mosses. In the Western Queen Elizabeth Islands (WQEI), Peary caribou seasonally migrate between islands. On Banks Island, Peary caribou seasonally migrated between habitats such as calving and winter ranges during the 1970s when numbers were higher. Information based on a limited number of satellite-collared caribou in the 1990s suggested that migration on Banks Island was reduced. On northwest Victoria Island, Peary caribou cows also migrated between summer and winter ranges based on satellite-collared caribou. The relationship

	between caribou abundance and extent of migration is a significant gap in current understanding of Peary caribou ecology. Because of snow cover, a key habitat requirement is terrain and vegetation features that offer choices as caribou adjust their foraging to snow conditions. Little is known about the habitat requirements for calving areas other than the generalities that calving areas are mainly associated with major drainages and coastal sites with varied terrain, providing snow-free or shallow snow-covered sites. Habitat fragmentation (caused by human activities) has not been documented within Peary caribou range in the NWT. **Biology** Peary caribou are adapted to extreme cold. Annual variability in winter conditions is characteristic of Peary caribou habitat. Peary caribou are adapted to this variability through their foraging strategies, which include local or long-distance movements when winter snow and ice conditions are exceptionally restrictive. Peary caribou are relatively long-lived, with females living as long as 12-13 years. Females usually first breed at 2 years of age and first calve when they are 3 years old. They give birth to a single calf, although under high forage availability and a corresponding high rate of body growth, cows can calve at 2 years of age. Under high forage availability Peary caribou cows can calve every year but this is rare. Peary caribou cows cope with occasional years of restricted forage access either by not

	becoming pregnant, or by weaning a calf prematurely. Peary caribou forage on a variety of plants and rely less than other caribou types (e.g. barren-ground, boreal, northern mountain) on lichen for forage in the winter. On Banks Island, where there is less lichen but more vegetation cover, Peary caribou feed extensively on willow during summer, and on mountain-avens and legumes during winter. Sedges are also important throughout the year. during some winters in the WQEI lichens are an important forage item. The debate about whether muskoxen and Peary caribou compete for food or space dates back to the 1970s and is largely unresolved. However, the two species do show overlap in dietary components.
Place	
Peary caribou live on the islands of the Canadian Arctic Archipelago. Within the Arctic islands of the NWT, records of Indigenous and community knowledge pertain almost exclusively to Banks Island and Northwest Victoria Island; little has been documented for the WQEI. There have been observed movements of caribou between Banks and Northwest Victoria Island. On Northwest Victoria Island, Peary caribou are found north of Ulukhaktok, predominantly north and northeast of Minto Inlet and west of the Shaler Mountains. On Banks Island, Peary caribou range across most of the island. Peary caribou are also known to live on Melville Island and other islands in the	Peary caribou are restricted to the High Arctic (Queen Elizabeth Islands) and the mid-Arctic islands of Canada, as well as the very northern extension of the mainland (Boothia Peninsula). In the Northwest Territories (NWT), Peary caribou live on Banks Island, northwest Victoria Island and the WQEI. The current distribution in the NWT covers approximately 144,000 km^2 and is naturally discontinuous (fragmented) by island geography and caribou behaviour. Peary caribou are known to occupy all of the Arctic islands in the NWT. There are two subpopulations: Banks/Northwest Victoria Islands, and WQEI. Movements between eastern coastal Banks and northwest Victoria islands may have decreased or ceased in the

Western Queen Elizabeth group. Observations of Peary caribou are made mainly in the context of hunting them for food. Harvesting rates have declined over time in both Sachs Harbour and Ulukhaktok- largely a result of community-imposed harvesting restrictions. Fewer harvesters go for Peary caribou than in the past; as well, hunts are conducted less often inland and more along the island coastlines.	late 1980s when the population declined, but there is no current data to suggest whether that is still the case.
Population	
A female caribou in good condition (i.e. sufficiently fat) may calve every year after reaching sexual maturity between 2 and 4 years of age. They may not calve every year if they are in poor condition. Some caribou may have two calves, indicating a healthy, growing population. Hunters reported in 2001 that Peary caribou on Banks Island were not as fat as they used to be (likely in the 1970s), although they were still in fairly good condition. In 2021, hunters from Banks Island reported caribou were in good shape with larger bulls observed. Inter-island movements of caribou may be decreasing. On Northwest Victoria Island, Peary caribou range was reported to have moved south in the 1950s, when the animals were more common around Ulukhaktok (formerly Holman) than they had been previously. By 1998, however, their range had shifted northwards away from the community again. On Banks Island, Peary caribou may have shifted their range in the last 50 years. In the 1960s, they were reported to undertake a seasonal migration	Based on the most recent surveys, there are about 7,800 Peary caribou (excluding calves) in the NWT, which represents about 75% of the global population. The other 25% are in Nunavut. Both subpopulations in the NWT display similar trends: high abundance was recorded in either the 1970s-80s (Banks/Northwest Victoria Islands) or the early 1960s (WQEI) followed by steep declines (averaging >90%) to lower numbers. Since then, numbers have increased on the WQEI, and slightly increased on Banks and Northwestern Victoria islands. However, although subpopulations of Peary caribou in the NWT have increased, they are still at lower levels than they were 40-60 years ago. The overall estimated decline for both subpopulations in NWT only is from about 36,000 Peary caribou (in 1961, 1972 and 1980) to about 7,800 (in 2012 and 2019, combining totals from different years). Current numbers in the NWT are about 80% less than historic numbers ~60 years ago, and about 50% less

from the north and east in the summer to the south and west in the winter. In contrast, in 2008 they were reported to move from the northwest to the southeast. In 2021, the Sachs Harbour HTC commented that there are "more caribou in different areas [and] way more caribou in [Aulavik National] Park than used to be" (WMAC-NWT 2021).

On Victoria Island, hunters report Peary caribou have been declining gradually since the 1970s. Co-management agencies reported a large decline in Peary caribou on Northwest Victoria Island, and interviews with Ulukhaktok hunters in 1993 record their deep concern about the status of Peary caribou.

In terms of the availability of caribou to residents of Sachs Harbour, they were reportedly rare in the 1950s, became abundant around the community by the 1970s, and scarce again by the 1990s. More recently, Sachs Harbour residents are observing a notable increase in Peary Caribou, correlating this observation to a decreasing muskox population, and are observing caribou once again coming near the community.

Peary caribou are described as highly mobile, and their populations are often reported to be cyclic. Previous experiences with scarcity and abundance of Peary caribou leads some hunters in both Sachs Harbour and Ulukhaktok to understand that the caribou will 'come back'. This may refer to a change in either population or their whereabouts.

Physiological changes in Peary caribou were

than numbers ~40 years ago. Over the last three generations (1992 to 2019), Peary caribou on Banks Island have increased from an estimated 1015 caribou to 1913 caribou at an average annual rate of 3.3%. However, the relative recovery over the last 27 years is eclipsed by the overall population decline since 1972, with the current population at only 17% of the population size in 1972.

The primary factors believed to have contributed to the declines are harvesting, predation, reduced forage availability caused by deep snow and icing/freezing rain events, and competition with increased numbers of muskoxen. These factors act differently depending on whether the number of caribou is high or low, and whether the number of muskoxen is high or low.

reported on Banks Island in 2001. These included smaller antlers on bulls- signifying fewer large bulls in the population- and less fat (likely compared to the 1970s). Recently, hunters from Sachs Harbour are seeing larger bulls with bigger and thicker antlers, and some caribou with really dark legs.	
Threats and Limiting Factors	
Sources note several contributing factors to Peary caribou declines on Banks and Northwest Victoria Island. Past overharvesting is most frequently mentioned as the primary cause on Northwest Victoria Island; this threat was mitigated through a community-imposed harvesting restriction. This harvesting moratorium was lifted in 2015 and now an annual quota of 10 animals is in place. Competition with muskoxen and severe weather events are most frequently mentioned as causes of declines on Banks Island. Some effects of climate change could have negative implications for Peary caribou. For example, a warming climate and changing winds, and less stable sea-ice conditions could impede their ability to travel between islands, which is one way they cope with severe weather conditions. Wolves are noted by many on Banks Island as a threat to caribou; wolf numbers increased in the 1980s and 1990s. A past wolf control (poisoning) program in the late 1950s has also been linked by some to growth of the muskox population on Banks Island. Wolf predation seems to be a less important	Climate change is an ultimate threat that is linked to a number of proximate threats and limiting factors. Severe weather events affect the ability of Peary caribou to access forage. This can occur through harsh winters, during which deep hard snow cover forces animals to forage in more raised wind-blown areas where snow cover has been reduced, or when rain falls on top of the snow, freezing it into a layer that is difficult to penetrate There has been less sea-ice (annual and multi-year), fewer ice floes, less land fast ice, and more open water in winter and spring. These changes are concerning as Peary caribou rely on movements over land and sea ice for survival at different stages of their lifecycle. The threat to Peary caribou is exacerbated by marine traffic and increased use of the Northwest Passage which may cause open leads resulting in delayed or impeded caribou movements or increased risk of drowning for caribou that attempt to cross. Wolf predation, harvesting, and availability of forage as mediated by weather, are the main proximate threats and limiting factors for Peary caribou. However, less is known about the relative contribution of each of these threats, and there is no information available

threat on Northwest Victoria Island. Recently, Sachs Harbour harvesters observed that caribou populations are increasing, while muskox are decreasing and fewer wolves have been observed. There are concerns about the negative effects of resource development on Peary caribou. Specific concerns pertain to low-flying helicopters, increasing interest in coal exploration, a proposed Melville Island gas pipeline, offshore oil and gas exploration, and increased offshore marine traffic.	on adult survival or causes of mortality to evaluate relative contributions. At current levels, harvesting, disturbance from human activity and contaminants do not appear to be significant threats. While temperatures and precipitation can be variable, it is not understood how this variability influences forage growth and productivity relative to winter forage availability, or parasite or disease prevalence. Arctic wolf numbers and muskoxen numbers appear to have increased in most Peary caribou subpopulation ranges since the 1980s. Since then, muskoxen numbers have decreased significantly on Banks Island and Northwestern Victoria Island, but increased on the WQEI. Higher muskoxen numbers may have supported increased Arctic wolf numbers, which have likely resulted in increased predation risk on Peary caribou.
Positive Influences	
Current wildlife management regimes are a positive influence on Peary caribou. Harvest quotas for Peary caribou have greatly reduced hunting pressure on both Banks and Northwest Victoria Islands. There is also some harvesting of muskoxen and wolves taking place. In Canada, Peary caribou were listed as Endangered under the federal *Species at Risk Act* in 2011. In 2015 COSEWIC re-assessed Peary caribou as Threatened. A proposed *Recovery Strategy for Peary Caribou in Canada* was posted for public comment in 2021 in cooperation with local communities, wildlife management boards, and	A key positive influence that contributed to halting the decline of Peary caribou in the 1990s was the voluntary restriction of harvesting of Peary caribou by Sachs Harbour and Ulukhaktok harvesters. In the early 1990s, the Olokhaktomiut Harvesters and Trappers Committee initiated a voluntary zero harvest on Peary caribou on Northwestern Victoria Island that was in effect until 2015/16 when a quota of 10 Peary caribou was established. On Banks Island, a quota was established in the early 1990s, which incrementally increased to the current quota of 72 caribou. Management planning, community conservation plans, and recovery planning are

federal/territorial governments. Habitat management is well-defined through updated Community Conservation Plans and the Inuvialuit Land Administration's practice of seeking approval from local Hunters and Trappers Committees before approving development-related proposals. The *Inuvialuit Settlement Region – Cruise Ship Management Plan 2022-2025* manages marine traffic and avoid travel when sea ice is crucial for caribou migration/movement. Some implications of a warming climate and changing winds are reported as being beneficial to Peary caribou. More wind may make it easier for caribou to cope with mosquitoes in the summer. Climate change may also increase available forage and result in warmer winters.	other positive influences, although the direct impact of these plans on subpopulations is not known. A proposed *Recovery Strategy for Peary Caribou in Canada* was posted for public comment in 2021. In the proposed recovery strategy, sea ice crossings were included in the identification of candidate critical habitat for Peary caribou. A limited amount of Peary caribou range is protected within Aulavik National Park and The Banks Island No. 1 Migratory Bird Sanctuary. With Peary caribou listed as "Endangered" in Canada since 2011, the federal *Species at Risk Act* provides Peary Caribou some protection within the National Park and the Migratory Bird Sanctuary because they are federal lands. These protected areas may have long-term implications for Peary caribou through habitat protection. Draft guidelines have been developed for passenger/cruise vessels in the Canadian Arctic, which include a summary of federal and territorial permit requirements, and guidelines for use of helicopters and unmanned aerial vehicles. In addition, the *Inuvialuit Settlement Region – Cruise Ship Management Plan 2022-2025* proactively sets standards to manage cruise ships and avoid travel when sea ice is crucial for caribou migration/movement.

Technical Summary – Indigenous and Community Knowledge Component

Question	Indigenous and Community Knowledge
About the Species	
For example: whether cultural relationships have been impacted by declines/changes in the species; whether the species is sensitive to natural/human-caused disturbances; the reproductive capacity of the species; the dispersal capacity of the species; whether the species has critical/important/sensitive habitat components.	Inuvialuit have been hunting terrestrial and marine mammals in their traditional territories of the Western Arctic since time immemorial. Harvesting caribou and other animals has always been an integral part of the Inuvialuit identity, values, livelihoods, and culture. Peary caribou were a staple for Inuvialuit people on Banks and Victoria Islands until the mid-1980s as a source of meat for food, hides for clothing sleeping skins (winter use) and tents, and bones for various tools and crafts. They remain a preferred source of food for residents of Sachs Harbour and Ulukhaktok. Harvesting has declined over time in both Sachs Harbour and Ulukhaktok as a result of socio-economic, environmental, and wildlife management changes over the last several decades. Fewer harvesters go for Peary caribou than in the past. Harvesting patterns, and therefore search effort, have changed over time. Ulukhaktok harvesters hunt more along the island coastlines than inland. Harvesters are no longer actively hunting on the WQEI. Interactions between Peary caribou and other species are largely limited to muskoxen and wolves. Both are usually considered to have negative implications for caribou. A female caribou in good condition may calve every year after reaching sexual maturity between 2 and 4 years of age. They may not calve every year if they are in poor condition. Peary caribou breed primarily in October and early November and start to migrate north in April and May. Calving occurs in late May early June, with a single calf that

	is particularly vulnerable in its first week of life. Caribou that have two calves are a sign of a healthy population. While caribou are normally found in small groups, they are described as being highly mobile animals that travel in order to find suitable forage. Peary caribou relocate seasonally to different areas within (and between) islands. There have been observed movements of caribou between Banks and Northwest Victoria Island. On Northwest Victoria Island, Peary caribou are found north of Ulukhaktok, predominantly north and northeast of Minto Inlet and west of the Shaler Mountains. On Banks Island, Peary caribou range across most of the island. Peary caribou are also known to live on Melville Island and other islands in the Western Queen Elizabeth group.
Place	
For example: amount and quality of habitat available to the species compared to the past; changes in range use by the species; whether knowledge holders feel there will be changes in habitat quantity/quality; whether the species has shifted its distribution/range, and if so, how.	Peary caribou are found in the islands of the Canadian Arctic Archipelago. Within the Arctic islands of the NWT, records of Indigenous and community knowledge pertain almost exclusively to Banks Island and Northwest Victoria Island. Indigenous and community knowledge has not been extensively documented for the WQEI. Community members describe how Peary caribou use a wide range of habitats and have unpredictable migration routes, and thus need access to large areas of landscape. Based on sources of Indigenous and community knowledge reviewed, it is unclear if there have been changes in range use by the species. Recently, however, Sachs Harbour residents have observed increasing numbers of caribou in the Aulavik National Park and coming near town. Changes in sea-ice conditions may impact multiple populations by inhibiting their movement. This may also accentuate a tendency for populations on larger islands to be more robust than those on smaller islands. There are no indications as to threats to caribou on the

	WQEI. The availability and quality of forage for Peary caribou may be reduced by other grazers such as muskoxen. While caribou and muskoxen inhabit different areas during most of the year, there is some overlap during the growing season, though each are dependent on different plant species. Habitat quality may have declined on Banks Island due to severe weather events and encroachment by muskoxen. There is no evidence that distribution or overall habitat has changed significantly, although caribou distributions may fluctuate somewhat on NW Victoria Island. Peary caribou range extends onto the Diamond Jenness Peninsula and may also include the Wollaston Peninsula, making the distinction of Peary versus Dolphin and Union caribou solely on the basis of location problematic. Peary caribou populations on the southern Arctic islands in Nunavut (including Bathurst Is.) experience wide fluctuations, and were reported as low and unstable in 2005. Peary populations on the northern Arctic islands in Nunavut (Devon and Ellesmere Is.) were reported as healthier and more stable. Peary caribou are known to move between islands, although no specific observations were reported of immigration of animals from Nunavut. Climate change and marine traffic may also play a role in the ability of Peary caribou to cross between islands in search of suitable habitat. Peary caribou habitat can be affected by the characteristics of weather and climate. Over the last 10-15 years an increase in abundance and diversity of lichen have been observed on Banks Island. Inuvialuit knowledge indicates that *Akeagonak* (lichens) are integral to the diet of Peary caribou, particularly in the fall and winter. Rain and associated ground icing can be significant cause of starvation in spring and fall. Some

	Inuvialuit report that the size of Victoria Island affords caribou more options because it is big enough that when freezing rain occurs in the autumn, the caribou can move away to better grazing land within the island. The effects of freezing rain on the availability of habitat for Peary caribou may be more severe on Banks Island because of its smaller size.
Population (e.g., local, regional)	
For example: how often the species is observed compared to the past (less, more, same) and, if possible, the degree of change in observed abundance; whether the species is now unavailable, or less available, in areas where it was historically abundant; whether these changes are seen as normal or not for the species; if knowledge holders are expressing concern about the species' future, whether they express these concerns in the short-, medium-, or long-term.	Observed changes in caribou distribution are not consistently comparable to recorded trends in search effort in the sources reviewed, and do not account for potential fluctuations in overall population size. Therefore, it is not possible to distinguish changes in range from changes in search effort or changes in population size. Few reports make claims as to future numbers of caribou, but those that do, note cyclical population trends. Harvesters describe cyclical population fluctuations of Peary caribou as connected to the availability of forage, and inversely related to muskoxen populations. Caribou are predicted to come back (although no indications are offered as to when). This may refer to a change in either numbers or their whereabouts. Exact numbers are not available from Indigenous and community knowledge sources. Previously, Peary caribou numbers were considered very low. Records indicate that residents of both Sachs Harbour and Ulukhaktok considered that populations of Peary caribou were worryingly low in the 1990s, compared to 1970 levels. But more recently, based on community consultation in response to the species assessment and recovery, communities are observing increases in the population, "generating hope among respondents that they will eventually return". Recent observations from Sachs Harbour are that the population is increasing, and that "when conditions are right, they can really increase fast".

Threats and Limiting Factors	
For example: how knowledge holders characterize the degree of disturbance the species and/or its habitat are facing, through human-caused or natural sources.	On Northwest Victoria and especially Banks Island, encroachment by muskoxen has been reported to negatively affect caribou. Muskox populations have been high since the 1970s, however surveys since 2001 suggest that these populations are decreasing. On Banks Island, wolf populations increased in the 1980s and 1990s, which contributed to caribou declines between 1994 and 1998. People feel the threat is being managed adequately including through significant wolf harvesting incentives. On Northwest Victoria Island, past overharvesting was reported as the largest contributing factor to declining caribou. However, a community-imposed harvest quota has kept harvest rates nil—to-minimal since 1993. A harvest quota of 10 Peary caribou has been in place since 2015/16, with annual harvesting level below quota most years since. Negative effects from severe winter conditions and freezing rain are reported on Banks Island and on Northwest Victoria Island; this threat seems to be more important on Banks. Trends in climate observations point to an increasing frequency of severe weather events. Changing winds and a warming climate may impede the ability of Peary caribou to travel between islands, which may be a key coping strategy against the effects of severe weather events. People are concerned about the effects of industrial development on caribou populations, specifically low-flying helicopters, coal exploration, a proposed Melville Island gas pipeline, increased offshore marine traffic, and increased interaction with humans through research and tourism. Declining trends in harvesting (or 'search effort') has challenged the ability of Indigenous and community knowledge to inform Peary caribou studies of population

	health and abundance over the last two decades.
Positive Influences	
For example: factors that are or are likely to have a positive influence on the status of the species in the NWT, including habitat protection, community conservation initiatives, etc.	Hunting pressure on Peary caribou is controlled under quotas and has been low in all NWT populations since 1994. Community Conservation Plans include specific land management guidelines for some areas important for Peary caribou and designate the highest degree of protection to calving areas. Commercial harvest of muskox has occurred on Banks Island since 1981, although harvests has been low (33 to 112 muskoxen annually) compared to the population estimate (~10,979 in 2019/20). Muskox herds are declining on both Banks Island and Northwest Victoria Island according to 2014/15 assessments. Some effects of climate change may be positive for Peary caribou, including increased forage, warmer winters, and fewer mosquitoes in summer. Co-management, community-based monitoring, and harvest reporting and sample submission provides information on Peary caribou abundance, distribution and population health (e.g. individual body condition). These have served as an early warning system for changes in Peary caribou population health and abundance and support adaptive management.

Technical Summary – Scientific Knowledge Component

Question	Scientific Knowledge
Population Trends	
Generation time (average age of parents in the population) (indicate years, months, days, etc.).	9 years (from COSEWIC 2015)
Number of mature individuals in the NWT (or give a range of estimates).	About 7,800 adults (1+ year old), based on 2019 surveys of Banks and Victoria islands, and 2012 surveys of NWT WQEI. Because Peary caribou can reproduce at 2 to 4 years of age, the number of adults would slightly overestimate the number of mature individuals.
Percent change in total number of mature individuals over the **last** 10 years or 3 generations, whichever is longer.	Over the last three generations (1992 to 2019), Peary caribou on Banks Island have increased from an estimated 1015 caribou to 1913 caribou at an average annual rate of 3.3%. However, the relative recovery over the last 27 years is eclipsed by the overall population decline since 1972, with the current population at only 17% of the population size in 1972. Current numbers in the NWT are about 80% less than historic numbers ~60 years ago, and about 50% less than numbers ~40 years ago.
Percent change in total number of mature individuals over the **next** 10 years or 3 generations, whichever is longer.	Although there are no population models or population viability analyses that estimate population change over the next 3 generations, if the population continues to increase at the same rate as it has over the past 27 years (88% increase), then the population could potentially increase by about 1683 caribou to about 3600 caribou in the next 3 generations.
Percent change in total number of mature individuals over any 10 year or 3 generation period that	Current numbers in the NWT are about 80% less than historic numbers seen 60 years ago and about 50% less than numbers ~40 years ago.

includes **both the past and the future**.	
If there is a decline in the number of mature individuals, is the decline likely to continue if nothing is done?	The precise cause of the decline is not well understood and may vary between the two subpopulations. The decline is likely due to a number of factors, of which some could be managed (e.g. predation, harvesting), while others may not be (e.g. climate fluctuations, climate change).
If there is a decline, are the causes of the decline reversible?	The decline is likely due to a number of factors, of which some could be managed (e.g. predation, harvesting), while others may not be (e.g. extreme weather events).
If there is a decline, are the causes of decline clearly understood?	The cause of the decline is believed to be due to a number of interacting factors including high harvest levels, changes in predation, reduced forage availability, extreme weather events, and possibly competition and/or apparent competition with muskoxen.
If there is a decline, have the causes of the decline been removed?	Partially – harvesting quotas have been set for the Banks/Northwest Victoria Islands subpopulation.
If there are fluctuations or declines, are they within, or outside of, natural cycles?	If the observed decline and current increase are part of a natural cycle, then this is the first long-term cycle that has been monitored. Therefore, if this is indeed a cycle, there are no previous cycles to compare to in order to evaluate if this cycle is within, or outside of, natural cycles. Regardless, the temporal scope of these fluctuations in Peary caribou numbers in the NWT exceed the three-generation time period of about 27 years. Therefore, limiting the assessment of population trend to the past 27 years would not capture the full extent of the fluctuations.
Are there 'extreme fluctuations' (>1 order of magnitude) in the number of mature individuals?	Current numbers are about 80% less than historic high numbers from ~60 years ago, and about 50% less than ~40 years ago. If these changes are indicative of fluctuations, they may reach one order of magnitude in the northernmost subpopulation.

Distribution	
Estimated extent of occurrence in the NWT (in km²).	237,022 km²
Index of area of occupancy (IAO) in the NWT (in km²; based on 2 x 2 grid).	167,492 km² (IAO) 158,293 km² for biological occupancy
Number of extant locations[1] in the NWT.	There are two subpopulations (Banks/Northwest Victoria Islands and WQEI). Each subpopulation is subject to a different combination of threats – but the number of 'locations' is difficult to determine due to complex weather patterns across a large area.
Is there a **continuing decline** in area, extent, and/or quality of habitat?	Uncertain due to limited information.
Is there a **continuing decline** in number of locations, number of populations, extent of occupancy, and/or IAO?	There is no known continuing decline in number of locations or subpopulations in the NWT. However, there have been recent apparent catastrophic declines in subpopulations in Nunavut, which is the only other jurisdiction globally that contains Peary caribou. Declines in extent of occupancy are uncertain due to limited information.
Are there 'extreme fluctuations' (>1 order of magnitude) in number of locations, extent of occupancy, and/or IAO?	Extreme fluctuations in number of locations are unlikely in the NWT as caribou continue to occupy islands across their distribution. Information on distribution in individual islands is limited, but if there is a fluctuation in extent of occupancy and/or IAO it is likely less than one order of magnitude.
Is the total population 'severely fragmented' (most	Subpopulations are naturally isolated on islands separated by up to 100 km of ocean/ice. Both subpopulations have

[1] Extant location – The term 'location' defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the species present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a species is affected by more than one threatening event, location should be defined by considering the most serious plausible threat.

individuals found within small and isolated populations)?	more than 1,000 adult caribou, so are not deemed 'small'.
Immigration from Populations Elsewhere	
Does the species exist elsewhere?	Yes (Nunavut)
Status of the outside population(s)?	Severe decline since the 1960s. Of the two subpopulations that occur entirely outside of the NWT, one (Prince of Wales/Somerset/Boothia) appears to have collapsed in the mid-2000s, and about half of another subpopulation (Eastern Queen Elizabeth Islands) appears to have collapsed more recently. The portion of the WQEI subpopulation that is located outside of the NWT is stable or increasing.
Is immigration known or possible?	Possible
Would immigrants be adapted to survive and reproduce in the NWT?	Yes – similar habitat and climates. However, although they belong to the same subspecies, Peary caribou on the high Arctic Islands are genetically distinct from those on Banks and Northwest Victoria islands.
Is there enough good habitat for immigrants in the NWT?	Likely
Is the NWT population self-sustaining or does it depend on immigration for long-term survival?	Unknown; may be self-sustaining but may be vulnerable to stochastic events and immigration between subpopulations may be necessary for each to be sustained.
Threats and Limiting Factors	
Briefly summarize negative influences and indicate the magnitude and imminence for each.	• Climate change (ultimate threat) could have significant implications for the survival of Peary caribou including increased incidence of rain-on-snow and icing events, and sea-ice loss;

	• Periodic and unpredictable lack of forage availability (primarily weather-related, which is climate-related); • Harvesting (currently managed); • Disturbances from human activity (currently low but could increase); • Contaminants (currently low); • Wolf predation (unknown - possibly significant); and • Intra- and inter-specific forage competition (possible - unknown). • Expansion of grizzly bears onto the Arctic Islands could potentially be an emerging threat.
Positive Influences	

Briefly summarize positive influences and indicate the magnitude and imminence for each.	• Voluntary harvest restrictions by Sachs Harbour and Ulukhaktok harvesters in the early 1990s (immediate and significant implications):
	  o Harvest quotas for Banks Island have been in effect since the early 1990s and are currently set at 72 caribou.
	  o On Northwestern Victoria Island, a voluntary zero harvest on Peary caribou initiated in the early 1990s was in effect until 2015/16 when a quota of 10 Peary caribou was established.
	• Less harvest pressure on Melville/Prince Patrick Islands, because people rarely travel there anymore.
	• Management planning, community conservation plans, and recovery planning (useful for awareness and management focus – limited short-term impact);
	• A proposed *Recovery Strategy for Peary Caribou in Canada* was posted for public comment in 2021 with identification of sea ice crossings as candidate critical habitat for Peary caribou.
	• Habitat protection in Aulavik National Park and the Banks Island No.1 Migratory Bird Sanctuary (longer-term and moderate implications).

	• Draft guidelines developed for passenger/cruise vessels in the Canadian Arctic, which include a summary of federal and territorial permit requirements, and guidelines for use of helicopters and unmanned aerial vehicles. • The Inuvialuit Settlement Region – Cruise Ship Management Plan 2022-2025 proactively sets standards to manage cruise ships and avoid travel when sea ice is crucial for caribou migration/movement. The GNWT is also developing a Climate Change Adaptation Strategy for Wildlife in the NWT.

Glossary[2]

Term	Dialect[3]	Translation	Source
Akeagonak	S, K	Lichen sp.	OHTC *et al.* 2016
Akłaq	U, S	Grizzly Bear	SHHTC *et al.* 2016
Amaruq	U, S, K	Wolf	SHHTC *et al.* 2016
Hiku	S, K	Sea ice	Lowe 1983, 2001
Iluiliup tuktuit	I	Barren-ground caribou	Ljubicic *et al.* 2018
Ikaahuk	-	Sachs Harbour	Inuit Tapitiit Kanatami 2018
Ilulliq	-	Melville Island	Inuit Tapitiit Kanatami 2018
Ikaariaq	-	Banks Island	Inuit Tapitiit Kanatami 2018
Kiiliniq	-	Victoria Island	Inuit Tapitiit Kanatami 2018
Kingailaup tuktuit	I	Peary caribou	Ljubicic *et al.* 2018
Kongilik	S, K	Mountain sorel (*Oryria digyna*)	OHTC *et al.* 2016
Nanuq	U, S, K	Polar Bear	SHHTC *et al.* 2016
Ningak	S, K	Moss campion (*Silene acaulis*)	OHTC *et al.* 2016
Nukatugaq	K	Young male caribou	JS 2018
Olaoyak	S, K	Willows (*Salix sp.)*	OHTC *et al.* 2016
Quiviut	S, K	Muskox's inner wool	OHTC *et al.* 2016
Tiriganniaq	S, K	Arctic Fox	SHHTC *et al.* 2016
Tuktu (Plural: Tuktuk)	K	Caribou	Lowe 1983
Tuktuaraaluit	S	Small caribou	ENR 2011
Tuktuinak	K	Small caribou	ENR 2011
Tuktu Kulavak	S	Female caribou	JS 2018
Tuktu Kulavak	K	Female caribou	JS 2018
Tuttunguluurat	U	Small caribou	ENR 2011
Tuktu Kulavak	S	Female caribou	JS 2018
Tuktu Kulavak	K	Female caribou	JS 2018
Umingmak	U, S, K	Muskox	SHHTC *et al.* 2016

[2] The terminology included in this glossary are informed only by sources reviewed and not verified or elaborated upon by Indigenous speakers or linguists.

[3] Three dialects are spoken in the Inuvialuit Settlement Region. Siglitun (S) is spoken in the coastal communities of Tuktoyaktuk, Paulatuk, and Sachs Harbour (Siglit). Uummarmiutun (U) is spoken in the Delta communities of Aklavik and Inuvik (Uummarmiut). Kangiryuarmiut (K), or Inuktitut or Inuinnaqtun (I), is spoken in the community of Ulukhaktok on Victoria Island (Kitikmeot Region),.

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PLACE NAMES

The below maps (Figures 1, 2, 3, and 4) can be referred to for both the Indigenous and community knowledge and Scientific Knowledge components of this status report. They are intended to help provide context to readers who may be unfamiliar with the geographic features (e.g., mountains, rivers, lakes) and place names referred to in this status report.

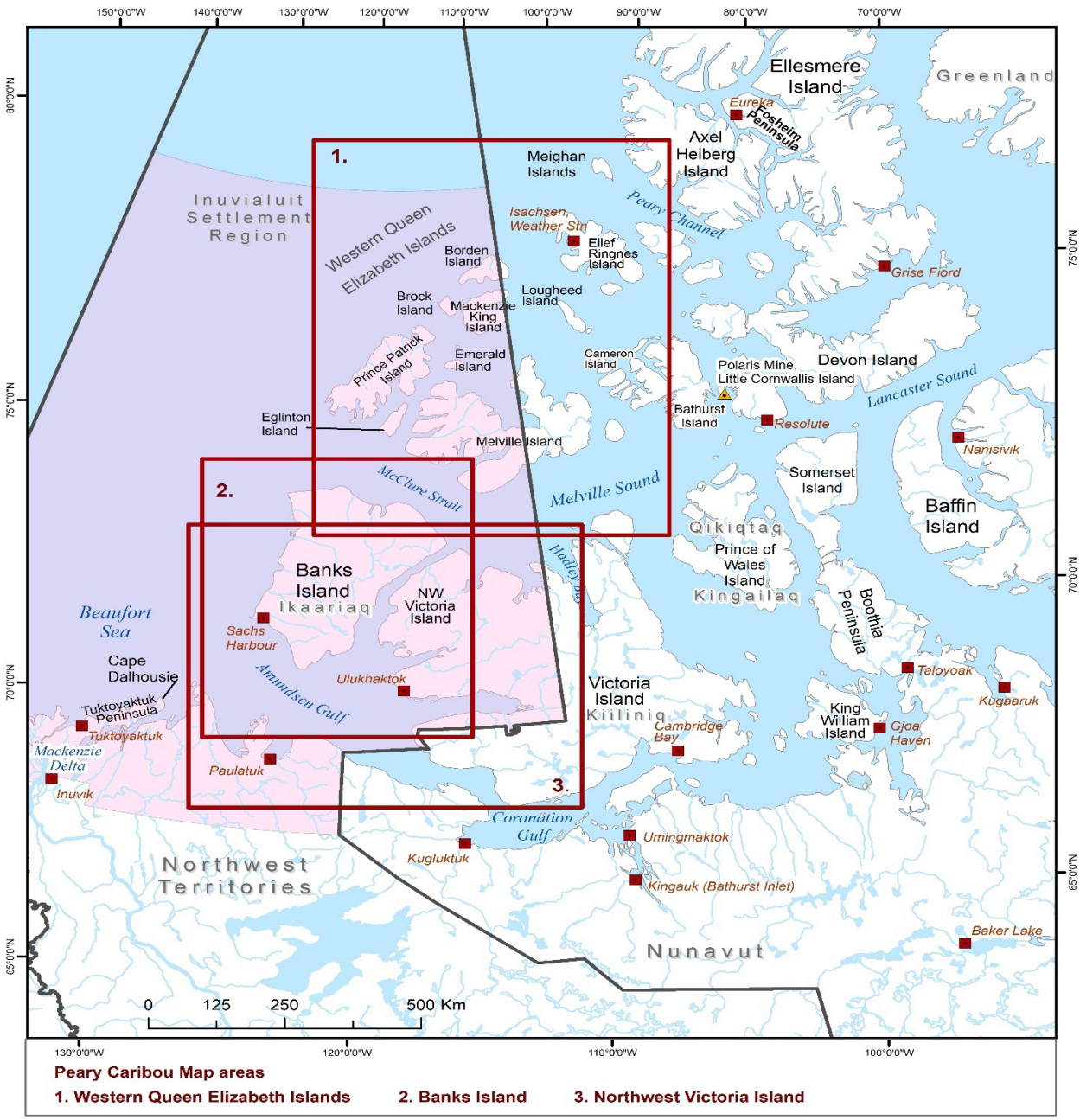

Figure 1. Map showing the regional areas of the Canadian Arctic Archipelago that Peary caribou occur: Western Queen Elizabeth Islands, Banks Island (*Ikaariaq*) and Northwest Victoria Island (*Kiiliniq*). Map courtesy B. Fournier, ENR.

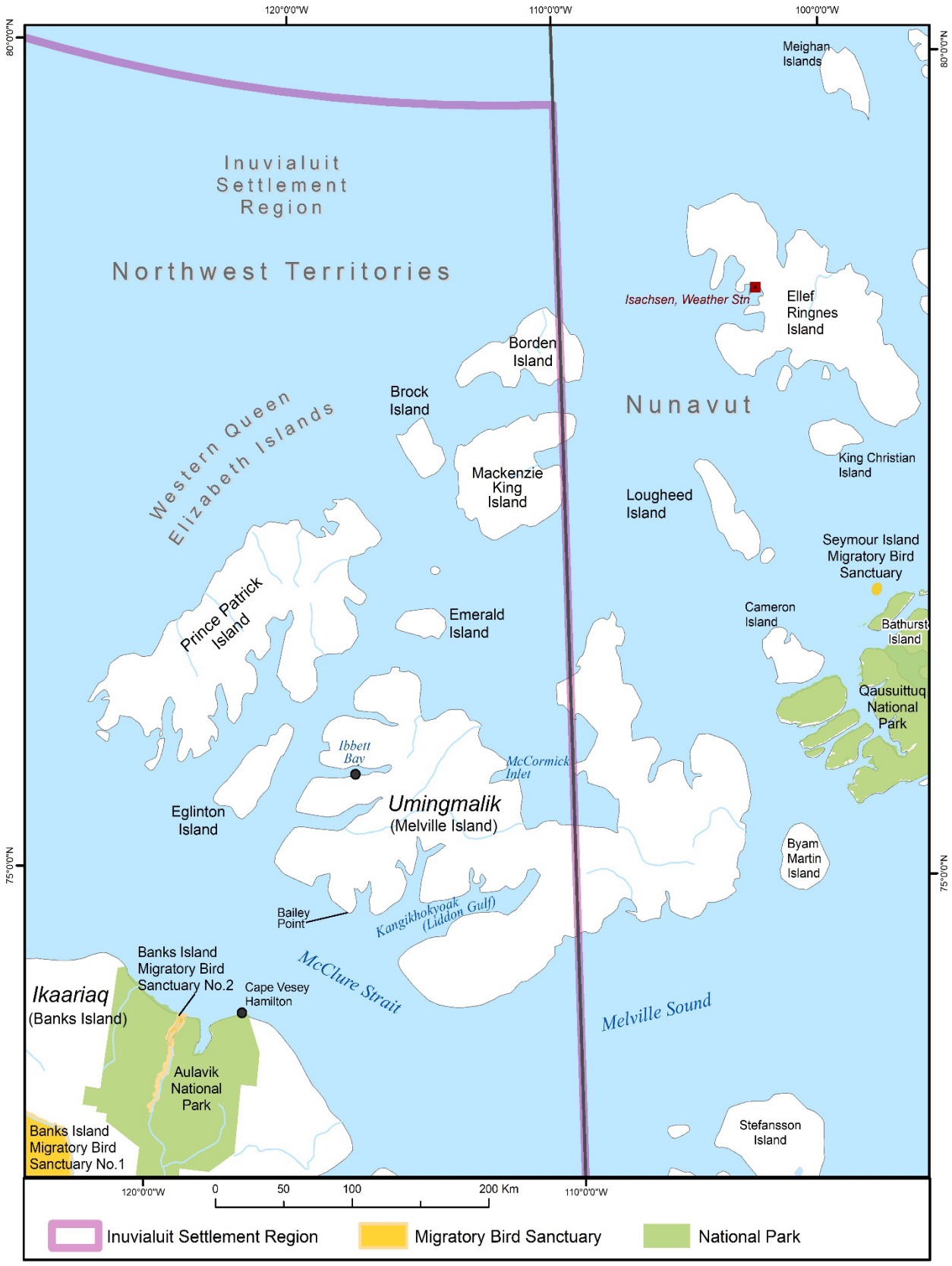

Figure 2. Map of Western Queen Elizabeth Island regional area. Map courtesy B. Fournier, ENR.

Figure 3. Map of Banks Island (*Ikaariaq*) regional area. Map courtesy B. Fournier, ENR.

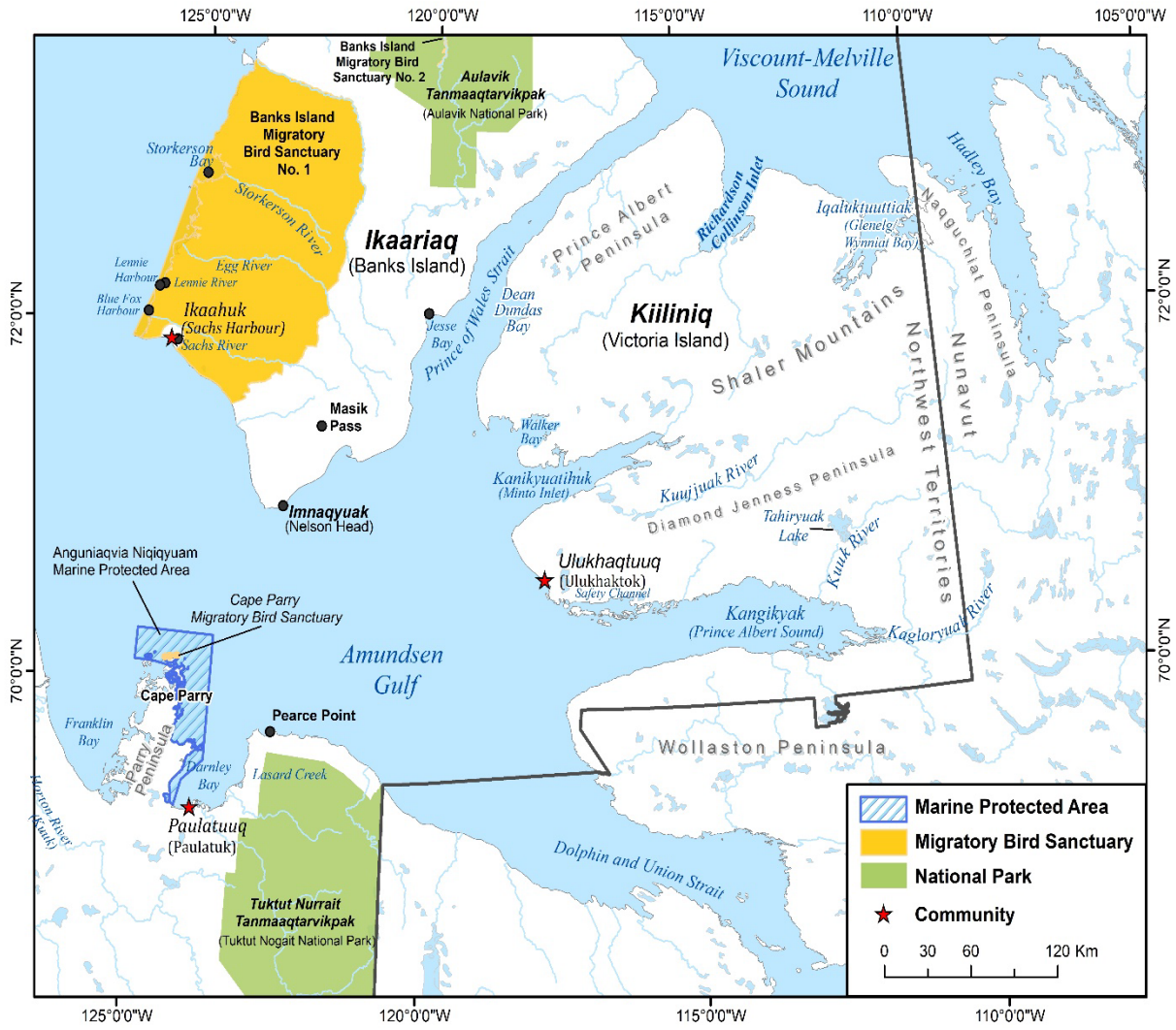

Figure 4. Map of Northwest Victoria Island (*Kiiliniq*) regional area. Map courtesy B. Fournier, ENR.

INDIGENOUS AND COMMUNITY KNOWLEDGE COMPONENT

Preface

"You can't really teach someone on a piece of paper, like theoretical. For that, you have to be more practical; you have to go out there and show them. They have to physically see what you are talking about, compared to reading it from a piece of paper. That's the teaching that I do. I bring them out there. I let them feel the ice. They can see the… different ice colours. Which is safe, which is good to go on, which is not safe, [where] it could be unstable. So, there are all these things about the ice. And you've got the currents, you've got the moon, you've got the wind direction. You can't teach a person in one week about all these changes that are happening, that you're aware of, that you could see, you could hear and feel. But giving that knowledge takes time; say, two, three years just to absorb this information and keep seeing." (PIN 158 [Paulatuk] in Joint Secretariat 2015)

The consideration of Indigenous peoples' cultural histories, identities, languages, social organizations, and interactions with their environment is of vital importance for the accurate assessment of species. While all reasonably available Indigenous and community knowledge was solicited for inclusion in this status report, limitations are acknowledged. First, in the completion of these reports, the Species at Risk Committee (SARC) is not able to conduct any primary research or information gathering activities (e.g., interviews). The transcription and verification of Indigenous and community knowledge is often complex and resource-intensive, not to mention sometimes controversial (Bayha 2012). It is often the case that only a small portion of the Indigenous and community knowledge that exists has actually been transcribed. This limits the completeness, and perhaps also accuracy, of a status report. Second, it is important for us to recognize that the Indigenous knowledge that has been transcribed and was available for inclusion in this status report, is, in many respects, removed from the cultural, spiritual, linguistic, and ecological context in which it was intended to be heard (Berkes *et al.* 2000; Thorpe 2004; SENES Consultants Ltd. 2010; Tłı̨chǫ Research and Training Institute [TRTI] 2016). Translation, in particular, can result in generalizations and the loss of sometimes subtle descriptions of inter- and intra-specific variation, interactions, and patterns (TRTI 2016; Polfus *et al.* 2017). As noted by Polfus *et al.* 2017: 17), "*words are used in context and convey different meaning depending on who is speaking, what dialect is being used, what questions are being addressed, where on the land the speaker is located, and the dialect or background of the audience*." Although Indigenous knowledge and its transmission is ultimately grounded in practice, language is integral to its interpretation (Bayha 2012; Polfus *et al.* 2016). Ultimately, understanding the environment (animals, plants, land, water, air, etc.); that is, practicing one's culture, is essential to understanding the stories and legends.

Preamble

"In the time before the Inuvialuit had books, our elders, both men and women, were the keepers of Inuvialuit knowledge…The hunters especially relied heavily upon the stories and advice given by their elders so they could become better hunters and leaders" in Inuvialuit Pitqusiit (GNWT 1991: 13)

"[Inuit] are traditionally concerned with knowing as much as possible, and individuals are given special respect and prestige if they are especially knowledgeable. Thus they are willing and anxious to learn from their fellows, both by watching them as they hunt and by listening as they recount their experiences or relate what they have heard from others." In Hunters of the Northern Ice (Nelson 1969: 374)

"Conservation is ensuring that if we take caribou, there will be caribou the next year and the year after that. The same for anything else. This applies to all uses of the land: if it is used and enjoyed now, it must be left and preserved so that it will be there for the next year and for future years." (Peter Green, Original Paulatuk Conservation Working Group, in Paulatuk HTC et al. 2016: 3)

Inuvialuit traditional knowledge is considered a "cumulative body of knowledge, know-how, practices and presentations maintained and developed by the peoples over a long period of time [which] encompasses spiritual relationships, historical and present relationships with the natural environment, and the use of natural resources" (Smith 2006, i). Indigenous and community knowledge has also been defined as "the knowledge gained by individuals through traditional learning patterns, and through living on and using the land… [as] observing, listening, testing, determining and experiencing all play considerable roles in retaining traditional knowledge" (MPEG 2006: 6.1.1). Indigenous and community knowledge is highly valued and central to the survival, culture, and identity of the Inuvialuit and through years of accumulated experiences and place-based observations, holds wisdom, insight, and perspective into the complex Arctic environment (Slavik 2013). It is generally expressed in oral form and is passed on from generation to generation by storytelling and practical teaching (Smith 2006).

As a holistic method of understanding the environment, Indigenous and community knowledge is deeply rooted in the cultural context of place, which includes the people and their stories of the environment. There is no separation between nature and culture - and people are part of the environment and the environment is understood through their cultural lens (Ingold 2000). Because Indigenous and community knowledge is embedded within a particular community and is contextually bound to the history and culture it develops from, its examination requires a commitment to the local context (Agrawal 1995). Likewise, Indigenous and community knowledge is not static. While the foundation is based upon historical observations, past experiences, and oral histories, Indigenous peoples' knowledge is not frozen

in the past, but is an accumulation of adaptive responses that evolve over time and are still evolving (Berkes 1999).

With respect to wildlife management in Northern Canada, Indigenous and community knowledge is continually informed by multiple sources, including western science, as a result of interactions between community members and the western scientific and resource co-management community (Usher 2000; Wray 2010; Slavik 2013). In the western Arctic, there has been a history of collaboration between local communities and wildlife biologists in the region. In fact, the *Inuvialuit Final Agreement* states, as a principle, that "the relevant knowledge and experience of both the Inuvialuit and the scientific communities should be employed in order to achieve conservation" (DIAND 1984: article 14.5). These efforts include a harvest monitoring and reporting program that provides observations and samples of Peary caribou population health (e.g. body condition), which has served as an early warning system for changes in Peary caribou population health and abundance (Johnson *et al.* 2016). However, it has been observed that a declining trend in harvesting (or 'search effort') has challenged the ability of Indigenous and community knowledge to inform Peary caribou studies of population health and abundance over the last two decades (Nagy 1999b; CPCVI 1998; GNWT and Government of Nunavut 2011; Pearce *et al.* 2011).

The *2012 Species Status Report for Peary Caribou (*Rangifer tarandus pearyi*) in the Northwest Territories* (SARC 2012) acknowledged that there has been limited documentation of Indigenous and community knowledge of Peary caribou in the NWT, although there remains extensive (though undocumented) knowledge of Peary caribou within the living memory of Elders and harvesters in Sachs Harbour and Ulukhaktok (Nagy 2004; Pearce *et al.* 2011). SARC (2012) also indicated that information from Indigenous and community sources documenting Peary caribou specific to the WQEI has been limited (SARC 2012). More recently workshops held by the Canadian Wildlife Service in Sachs Harbour and Ulukhaktok included Indigenous knowledge that informed the federal Recovery Strategy for Peary caribou (ECCC 2021, b) and the Johnson *et al.* (2016) knowledge assessment included workshops with the community of Grise Fiord. In 2004, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed Peary Caribou as 'Endangered' in Canada (COSEWIC 2004) and Peary Caribou were subsequently listed as 'Endangered' under the federal *Species at Risk Act* in 2011. In 2015, COSEWIC re-assessed Peary caribou as 'Threatened' (COSEWIC 2015). The federal listing of Peary caribou as 'Endangered' in 2011 prompted additional research and synthesis across the range, including an increased effort to collect and synthesize Indigenous and community knowledge in research. However, the majority of published research since 2012

reflects the *Inuit Qaujimajatuqangit*[4] (IQ) of Nunavut communities within the Peary caribou range or communities that harvest Peary caribou – Cambridge Bay, Taloyoak, and Grise Fjord. Publications of these studies were reviewed for this status report update, recognizing the transboundary nature of Peary caribou and importance of Indigenous knowledge and local observations across the species range in the central and western Arctic.

This update to the *Species Status Report for Peary Caribou (*Rangifer tarandus pearyi*) in the Northwest Territories* (SARC 2012) attempts to draw on recent studies, publications, and community consultation documents to expand and update the Indigenous and community knowledge component. This includes the review and integration of several recent publications listed within the bibliography, as well as minutes and notes resulting from a series of community consultation rounds specific to Peary caribou led by Wildlife Management Advisory Council (NWT) (WMAC-NWT), Canadian Wildlife Service (CWS), and the Government of Nunavut.

The 2022 SARC assessment update benefitted from the following sources:

- The 2016 updates to the Community Conservation Plans (CCPs) (Paulatuk HTC *et al.* 2016; SHHTC *et al.* 2016; and OHTC *et al.* 2016).
- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 2015. COSEWIC assessment and status report on the Peary Caribou *Rangifer tarandus pearyi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 92 pp.
- Johnson, C.A., Neave, E., Blukacz-Richards, A., Banks, S.N., and P.E. Quesnelle. 2016. Knowledge assessment (community and scientific) to inform the identification of critical habitat for Peary caribou, *Rangifer tarandus pearyi*, in the Canadian Arctic. Environment and Climate Change Canada, Science and Technology, Ottawa, Ontario, Canada. 192 pp.
- Joint Secretariat [JS]. 2018. Inuvialuit Harvest Study: Partner Report. Joint Secretariat, Inuvik, NT. 27 pp.

The proposed federal Recovery Strategy for Peary Caribou. ECCC. 2021. Recovery Strategy for the Peary Caribou (*Rangifer tarandus pearyi*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xii + 101 pp. The availability of these recent publications - especially the community prepared conservation plans, regional co-management plans, and COSEWIC species status and assessment reports - provided great value in contributing recent quantitative, qualitative, and spatially explicit

[4] IQ is the system of values, knowledge, and beliefs gained by Inuit through generations of living in close contact with nature. For Inuit, IQ is an inseparable part of their culture and includes rules and views that affect modern resource use. (GNWT and GN 2018)

observations. Although one challenge in interpreting these documents is that they often tend to combine Indigenous and community knowledge and science without any clear indication of which statements are founded in which sources of knowledge. It should also be noted that several new sources and research projects specific to Inuvialuit indigenous and community knowledge are currently under various stages of research, data collection and analysis and have not been verified or published at the time of this update. This includes a Peary Caribou Traditional Knowledge Project (ENR Peary Caribou TK Project; Nathoo pers. comm. 2020) and on-going research relating to community-based monitoring of caribou and muskox through the University of Calgary (Mavrot pers. comm. 2020). At the federal level, in 2021 Environment and Climate Change Canada posted the proposed *Recovery Strategy for the Peary Caribou (*Rangifer tarandus pearyi*) in Canada* (ECCC 2021).

ABOUT THE SPECIES

Names and Classification

Common Name – English	Peary Caribou (Island caribou, Victoria Island caribou, Minto Inlet caribou, Banks Island caribou)
Common Name – French	Caribou de Peary
Scientific Name	*Rangifer tarandus pearyi*
Kangiryuarmiut (K)	*Tuktu* (Plural: *Tuktuk*) (Lowe 1983)
Community of Ulukhaktok	*Toktu* (Community of Ulukhaktok *et al.* 2008)
Inuktitut	*Kingailaup tuktuit* (Ljubicic *et al.* 2018)[5]
Inuinnaqtun (I)	*Tuktuinak* (small caribou) (ENR 2011)
Siglitun (S)	*Tuktuaraaluit* (small caribou) (ENR 2011)
Ummarmiutun (U)	*Tuttunguluurat* (small caribou) (ENR 2011)

Relationship with People

Regional/Cultural Background

Inuit occupy the largest area of any Indigenous peoples, extending from Siberia, across the arctic coastal areas of Alaska and Canada, to the east coast of Greenland (Freeman 1976; Damas 1984; Riewe 1991). The Inuvialuit in the Mackenzie Delta-Beaufort region of Canada's Western Arctic originate from at least three regionally and culturally distinct Inuit ancestors – the Mackenzie Inuit, the Iñupiat, and the Kangiryuarmiut – Copper Inuit (Ayles and Snow 2002). The Inuvialuit are approximately 5,000 people and are made up of three subgroups — the *Uummarmiut*, *Siglit* and *Kangiryuarmiut* — each with a distinctive dialect of the Inuvialuktun language (Joint Secretariat [JS] 2015). Most Inuvialuit live among six settlements within the northern region of the Northwest Territories. One of these settlements (Sachs Harbour [*Ikaahuk*]) is within the core range of the Banks-Victoria subpopulation of Peary caribou, while two others (Ulukhaktok and Paulatuk) are outside the core but areas within their general range (seasonal use).

[5] "Kingailaq" means a "place with no mountains", and "kingailaup tuktuit" refers to caribou coming from the islands north of Qikiqtaq. Kingailaq was always translated as a specific reference to the island known as Prince of Wales Island in English, although Kingailaq is also the Inuktitut name for Boothia Peninsula. Iluiliup tuktuit are most commonly translated into English as barren-ground caribou (*Rangifer tarandus groenlandicus*), whereas kingailaup tuktuit are most commonly translated into English as Peary caribou (*Rangifer tarandus pearyi*)" (Ljubicic *et al.*, 2018: 218).

Prior to the first traders traveling to 'Banksland' in 1916, Banks Island (*Ikaariaq*) was occupied seasonally by the *Kangiryuarmiut* – Copper Inuit from the Walker Bay and Minto Inlet region of Victoria Island (*Kiiliniq*) (Farquharson 1976; Nagy 1999a; Usher 1971a). By mid 1910s, Inuvialuit families from the mainland and Victoria Island began traveling to Banks Island in order to trap white fox (Ayles and Snow 2002). In Usher's extensive ethnography of Bankslanders, he counted that between 1928 and 1967, of the "95 adult men have trapped full-time for at least one season on Banks Island, almost half were Alaskan lineage (although very few were born in Alaska), with the rest being Mackenzie Eskimo, Copper Eskimo, or mixed-blood in approximately equal proportions" (Usher 1971a: 58). In the early years, these trappers established seasonal camps in thirteen sites throughout the island that favored safe anchorage and haul-up of the schooners, including Siksik Bay, Storkerson Bay, Sea Otter Harbour, Blue Fox Harbour, Lennie Harbour, De Salis Bay, and Jesse Bay (CSH *et al.* 1992; SHHTC *et al.* 2016). Today, Sachs Harbour is the smallest community in the Inuvialuit Settlement Region (ISR). Residents participate in a mixed-subsistence based economy and throughout the year, harvest caribou, muskox, arctic hare, bearded seal, ringed seal and polar bear, along with several fish and bird species (Riedlinger 2001a).

The origin of people currently living in Ulukhaktok is a mix of those from Walker Bay, Minto Inlet, Tuktoyaktuk, Sachs Harbour, Kugluktuk, and Reed Island. Victoria Island is the ancestral home of the Copper Inuit. The Copper Inuit, the western most group of Central Inuit, occupied the areas East of Mackenzie Inuit, including Southern Banks Island and Victoria Island and occasionally travelled east to King William Island where they traded copper for wood (Damas 1984; Olokhaktomiut Hunter and Trappers Committee [OHTC] *et al.* 2016). Historically, two Copper Inuit groups occupied Northwest Victoria Island: the *Kanghiryuachiakmiut* (centred in Minto Inlet), and the *Kanghiryuakmiut* (centred in Prince Albert Sound) (Farquharson 1976). These groups were engaged in a purely subsistence lifestyle which required seasonal movements. Typically, families would congregate and move in spring to areas along the rivers and inlets of Minto Inlet and Prince Albert Sound to fish and hunt caribou (OHTC *et al.* 2016). In fall and winter, families were more dispersed and hunted along the coastline and sea ice where seals and polar bears were hunted (OHTC *et al.* 2016). Stefansson (1919) observed that the Copper Inuit were less dependent on seals and marine mammals than the Mackenzie Inuit and Iñupiat, subsiding on a caribou, fish, fowl and small game.

Traditional lifestyles and harvesting patterns began to change for Inuvialuit with the arrival of the fur traders and trading posts. Between 1910 and 1916, Inuvialuit living around the Amundsen Gulf area, became oriented to the trapping economy and the rifle which resulted in more permanent settlements near trading posts, adoption of new technologies such as firearms and steel traps, and a mixed diet supplemented by the introduction of imported foods (Usher 1966). The later introduction of the outboard motor and the snowmobile (around 1969)

had a significant effect on the lifestyle of the local people, further increasing the efficiency of hunters. These changes resulted in "less but more efficient time spent subsistence harvesting, more time spent harvesting and preparing furs and reduced dependency on traditional foods" (OHTC *et al.* 2016: 15). The increased efficiencies to harvest game have been offset to some extent by the reduced number of dogs to feed and by increased local consumption of imported food (OHTC *et al.* 2016).

Cultural and Economic Importance

Inuvialuit have been hunting terrestrial and marine mammals in their traditional territories in the Western Arctic since time immemorial (JS 2015). Harvesting caribou and other animals has always been an integral part of the Inuvialuit identity, values, economy, livelihoods, and culture. The values, beliefs and practices of harvesting are passed on through language, Indigenous ways of knowing, oral histories, land-based learning, and inter-generational knowledge sharing (Bayha 2012; Bennett and Rowley 2004; Kendrick and Manseau 2008; Ljubicic *et al.* 2018; Polfus *et al.* 2017).

Caribou have been an important part of harvesting activities and material culture of Inuit families for generations (Bennett and Rowley 2004; Freeman 1976). Peary caribou were a staple for Inuvialuit on Banks and Victoria Islands as a source of meat for food, hides for clothing, sleeping skins (winter use) and tents, and bones for various tools and crafts until the mid-1980s (OHTC *et al.* 2016, Whittles 2005). Inuvialuit have historically used Peary caribou as a primary source of food and clothing while living and traveling on Banks Island and Northwest Victoria Island, and they remain a preferred source of food for residents of Sachs Harbour and Ulukhaktok. From the mid-1970s until the late 1980s, Peary caribou have also contributed to the wage economy of Sachs Harbour and Ulukhaktok, through fur trading and some big-game hunting (Condon 1996; Whittles 2005).

Harvest Patterns and Search Effort

'Search effort' is a way of describing how well people know where Peary caribou are. To the extent that this is based on Indigenous and community knowledge, it is formed through iterative experience and informed by the teachings of Elders and discussions with other hunters (McMillan 2012). Taylor (2005: 31) describes the concept of search effort as it relates to Indigenous and community knowledge in Nunavut:

"The Inuit observations were not the result of a systematic aerial study that attempted to cover the given percentage of ground using a repeatable methodology. Instead, they are observations made in areas where people could travel by foot, dogsled, snowmobile and/or boat. Sightings were made as a result of: (i) informed decisions as to where to hunt; (ii) exploration of unknown areas i.e., areas where animals had been known to occur sometime in the past; or (iii) by chance (e.g., not attempting to find caribou… but by camping or working in an area where animals happened to be present)."

Search effort by Indigenous peoples varies, but in a general sense, has a longer timeframe (many generations) and smaller spatial coverage (local, seasonal hunting areas) compared to aerial surveys of the region by biologists (COSEWIC 2018). With respect to Indigenous and community knowledge, search effort can be reflected by hunting ranges – both for Peary caribou as well as observations while harvesting other species. From the sources reviewed for this report, Inuvialuit observations of Peary caribou seem to be primarily made in the context of harvesting them for food and clothing across a vast area in the Inuvialuit Settlement Region. Harvesting occurs on trips made specifically for hunting caribou and also during other activities such as trapping, hunting other species, or traveling from one place to another, as Riedlinger and Berkes (2001: 321) explain:

"In the community of Sachs Harbour, many families maintain camps at inland lakes that they travel to regularly, often at the same time every year. These trips provide a time series of observations which can be recalled years later, on such things as inland snow conditions, sea-ice, and the appearance of migratory animals... Such observations provide an in-depth, cumulative, relational, diachronic [happening over time] set of information for a given area."

Historical accounts of search effort describe hunters traversing vast areas to locate caribou (Stefansson 1921; Berger 1977). This was often a seasonal pattern where in the spring hunters would begin to travel to locations they knew were used by caribou in the summer (William Kuptana [section N92-253-084a] in Nagy 1999a):

"[Hunters would] start going north hunting caribou since there was no more caribou where they were. Both dogs and their master would start out north with their packs. They had blankets of caribou skins and most of the time, they would be hungry as there was no caribou so they were also trying to get to where there was fish... This is how they got enough to eat while they kept traveling straight north where there was caribou. Maybe they would get one caribou and share with everyone, whoever they travel with. Whoever got caribou would keep the skin for himself, for their clothing. This is why they would go north and spend all summer where there was caribou. Those old time people really suffered as they had no fish nets or guns. This was the way before the white people ever came. They would make hunting blinds for women and men while hunting caribou. After making a blind, they built inukshuk out of moss on both sides of the shade. They built this inukshuk just right for a man to shoot in between the inukshuk. The women would herd caribou and the men aimed their bow and arrow behind inukshuk."

When caribou were available, hunters and their families would harvest and prepare large amounts of dried meat in preparation for harsher times (Susie Tiktalik and William Kuptana in Nagy 1999a)[6,7]. In summertime, this often involved caching meat for the winter. People also

[6] "When the people were getting caribou, it was just like they had lots of meat... When people started coming and making dry meat, there was a lot of dry meat racks with lots of meat drying. They prepared all the meat so they wouldn't spoil. They would cook the insides to be put away. They used everything and put it away because they were thankful for the food" (Susie Tiktalik [N92-253-216b] in Nagy 1999a).

hunted caribou in the late summertime as their coat was in prime condition for winter parkas (Farquharson 1976; William Kuptana [section N89-08-009a] *in* Nagy 1999a). Sometimes it was necessary to make clothing from caribou harvested in the winter, however, even though their hides were in poor shape, and falling apart (William Kuptana [section N89-008-011a] *in* Nagy 1999a).

Harvesting patterns, and therefore search effort, can also change over time. It is important to account for these changes (especially which areas are traversed, when, and how often) because they affect the observations that are made. For example, before the introduction of rifles, some groups only hunted caribou on hilly land (presumably because of the cover it afforded) (Farquharson 1976). Sometime before 1923, rifles became available which likely made hunting caribou easier on sea-ice devoid of cover (Farquharson 1976). In the 1970s, caribou hunting became a practice undertaken with skidoos rather than dogsleds during the winter (Condon 1996: 161-64; Community of Ulukhaktok *et al.* 2008). Skidoos made hunting faster and easier, and caribou would not be as likely to run away as they had been when hunters used slower dog-teams (Condon 1996). Hunters could also cover a greater distance searching for caribou, thus increasing the effectiveness of their search effort (Condon 1996).

Harvesters' observations of abundance and movement patterns may be limited or restricted to specific areas of interest. For example, some areas may not be traversed at all, such as the high ground near Nelson Head on Banks Island[8]. As a result, there may be movement or migrations routes used by Peary caribou that have yet to be identified (Johnson *et al.* 2016). Unfortunately, accounts of harvester search effort from the sources reviewed here are not consistent enough to draw specific inferences that might give context to observations about Peary caribou populations, distributions, and dynamics over time.

Overall search effort is likely declining as multiple reports indicate that fewer hunters in Sachs Harbour and Ulukhaktok hunt for caribou than in the past (Condon 1996: 175; Collings and Condon 1996; Nagy 1999b; Pearce *et al.* 2011). Increasing living and subsistence costs and time-constraints have resulted in some Inuit spending less time harvesting. Community-imposed wildlife management quotas have also decreased search effort as well, as harvesters limit their travel range based on cost vs. returns of travelling great distances to potentially harvest relatively few animals (Nathoo pers. comm. 2021).

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[7] "People long ago they sure used to suffer a lot, they just tried to look for food to eat, all the time. They try to do their best. When they had enough food for themselves, when they feel as if they have enough food, it is like a white person would do when they have a lot of groceries. They make big bags in the fall with caribou and with the fish that are frozen… They always become big bags, they can't even lift it up anymore. Two people could go into one of them big bags. It's called a puguhiq. The same thing with the caribou meat" (William Kuptana [N89-008-011a] in Nagy 1999a).

[8] "We never go through that, we never hunt in that part because it's too high and lots of rocks there" (Peter Esau *in* Berger 1976b: 4127-28).

Less time on the land has affected the generation and transmission of environmental knowledge, language and land skills among some Inuit (Pearce *et al.*; 2010; 2011b). John Lucas explains, "There's some [hunters], but now it's starting to be going down. Now that all these old timers are slowly finishing, we don't have that many. Most of these young guys that are going out, they lack experience. It's getting kind of dangerous too." (*in* Nagy 1999b: 153-154).

The increase in the frequency and magnitude of climate events have increased travel risks and compromised access to some hunting grounds (Pearce *et al.* 2010). Riedlinger (2001a, 2001b) and Fawcett *et al.* (2018) also describe how climate change is impacting harvesters' search effort. For instance, Riedlinger (2001) records that less snowfall on Banks Island impedes hunters' ability to travel the land. Specifically, hunters report that they are no longer able to go caribou hunting at the end of September for lack of snow: "We notice because [now] we travel to our cabin in October" (F. and M. Kudlak *in* Riedlinger 2001a: 73). Unreliable snow conditions leading to more bare ground and open water also means that families prefer to travel along the coast rather than inland (Riedlinger 2001b: 97-98). Variable winds, increasing storm intensity, unpredictability and speed of onset of weather, and changing wind-ice regime can make caribou hunting more dangerous, costly, and increase time constraints, as Fawcett *et al.* (2018) explains:

"Winds were becoming more of a problem in the summer months when people travel to hunting areas by boat. Wind can create wave activity that makes boating difficult, if not impossible, and makes some hunting areas inaccessible. [These] conditions continue to challenge boat travel to caribou hunting areas in PAS (Dolphin-Union herd)… Summer caribou hunting by boat has always been expensive but can now cost as much as CAD2000 per boat because of the need for extra gas and supplies in preparation for unpredictable wind and ice conditions."

Rapid seasonal transitions and hazardous conditions lead to more hunters being stranded or injured. Fawcett *et al.* (2018) documents how Inuit are responding by altering travel routes and equipment, taking greater pre-trip precautions, concentrating their efforts on more efficient and accessible hunts, and enhancing country food sharing networks.

Northwest Victoria Island

Residents of Ulukhaktok have historically hunted both Peary caribou and Dolphin and Union caribou populations on Victoria Island. When either Peary or Dolphin and Union caribou are less accessible, this can lead to increased hunting pressure on the other (Farquharson 1976; Community of Ulukhaktok *et al.* 1994; 2008). For example, Farquharson (1976) describes that between 1940 and 1962, Dolphin and Union caribou became scarcer south of Prince Albert Sound, which increased hunting of the Peary caribou. Conversely, harvesting pressure can shift to "barren-ground caribou around Prince Albert Sound" (presumably Dolphin and Union caribou) when Peary caribou are scarce (Community of Ulukhaktok *et al.* 1994; 2008: 69). Accounts also seem to suggest that the peak harvesting season may have changed from the

late winter/spring (before the 1970s), to the winter (1970s-80s), to the autumn (since the 1990s), although some harvesting may occur year around (Farquharson 1976; Jacobson 1980; Community of Ulukhaktok *et al.* 2008; Kassam 2009). In addition, by the mid-1980s harvesters were using more coastal areas on Northwest Victoria Island than they had previously (Kuptana 1983).

Kanghiryuachiakmiut (Copper Inuit that occupied Minto Inlet) would hunt caribou primarily in the spring and fall over much of Northwest Victoria Island, including the Minto Inlet area, Richard Collinson Inlet, Glenelg Inlet, and along the Kuujjua River (Farquharson 1976). *Kanghiryuakmiut* (Copper Inuit that occupied Prince Albert Sound) hunted seals in the winter, and caribou during the rest of the year along the Kagloryuak and Kuuk Rivers and around North Tahiryuak Lake (areas that may be occupied by either Peary or Dolphin and Union caribou) (Farquharson 1976; Community of Ulukhaktok *et al.* 2008). Most of the *Kanghiryuakmiut* hunting was conducted in the spring and summer, and to a lesser extent in early fall (August and September) when the animals were at their fattest and their hides ideal for making clothing (Condon 1996: 76).

From 1923-39, hunters from *Kanghiryuachiakmiut* would hunt caribou in the spring along the rivers and inlets of Prince Albert Sound and Minto Inlet, often when the caribou were crossing Minto Inlet from the highlands south of the Kuujjua River (Farquharson 1976: 58; Community of Ulukhaktok *et al.* 2008: 14). In the summer, hunters (including some from *Kanghiryuakmiut*) travelled around the Prince Albert Peninsula from Deans Dundas Bay to the Shaler Mountains and Glenelg Bay to hunt Peary caribou, while others went across to De Salis Bay or Cape Treadwell on Banks Island. Then, "in late summer, they began to move back toward their winter camps, and they hunted caribou all around Minto Inlet to get skins for winter clothing" (Farquharson 1976: 58). Families obtained only a few caribou while trapping during the winter (Farquharson 1976).

Hunting increased between 1939 and 1965 around Minto Inlet, with the exception of the highland area northeast of Ulukhaktok as "many caribou winter there, but the area is too rough for fast and easy travel" (Farquharson 1976: 61). Between 1962 and 1976 caribou were hunted along the coast in the fall, but mostly by snowmobile inland east of Minto Inlet as far as the Shaler Mountains (Farquharson 1976). Hunting also continued in the winter along trap lines, sometimes far inland north of Minto Inlet, along the south coast, and to the east of Ulukhaktok past the Kuuk River (Farquharson 1976). In early spring, caribou were typically accessible close to Ulukhaktok, and were hunted on the Prince Albert Peninsula, and along the Kuujjua River. The mountainous area to the northeast of Ulukhaktok was still traversed less frequently, however.

Jacobson (1980) describes caribou harvesting in the late 1970s by approximately a dozen residents of Ulukhaktok. The harvesting was usually in conjunction with trapping and occurred

on Northwest Victoria Island from October to April, along Prince of Wales Strait and Minto Inlet, as far east as Glenelg Bay. From 1980 until at least 1983, Inuvialuit on Victoria Island did not hunt as far inland as they did previously, instead hunting more along the coast during the summer (Kuptana 1983: 5). In the 1980s, hunting around Minto Inlet was conducted mainly in the winter, and around Prince Albert Sound in the summer (Gunn and Fournier 2000).

Based on interviews in 1998 and 1999, Kassam (2009) presents caribou hunting by Ulukhaktok residents as occurring somewhat from February to May, but at its highest in August, September, and October. He notes these characteristics as related to conservation measures but does not elaborate (Kassam 2009: 132). The *Olokhaktomiu*t Community Conservation Plan (OHTC *et al.* 2016: 154) provided a harvest calendar that illustrates caribou harvesting concentrated between July and August, and again from October through November, though it is unclear if this refers to Peary, Dolphin and Union or both.

Caribou hunting areas included Prince Albert Sound, Minto Inlet, Berkley Point, the west end of Diamond Jenness Peninsula, and the Shaler Mountains. Ulukhaktok harvest has usually occurred in Minto Inlet area where Peary caribou predominate, however, harvest shifts to barren-ground caribou, Dolphin and Union from Prince Albert Sound area when northern animals are scarce (OHTC *et al.* 2016). Numerous outpost camps line the shores of Minto Inlet, which are extremely important to the families of Ulukhaktok for hunting, fishing and trapping, and occasionally used for sport hunting species including caribou, muskox and wolf (see Figure 5) (OHTC *et al.* 2016: 29).

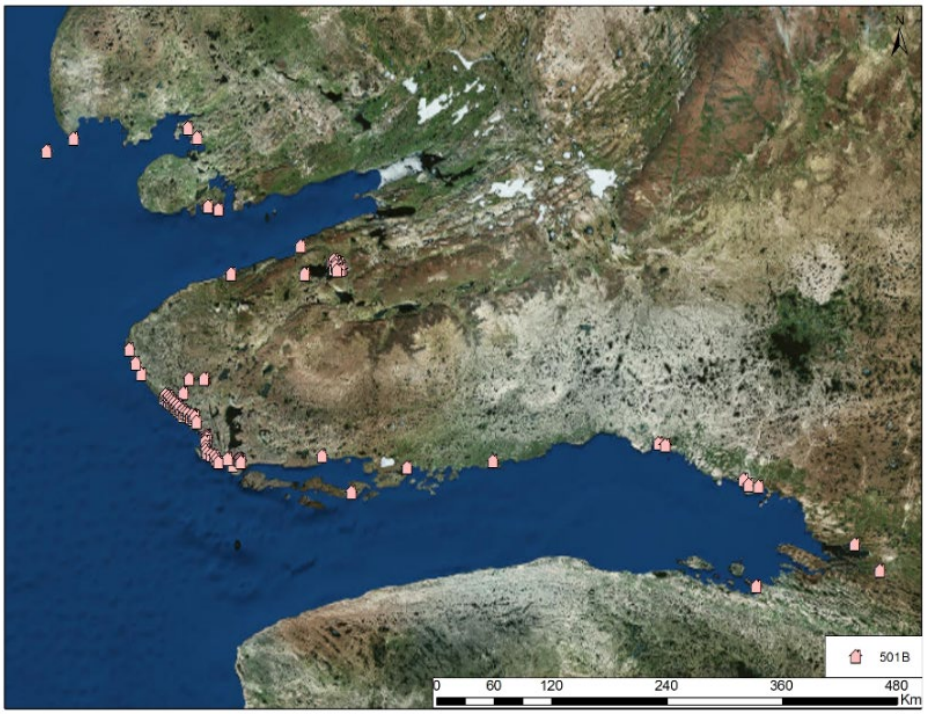

Figure 5. Site 501B Ulukhaktok Outpost Camps (OHTC *et al.* 2016: 28).

Generally, due to a voluntary zero-harvest policy implemented by the Olokhaktomiut Hunters and Trappers Committee in 1993, people in Ulukhaktok travelled less regularly to the Minto Inlet area (CPCVI 1998; Gau *in* SARC 2012: 17). Since these measures took effect, only 30 caribou total were reported as being harvested between 1994 and 2014 on Northwest Victoria Island including 7 in 1994/1995 and 23 in 1997/1998 (ENR 2011; ENR 2021). A limited harvest quota of 10 Peary caribou from the Minto Inlet management areas was established in 2015/16 and harvest levels from 2015-2020 were respectively 3, 6, 0, 10, 9 and 1. (ENR 2021 see Table 3).

Banks Island

Hunting caribou on Banks Island occurs year-round, but in practice, is a mostly seasonal activity, peaking in the autumn (SHHTC *et al.* 2016: 122). Historically, hunters searched for caribou primarily in the summer, fall, and early winter (Nagy 1999b). Usher (1971b) offers the most detailed account of the seasonal harvest of caribou (from 1964-67) that peaked in October and November:

"[Bankslanders have a seasonal pattern of caribou hunting. After sealing ends in September there is a brief lull in activity. Those who do not go to the mainland may hunt ptarmigan or owls around the settlement, work on sealskins, haul up their boats and repair winter travelling gear. The tenor of life is relaxed and there is much visiting from house to house. Men who have not hunted in October do so while setting traps in November. The caribou are more spread out and a man can usually count on seeing a few while travelling on the trap line without making special hunts. Most caribou killed at this time are cached, mainly because the toboggan is already partly full... Hunting declines during the dark days, although a few men may make short hunting trips from the settlement as the caribou are normally close. As the days lengthen, there is a slight increase in the number of caribou taken, but the kills occur on the trap line and no special trips are made. Some men go inland to hunt in May or June, but only for a few days and generally not so far inland as in the autumn. One old Copper Eskimo woman walks inland with pack dogs to hunt in July and August; otherwise there is no summer hunting on the Island. The summer is thus a period of meat deficit in relation to production, with the greatest shortage occurring in September. Most fall kills are made in the upper valley of the Big River, or in its tributaries above the Egg River. Sometimes the hunters come upon a small herd, other times upon solitary young bulls. The latter tend to be curious at this time of year, and will approach hunters if the dogs can be kept quiet. [From 1964-1967] Per hunter effort seems to have increased over the period, although this is complicated by toggling and fishing activities which were included in some trips. Indices of time and distance per caribou remained relatively constant. Data from 1966 showed that less than one quarter of the days out were actually spent in hunting caribou, the rest being used for travelling or other activities."

Hunting usually declined in the winter, and then increased again in May and June (although hunters did not range as far as in the autumn). He notes in particular that "the summer is thus a period of meat deficit in relation to production, with the greatest shortage occurring in

September". Elders reported that much of this time was spent around the Big River and Egg River areas (Joe Apiana, Sarah Kuptana, Edith Haogak, Peter Sydney, and Susie Tiktalik *in* Nagy 1999a). These areas were especially good for autumn hunting during the 1960s (Usher 1976). Caribou were also taken on trap lines across the island in the early 1970s, although most were harvested on the southern half of the island (Usher 1976). More specific data is available for hunts occurring in 1966-67 (Usher 1971b). These featured a pattern whereby October kills were made in the south-central portion of the Island, at the headwaters of Big River, November kills were made in the west portion of the island from Egg River in the south to Storkerson Bay in the north; December and January kills were made in the southwest corner of the island close to Sachs Harbour.

From 1964-66, Usher records a trend of Sachs Harbour harvesters (in aggregate) spending less time on the land and travelling shorter distances on October caribou hunts. Despite this, he also records a trend of per-hunter effort increasing. Such data might indicate a trend towards fewer active caribou harvesters over those years (although he also notes that in 1966 only one quarter of days spent on the land were actually spent hunting caribou) (Usher 1971b: 72).

By the early 1970s, caribou were so abundant that hunters were able to obtain their winter's supply of meat relatively close to Sachs Harbour, and thus did not as often travel further afield (Usher 1976). However, hunters in 1976 did report travelling as far as Nelson Head in the late fall and winter for caribou (Peter Esau *in* Berger 1976b: 4085). Hunters continue to use areas close to Sachs Harbour. However, inland locations (such as Big River and Egg River) are used less than they were in the past, and coastal locations farther away from Sachs Harbour are used more.

In Spring 2020, one harvester travelled from the north to the west of Banks Island along Bernard river and observed "all along the river there are lots of caribou tracks on banks above river, feeding, some areas near the river totally trampled with caribou. [I] covered about 1810km [that] spring, seen way more caribou than muskox, all over the place [including] one herd [which] was 28, 29 caribou" (WMAC-NWT 2021: 1). The same harvester made observations of "[a] crazy amount of caribou [and] only about 4 hints of muskox" while on a polar bear hunt, noting that they "did [the] same trip 5-6 years ago and there were hardly any caribou [in the area]" (WMAC-NWT 2021: 1).

Figure 6 shows areas where caribou were harvested in 1966-67. A comparison of this map to the harvest areas mapped in 2008 (Figure 12) suggests that harvesting continues in locations close to Sachs Harbour year around, but that there may be more harvesting along the coast and less harvesting inland. In particular, substantial autumn harvests along the Big River and Egg River in 1966-67 are not reflected in the harvesting areas of 2008. Instead, coastal areas further away from Sachs Harbour (i.e. around Nelson Head and Jesse Bay) are indicated as seasonally important from July to December.

A small harvest of Peary caribou continues on Banks Island, under a management quota that was set at 36 animals per year (or one animal per household in Sachs Harbour) in 1992, was raised to 72 animals per year from 2010 through 2021 (ENR 2011, ENR 2019, ENR 2021). Harvests have been less than quota since 1994 (ENR 2011). The most recent annual reported harvest for Peary caribou in Sachs Harbour (based on tags returned to ENR) from 2015-2021 is respectively 29, 14, 21,3, 47 and 23 (ENR 2021; see Table 3).

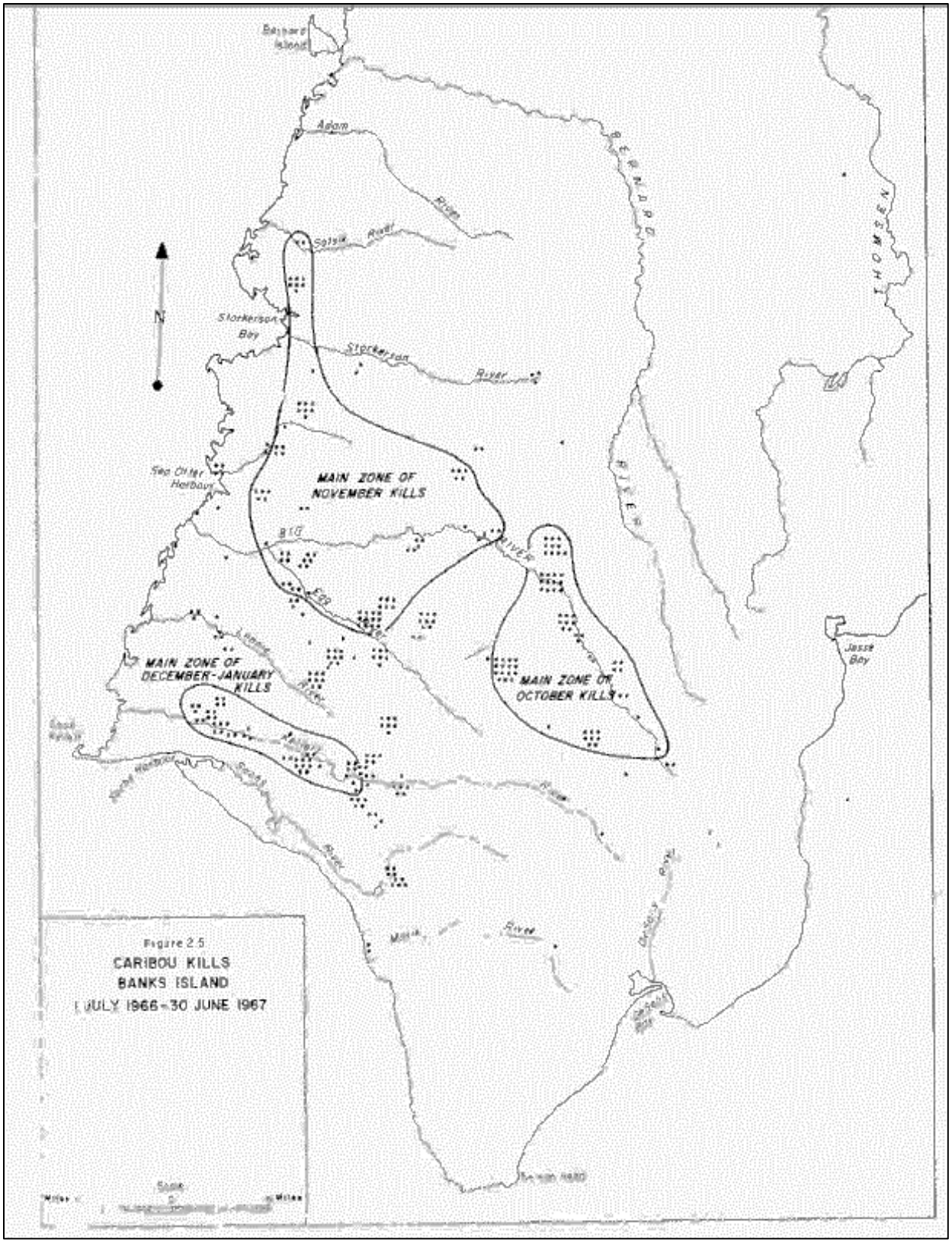

Figure 6. Caribou harvesting locations on Banks Island: 1967-1968 (reproduced from Usher 1971b:69, with permission from Peter J. Usher and Aboriginal Affairs and Northern Development Canada).

Table 1. 2018 reported harvest for Peary Caribou (adapted from Inuvialuit Harvest Study from JS 2018).

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Set	Oct	Nov	Dec	Total
Paulatuk	6	-	-	-	-	-	-	-	-	-	-	-	6
Sachs Harbour	-	1	-	1	-	-	-	-	3	8	2	-	15
Ulukhaktok	-	-	2	-	1	-	-	-	-	-	2	1	6
Total	**6**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**3**	**8**	**4**	**1**	**27**

Western Queen Elizabeth Islands

On Melville Island (*Ilulliq*), Kangikhokyoak Gulf (Liddon Gulf) and the area from Ibbett Bay to McCormick Inlet is important year-round habitat for Peary caribou (OHTC *et al.* 2016). Hunters from Sachs Harbour and Ulukhaktok periodically visit this region, most notably for polar bears, and therefore may have insights into caribou distributions there (Andy Carpenter in HCM 1998; Morris Nigiyok *in* Nagy 1999b: 153; Slavik *in* SARC 2012: 20; Larter *in* SARC 2012: 20). In addition, some hunters from Resolute Bay in Nunavut may also occasionally visit the islands hunting polar bears (Imoosie Amagoalik *in* Nunavut Tusaavut Inc. 1997:66). While there is no quota for Peary caribou in the WQEI, harvest reporting is mandatory and there has been no harvest since 1991 except for six Peary caribou in 2013/14 (ENR 2021). No harvest currently occurs in the Nunavut portion of Melville Island (Government of Nunavut 2014).

Description

Tuktuk (singular: *Tuktu*, Peary caribou, or *Rangifer tarandus pearyi*) are recognized by Inuvialuit based on their smaller size, distinctly lighter colour, and different taste and texture of the animals' meat compared to other groups of caribou (Figure 7; Alex Banksland, Agnes Goose, Morris Nigiyok, and Harry Egotak *in* Elias 1993).

Jenkins *et al.* (2011: 1) report that the distribution of Peary caribou within Canada extends "across the Queen Elizabeth Islands in the north, and east from Banks Island to Somerset and the Boothia Peninsula in the south." However, this distributional classification has undergone several revisions over time leading to potential confusion about what are considered Peary caribou. Some accounts have suggested that caribou on Banks Island and Northwest Victoria Island are an intergrade species between 'Peary caribou' (of the more northerly islands) and barren-ground caribou on the mainland (Usher 1971b; Miller 1990). In the 1970s, COSEWIC designations combined what are now considered to be Peary caribou with Dolphin and Union caribou, but then later separated the species into three subpopulations (Banks Island, High

Arctic, and Low Arctic) in 1991 (NWT Peary Caribou Technical Committee 2004). Finally, in 2004, previous designations were deactivated, and Peary caribou were assessed separately within the range indicated in Figure 8 in *Distribution* (Jenkins *et al.* 2011, COSEWIC 2015).

Figure 7. Peary caribou. Photo by John Nagy, ENR.

The complexities of classifying different groups are also evident in ambiguities regarding the number of distinct caribou groups referred to in community reports. For instance, on Victoria Island the *Olokhaktomiu*t Community Conservation Plan (OHTC *et al.* 2016) refers to 'Peary caribou', 'Victoria Island caribou', and non-specific 'caribou'. In addition, the draft *Co-Management Plan for Minto Inlet Caribou, Muskox, Arctic Wolves, Small Herbivores, King Eiders and common Eiders on NW Victoria Island* (hereafter referred to as CPCVI 1998) refers to 'Minto Inlet caribou'. On Banks Island, the Sachs Harbour Community Conservation Plan (CSH *et al.* 2008; SHHTC *et al.* 2016) also refers to 'Peary caribou', and 'Banks Island caribou'. None of these documents indicate the differences, if any, between such groups, although some of the designations appear consistent with a species status report compiled by Miller (1990).

This report follows the classifications presented by the NWT Peary caribou Technical Committee (2004) and COSEWIC (2015), as well as Jenkins *et al.* (2011), and advocates that caribou populations of Banks Island and Northwest Victoria Island be classified as the *pearyi* subspecies, and assumes all the designations described above refer to Peary caribou

(references to 'non-specific caribou' are included where they specify locations where Peary caribou are known to occur).

The history of such name changes and variable local names for groups of caribou and evolving scientific analyses (see COSEWIC 2011; 2015) that have grouped them into specific units have caused a significant level of confusion between communities and wildlife managers. Recognizing that more outreach with local hunters could resolve potential ambiguities and bring about a common understanding in the classification of Peary caribou and Dolphin and Union caribou, WMAC-NWT has done significant outreach and education to improve communication within the community of Ulukhaktok to support the differentiation of Peary caribou and Dolphin and Union caribou (Nathoo pers. comm. 2021).

Biology and Behaviour

Peary caribou breed primarily in October and early November and start to migrate north in April and May. Caribou in good condition can calve every year and harvesters in Ulukhaktok noted that in 2017-2018 "every cow had a calf" (WMAC-NWT 2020a: 6). It is rare to see cows with twin calves (WMAC -NWT 2020a). Calving occurs in late May early June, with a single calf that is particularly vulnerable in its first week of life. Sexual maturity occurs between 2 and 4 years of age with adults living to 15 years in the wild (SHHTC *et al.* 2016). Peary caribou are most often observed in small groups of five to ten animals (Usher 1971b). Individual Peary caribou have also been observed, and the largest group reported was 200 animals on Banks Island (Usher 1971b; Stefansson 1921).

No information on Peary caribou breeding strategies was found in sources reviewed for this report.

Diet and Feeding Behaviour

Inuvialuit knowledge indicates that *Akeagonak* (lichens) are integral to the diet of Peary caribou, particularly in the fall and winter. In mid-June, caribou show some preference for feeding on *Ningak* (moss campion or *Silene acaulis),* which grows on sandy locations (OHTC *et al.* 2016). After the snow has gone (around mid-July) feeding is more focused on moist sites. At this time Peary caribou diet includes sedges, grass and willows as well as *Kongilik* (Mountain sorrel or *Oxyria digyna*) (OHTC *et al.* 2016) and the community of Gjoa Haven note that seaweed may be consumed when other vegetation is inaccessible (ECCC 2021). Rain and associated ground icing can be a significant cause of starvation in spring and fall (OHTC *et al.* 2016). Diet and feeding behaviours are further elaborated in the *Key Habitats* section.

Body Condition

Peary caribou health or body condition is often described in terms of fat, with more fat indicating better health (Stefansson 1921; Herodier Kalluk in Nunavut Tusaavut Inc. 1997;

Riedlinger 2001a; Lyver and Gunn 2004; Taylor 2005). Body condition in turn affects mortality, pregnancy, calf survival, and age at first breeding (Lyver and Gunn 2004).

Stefansson (1921:246-7) offers a detailed account of caribou fat variability by age, gender and season:

"In late November after the rutting season the old bulls are exceptionally thin, while cows and young bulls are at their fattest. Then, by around late December the young bulls have lost most of their fat, the cows become thinner, and the old bulls shed their antlers at which time they begin to slowly restore fat. By February or March, the old bulls begin to accumulate fat on their kidneys and brisket, while the young bulls and cows carrying young are still thin, although the cows have some back fat and considerable intestinal fat. By May or June the cows have lost all their fat, while the oldest bulls have gained enough that they are good to eat. The young bulls are still thin. In July the cows begin to fatten, and the old bulls accumulate back fat about one and a half inches thick. By late August or early September this fat has become three inches thick in extreme cases and will weigh before drying thirty or forty pounds if the animal is large. At this time the intestinal fat is an additional ten or fifteen pounds besides the great amount on brisket, ribs, pelvis and elsewhere."

The cows and young bulls also are moderately fat in August and September and gain a little for the next month or two (Stefansson 1921).

Recently, harvesters from Sachs Harbour have observed that while bulls have had thin antlers last few years, their horns are now "getting bigger and bigger, thick!" as some harvesters report seeing larger bulls with bigger horns (WMAC-NWT 2021:3).

Relationships Within and Among Species

Peary caribou are usually found in small groups. Within groups of Peary caribou, bulls play an important role in guiding the group and maintaining the strength to dig through the snow for food; older animals are also more passive and reportedly have a calming effect on younger animals within the group (Taylor 2005). Interactions between Peary caribou and other types of caribou were not discussed in the Indigenous and community knowledge sources reviewed. Descriptions from Indigenous and community knowledge sources regarding the interactions between Peary caribou and other species are limited to muskoxen, wolves, and grizzly bear. Both are usually considered to have negative implications for caribou.

Wolves

The Sachs Harbour Community Conservation plans (CSH *et al.* 2000; 2008; SHHTC *et al.* 2016) and harvesters such as Sam Oliktoak (in Nagy 1999b) note the possibility that wolf predation has been partially responsible for Peary caribou declines. Wolves tend to follow muskoxen and caribou movements (CSH *et al.* 2008), even between islands (Peter Esau in SHCM 1998), and sometimes kill more than they need to eat (Charlie Hoagak, A. Carpenter, and Peter Esau in

the *Co-Management Plan for Caribou, Muskoxen, Arctic Wolves, Snow Geese, and Small Herbivores on Banks Island* 2000 [hereafter referred to as CPCBI 2000]). The most thorough description of interactions between wolves and Peary caribou is given by Stefansson (1921). He observed that wolves prey on older caribou more than younger caribou as the latter are able to outrun the former when they are only a few days old. The oldest bulls are noted as often being the slowest to flee from wolves, especially at the beginning of the breeding season when they are at their maximum weight. "When you see a caribou that has been singled out for pursuit by wolves, it is in the first probability an old bull and in the second an old cow. Skeletons of wolf-killed animals are nearly always found to be skeletons of these two" (Stefansson 1921:248-9). Stefansson (1921:476) also observed a cyclical relationship between wolves and caribou on Brock Island:

"We found a striking difference between our New Land [Brock Island] at the time of discovery [June 1915], when caribou traces were more numerous than we have seen them almost anywhere in the Arctic, and that same land in the fall of 1916 when the wolves appeared to be as numerous as the caribou and the caribou not one-tenth as numerous as a year and a half before. In May 1916, a period intermediate between the plenty of 1915 and the scarcity of the autumn of 1916, we found an intermediate condition as to the number of caribou"

Hunters reported high wolf populations on Northwest Victoria Island in the 1930s and 1940s (SHHTC *et al.* 2016). Wolf control programs were initiated in 1955 on Banks and Northwest Victoria Islands, which reduced their numbers (Heard 1984; Peter Esau in SHCM 1998; CSH *et al.* 2008) but the programs were discontinued in 1959 when wolf 'control' had been attained (Peter Esau in Berger 1976b; Heard 1984; CSH *et al.* 2008). Current Community Conservation Plans specify that residents still do not support the use of poison, aircraft, or systematic wolf control or elimination (CSH *et al.* 2008; SHHTC *et al.* 2016). Wolf numbers began to recover in the mid-1970s on Northwest Victoria Island (CSH *et al.* 2008) and were reportedly also increasing in the 1990s (CPCVI 1998). Fifty wolves were seen during a survey of Banks Island in 1998, which was considered to be a healthy number (CSH *et al.* 2008). Fewer wolves have been observed by harvesters from Banks Island recently (WMAC-NWT 2021).

Interactions between wolves and muskoxen may also be important for caribou. For example, Peter Esau suggests the absence of wolves following the poisoning program in the late 1950s has contributed to the growth of the muskoxen population on Banks Island (Nagy 1999b: 156). Some Inuvialuit believe that caribou avoid muskoxen because they attract wolves (CWS 2013).

Muskox

Interactions with muskoxen are also described by several sources. These are mentioned in terms of the effects of muskoxen on caribou forage, and the effects of their smell. Muskoxen are known to forage on a wide variety of vegetation, including grasses, sedges, and willows, some of which caribou may also consume at certain times (Taylor 2005; SHHTC *et al.* 2016).

Both muskox and caribou are found in the same area in the summer but feed on different plants (OHTC *et al.* 2016: 101). The availability of forage for Peary caribou may be reduced by other grazers such as muskoxen according to Agnes Carpenter (*in* Nagy 1999b). The *Olokhaktomiu*t Community Conservation Plan also records that although caribou and muskoxen inhabit different areas during most of the year, there is some overlap during the growing season (OHTC 2016).

Other hunters are less certain whether or not muskoxen and caribou eat the same food, but note that muskoxen certainly eat far more: "[Muskox] eat so much, maybe they take all the food and let [the caribou] get short of food, maybe. You know the big muskox can eat three times more than one caribou, or even four times as much. [They have] big guts" (Geddes Wolki in Nagy 1999b:154). Trampling of vegetation by muskoxen may also be a factor: "When muskox is feeding and grazing on the ground, they take everything and they're heavy enough that they trample all the snow, and then caribou can't go there and start feeding right where the muskox been through…" (Peter Esau *in* Berger 1976b: 4126). The NWT Peary Caribou Technical Committee (2004: 15) also reports that "some Inuit and Inuvialuit believe… that caribou avoid muskoxen and that muskoxen trample the snow in caribou feeding areas".

There are several observations that Peary caribou do not stay in areas where muskoxen are present and that areas normally occupied by high densities of Peary caribou in the past were displaced by the arrival of muskoxen (Taylor 2005; Johnson *et al.* 2016).

The strong smell of muskoxen is said by many to be unpleasant for caribou (Frank Kuptana *in* Elias 1993; Taylor 2005). David Nasogaluak, for instance, remembers "That Old Lady Tiktalik used to say that the smell of muskox, the caribou don't like it" (*in* Nagy 1999b:164). Kassam (2009: 131) reports many Ulukhaktok residents stating that "caribou don't like muskox".

Indications that interactions with muskoxen are detrimental to Peary caribou are more numerous for Banks Island than Northwest Victoria Island. It was suggested at the Peary caribou Recovery Strategy Meeting (CWS 2013) that competition with muskoxen may be a greater threat in the NWT and Kitikmeot regions, particularly on Banks Island, than in the high arctic islands of Nunavut in areas known to local hunters (Iviq HTA 2013; Resolute Bay HTO 2013). Thus, "the degree of competition [with Muskox] may vary regionally within the Peary caribou distribution" (Johnson *et al.* 2016: 104-5). However, some hunters from Ulukhaktok assert that Peary caribou and muskoxen do not compete (Alex Banksland and Morris Nigiyok in Elias 1993) and that muskoxen do not negatively impact Peary caribou (e.g. Elders from Ulukhaktok *in* Gunn 2005; hunters from Ulukhaktok *in* SARC 2012; SHHTC 2013). In Nunavut, Taylor (2005) noted that some community members understood caribou and muskoxen to typically feed on different vegetation and occupy different habitats. However, in cases where the two species might compete, Taylor (2005: 97) inferred that competition may have a greater impact on caribou, "who [Seeglook Akeeagok] believes are picky eaters, while muskoxen eat a

wider variety of vegetation". Similarly, Grise Fiord and Ulukhaktok hunters have reported that Peary caribou and muskoxen can have overlapping seasonal ranges, but that they are dependent on different plant species" (Johnson *et al.* 2016: 103).

Dolphin and Union Caribou

Peary caribou can be distinguished from Dolphin and Union caribou because of the smaller size (WMAC-NWT 2018a) and that they "split up [when] they start running" (WMAC-NWT 2020a: 5). Harvesters in Ulukhaktok have always observed Peary and Dolphin and Union caribou join together and move south - especially near Minto inlet. (WMAC-NWT 2018a; WMAC-NWT 2018b: 23) Several mentions were also made in Gjoa Haven of a potential mixture of barren-ground caribou (*iluiliup tuktuit*) and Peary caribou (*kingailaup tuktuit*) (Ljubicic *et al.* 2018). This presents a challenge in differentiating Dolphin and Union caribou from Peary caribou during harvest (WMAC-NWT 2015: 5).

Grizzly Bears

Sachs Harbour, Ulukhaktok, and Cambridge Bay have raised concerns about the high/increasing numbers of grizzly bears and their impact as a new, potentially important predator for caribou and muskoxen (Government of Nunavut 2016; Tomaselli *et al.* 2018; Nathoo pers. comm. 2021; ECCC 2021). It is suggested that climate change and the extended spring and fall conditions are creating an ecological shift that favours the new predator, as harvesters in Cambridge Bay are seeing grizzly bears emerging earlier from their dens, sometimes as early as the first week of April, and returning to their dens for hibernation later in the season (Government of Nunavut 2016).

PLACE

Distribution

Peary caribou live in the Canadian Arctic Archipelago and are the most northern group of caribou in North America (Figures 8 and 9; Jenkins *et al.* 2011).

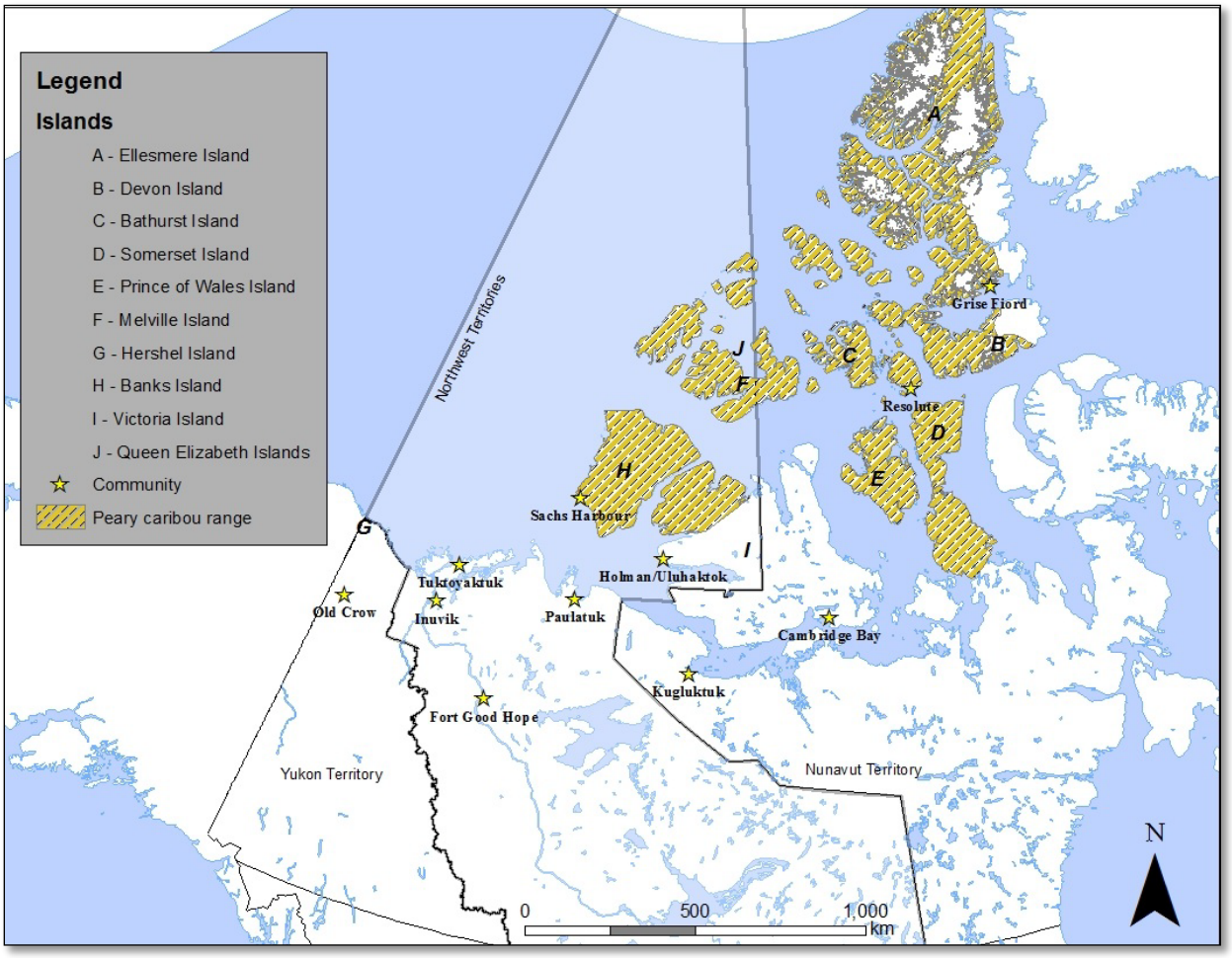

Figure 8. Distribution of Peary caribou (Jenkins *et al.* 2011). Note that King William Island has now been added to the distribution of Peary caribou based on recommendations of co-management groups (see Figure 10; ECCC 2021).

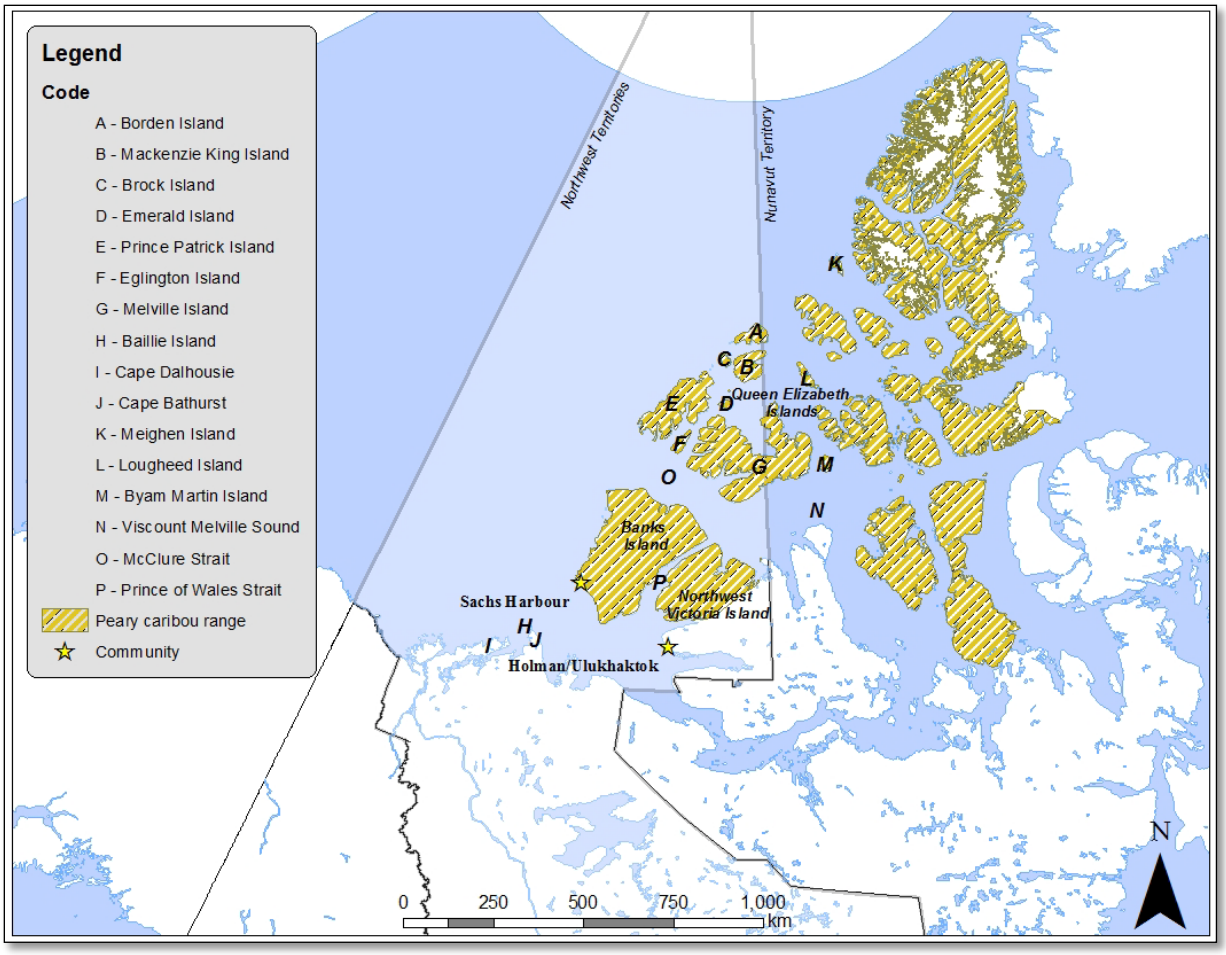

Figure 9. Place names and distribution of Peary caribou (Jenkins *et al.* 2011). Note that King William Island has now been added to the distribution of Peary caribou based on recommendations of co-management groups (see Figure 10; ECCC 2021).

NWT Distribution

The core range of Peary caribou in the Northwest Territories includes the islands of the Arctic Archipelago and sea-ice movement routes (Figure 10; ECCC 2021). Peary caribou are sometimes seen out on sea-ice and are reported to have occasionally travelled to the mainland out of the core range (Morris Nigiyok *in* Elias 1993; Larry Carpenter *in* Sachs Harbour Community Meeting [SHCM] 1998; Larter *in* SARC 2012: 9). Harvesters in Paulatuk have observed that "there are Peary Caribou out on [Tuktoyaktuk] Peninsula [and] Parry Peninsula, [but] feel critical habitat is basically out on the islands" (WMAC-NWT 2016: 11).

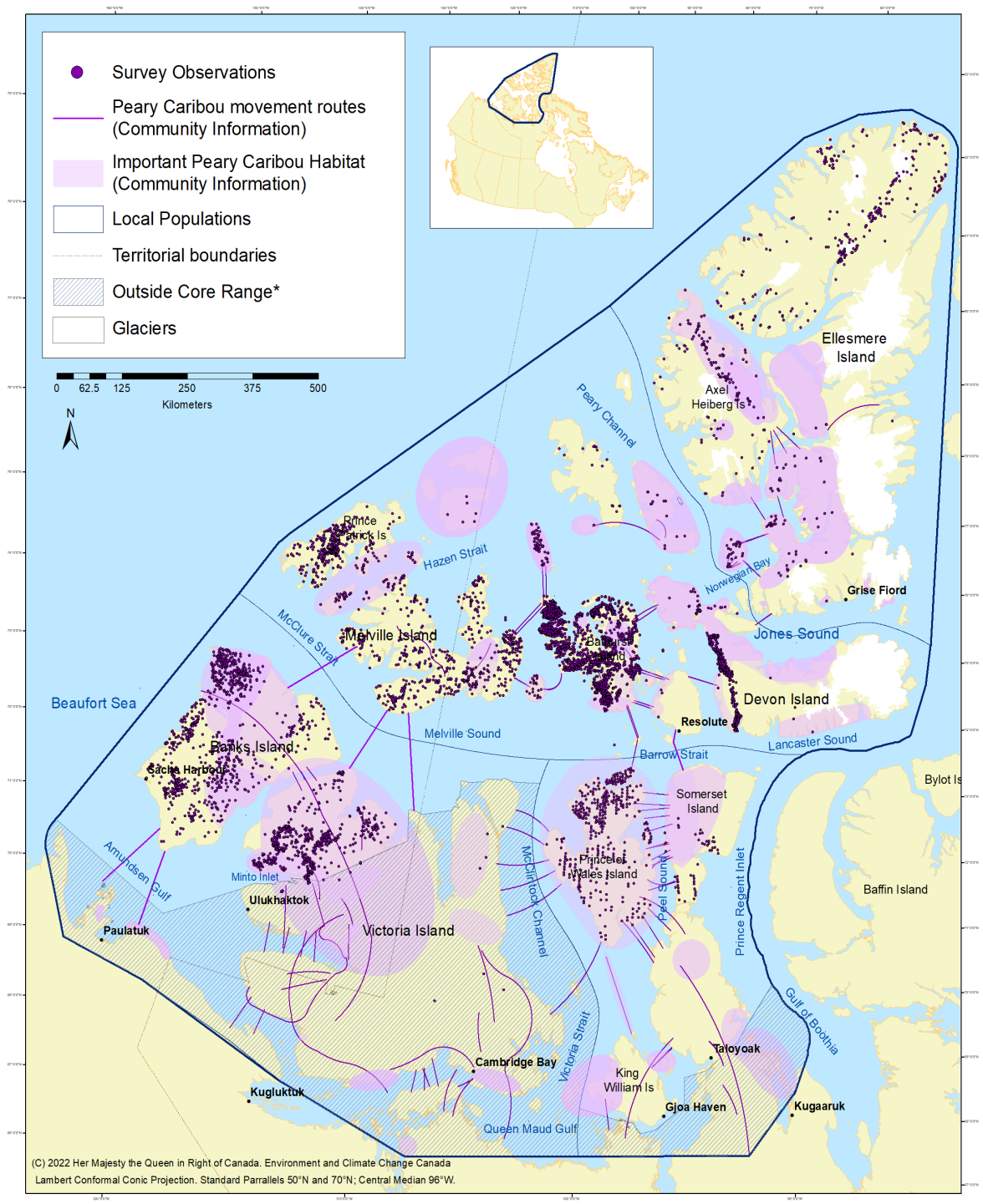

Figure 10. Community Knowledge and survey data of Peary caribou habitat, distribution, and movement for 1970-2020 (reproduced from Johnson *et al.* 2016 *in* ECCC 2021 with permission). Communities believe that areas identified outside of the core range (identified in the legend with an Asterix*) should be protected against shipping and icebreaking during sensitive periods for Peary caribou to ensure sea ice formation in the fall.

In Nunavut, it is known that Peary caribou move to the mainland, particularly Boothia Peninsula (Jenkins *in* SARC 2012: 9). One hunter from Resolute indicated that at one point "Peary caribou went down to a place where there are only supposed to be mainland caribou, and then vice versa" (Parlee and Furgal 2010). Peary caribou were reportedly seen around Kugluktuk (formerly Coppermine) on the mainland in the 1990s (Larry Carpenter *in* SHCM 1998), and one light-coloured caribou was apparently killed at Old Crow in the Yukon in the winter of 1963-64 (Miller 1990: 14). However, because both Dolphin and Union and Peary caribou are whiter in pelage than barren-ground caribou, it is unclear whether the latter example refers to Peary caribou, or members of the Dolphin and Union population (Miller 1990).

Hunters in Ulukhaktok also indicate that the core range should be expanded to include the Wollaston Peninsula on Victoria Island (ECCC 2021).

Northwest Victoria Island

At least two distinct populations of caribou inhabit Victoria Island according to knowledge held by residents of Ulukhaktok: Peary and Dolphin and Union (Elias 1993). Peary caribou typically calve north of Minto Inlet, while Dolphin and Union typically calve in the Prince Albert Sound area. The 2016 *Olokhaktomiu*t Community Conservation Plan identifies that a "third herd may calve in the vicinity of Richard Collinson Inlet" (OHTC *et al.* 2016: 96).

Ulukhaktok's close proximity to the mainland Arctic Coast and adjacent islands, and seasonal presence of a continuous ice connection, has also allowed periodic movements of caribou, as well as muskox, grizzly bear and other species from these areas to and from Victoria Island (OHTC *et al.* 2016). Given that the Dolphin and Union population migrate seasonally from Victoria Island to the mainland, they may also be known as 'Island' caribou to some residents in Paulatuk on the mainland (Gau *in* SARC 2011: 9). This can sometimes make it difficult to identify which group is being referred to in documents recording Indigenous and community knowledge.

To some extent, differentiating Dolphin and Union from Peary caribou can be inferred by location based on a consensus that Peary caribou live north of Ulukhaktok, predominantly around and north of the Minto Inlet area, while Dolphin and Union caribou are more common inland on the Diamond Jenness Peninsula in the summer, and southeast of Prince Albert Sound in the winter (Alex Banksland, Jimmy Memogana, and William Kagyuk *in* Elias 1993). However, Indigenous knowledge from Ulukhaktok (Harry Egotak in Elias 1993, CSH *et al.* 2008) also indicates overlapping ranges, insofar as Peary range extends onto the Diamond Jenness Peninsula and discussions with the Olokhaktomiut HTC have indicated that the core range should be expanded to include Wollaston Peninsula (ECCC 2021), making assignments of caribou into groups solely on the basis of location problematic (Gunn and Fournier 2000: 56).

This is compounded by the ambiguities in caribou classifications in some documents noted above.

Figure 11 shows important areas on Northwest Victoria Island identified for caribou other than Dolphin and Union caribou. Notably, this shows Peary caribou range extending somewhat further south and east than is indicated in Figures 8 and 9.

Table 2 below identifies key geographies on Victoria Island that are important habitat for Peary caribou.

Table 2. Key geographies on Victoria Island that are important habitat for Peary caribou.

Place	Seasonality / Harvesting Season	Importance of the Area	Reference
Area surrounding Omingmakyok, Ungirut Bay and Okpilik Lake	N/A	Unique and sensitive landscape feature (willow bushes)	(CSH *et al.* 2008; OHTC *et al.* 2016)
Area south of Glenelg Bay	November to May	Important habitat for species	(OHTC *et al.* 2016: 40)
Kuukyuak (Kuujjua) River and Diamond Jenness Peninsula coastal Zone	Year round	Habitat for species, subsistence hunting, sport hunting of caribou and muskox.	(OHTC *et al.* 2016: 49)
South of Wynniatt Bay	Year round	Habitat for species and harvesting	(OHTC *et al.* 2016: 52)
Tahiyuak Lakes (South, East), Kangikihnik Lake, Kaglokyuak, Engaloak Rivers, Anmalokitak Lake, Tahek Lake region	Year round	Habitat for species	(OHTC *et al.* 2016)
Hikongiyoitok Lake and Kugaluk River region	N/A	Important habitat for caribou, specifically calving grounds	(OHTC *et al.* 2016: 56)
Tahikpalok Lake Region and North shore of Prince Albert Sound	Year round	Important winter habitat for caribou and muskox and harvesting	(OHTC *et al.* 2016: 50); (WMAC-NWT 2018 a)
Tahioyak (Safety Channel) and the islands surrounding	Year round	Important wildlife habitat for species and used by the people of Ulukhaktok for the subsistence harvesting of the same species.	(OHTC *et al.* 2016: 44)

East and North of Prince Albert Peninsula, bordering Deans Dundas Bay to the west and Richard Collinson Inlet to the east, the Prince Albert Peninsula wildlife area	N/A	Important Calving ground	(OHTC *et al.* 2016: 71)
North of Minto Inlet, all of Victoria Island; Ice between Victoria island and mainland, Prince of Wales Strait."	N/A	Important habitat and calving area	(SHHTC *et al.* 2016:96)
Colville Mountains in the middle of Wollaston Peninsula and located in territorial boundaries of Nunavut	N/A	Important calving ground	(Government of Nunavut 2016)
Wynniatt Bay, Shaler Mountains (wintering area), and Hadley Bay	N/A	Habitat where caribou are seen	(Government of Nunavut 2016)
Areas around Minto Inlet	Year round	Hunting, fishing and trapping	(OHTC *et al.* 2016: 58)
George Island	July to December	Hunting caribou and muskox	(OHTC *et al.* 2016: 58)
Nigiyok Naghak	July to December	Local hunting area that is utilized regularly and a sensitive calving area for Peary caribou.	(OHTC *et al.* 2016: 58)
Tahiryuak (near Minto)	October 2018	"Lot of signs of caribou…The caribou were migrating towards I/PC/04 and Prince Lots of muskox seen near Minto (about 70)."	(WMAC-NWT 2018 a.: 2)
Hadley Bay	N/A	Harvesting Peary caribou, hunting polar bear by Inuit from Cambridge Bay	(Government of Nunavut 2014: 17).

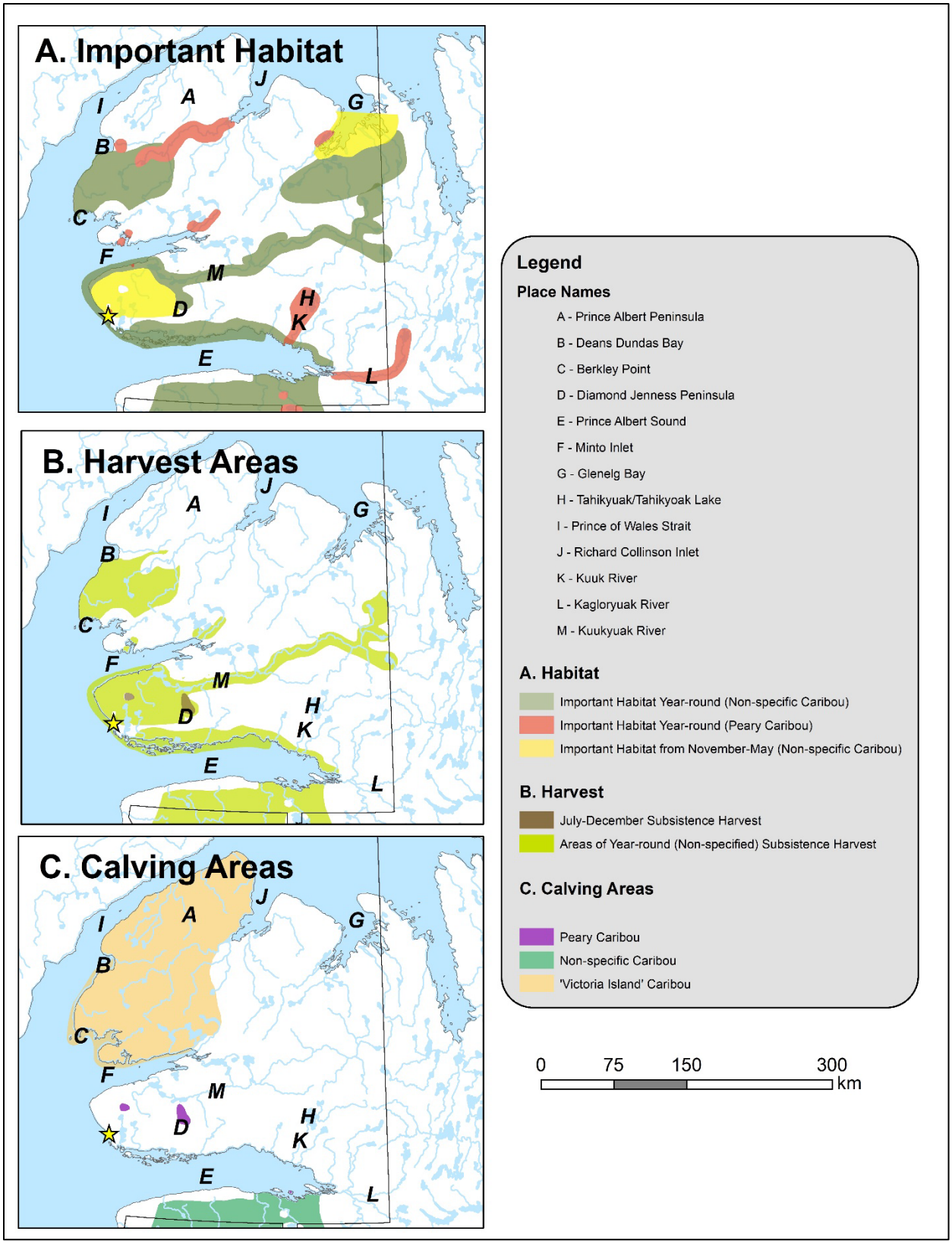

Figure 11. Important areas for Peary caribou, Victoria Island caribou, and non-specific caribou on Northwest Victoria Island identified in the OHTC *et al.* 2016 (reproduced with permission).

Banks Island

Figure 12 shows important areas on Banks Island identified for Peary caribou (CSH *et al.* 2008; SHHTC *et al.* 2016). An older version of the Sachs Harbour Community Conservation Plan (CSH *et al.* 1992) also shows the seasonal movements of caribou ranging over virtually the entire island (Figure 13). More recently, important areas for caribou on Banks Island were documented in the Sachs Harbour Community Conservation Plans (CSH *et al.* 2008 and SHHTC *et al.* 2016) and are combined below in Figure 14. A more recent map of Banks Island caribou calving grounds was provided in in the 2016 Sachs Harbour Community Conservation Plan (SHHTC *et al.* 2016: 52; see Figure 12).

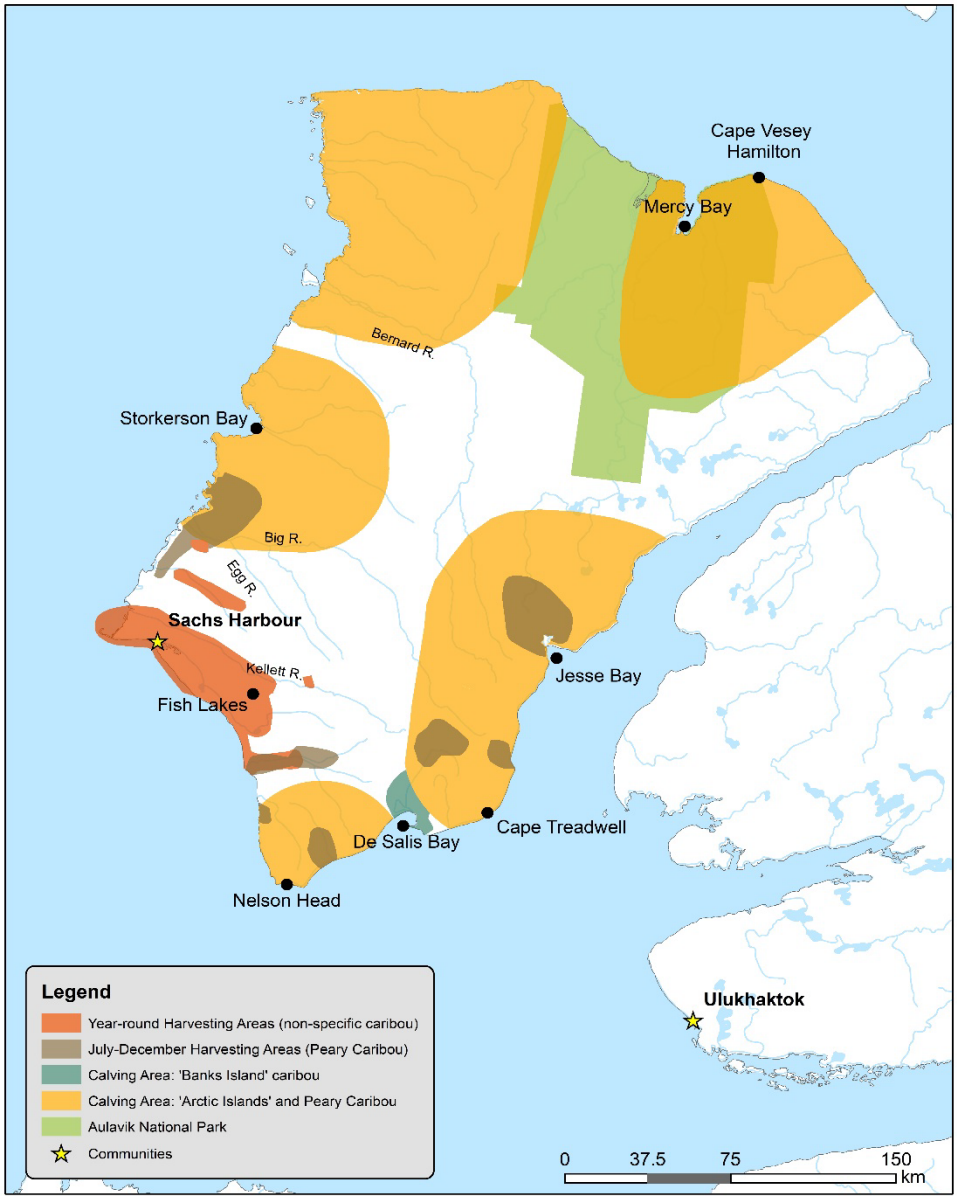

Figure 12. Important areas for caribou on Banks Island identified in the Sachs Harbour Community Conservation Plan (reproduced from SHHTC *et al.* 2016 with permission).

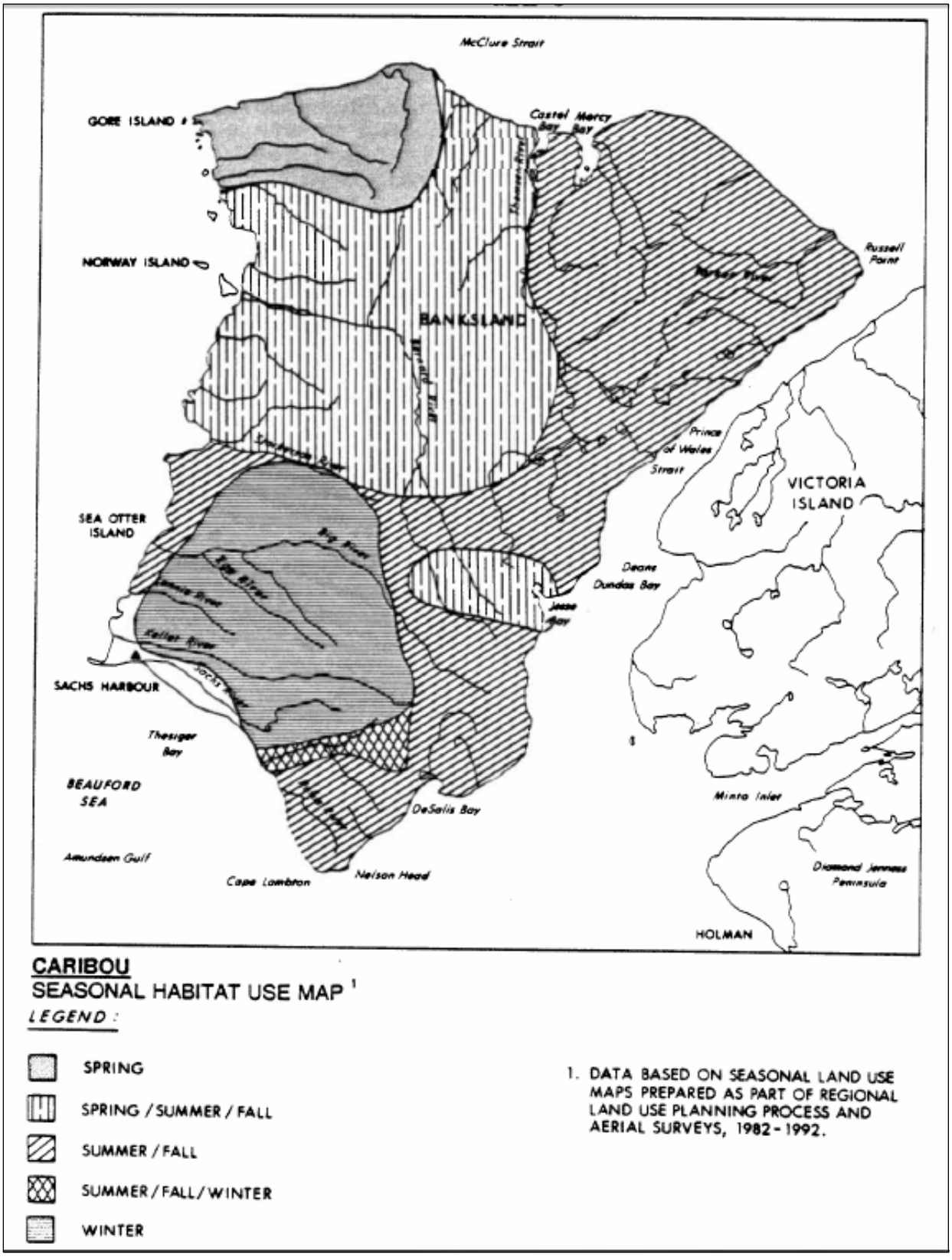

Figure 13. Caribou seasonal habitat use on Banks Island 1982–1992 (reproduced from CSH *et al.* 1992:60, with permission from the Sachs Harbour Hunters and Trappers Committee).

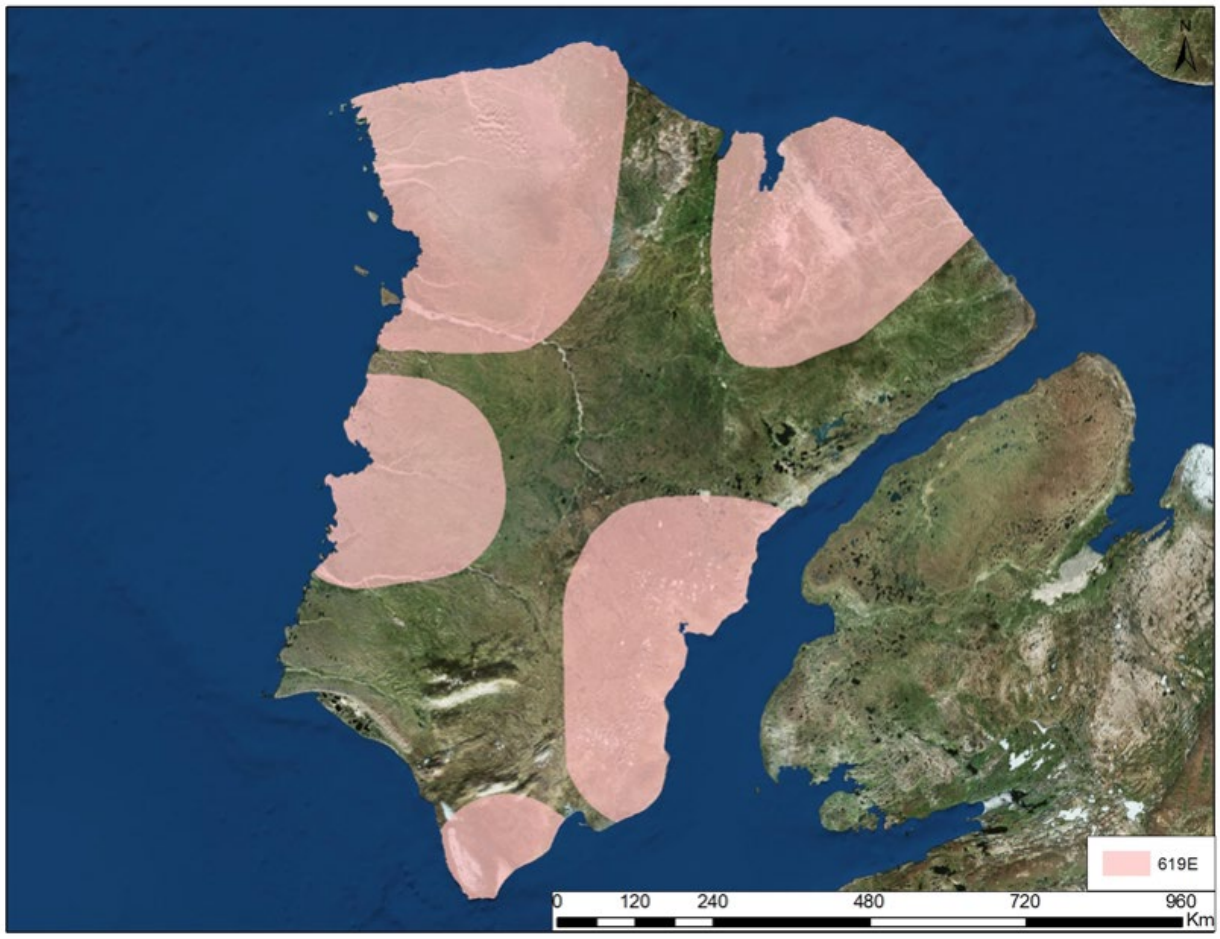

Figure 14. Banks Island caribou calving grounds (reproduced from SHHTC *et al.* 2016: 52 with permission).

Western Queen Elizabeth Islands

Figure 15 shows important areas on the WQEI identified for 'caribou' (assumed to be Peary caribou) (SHHTC *et al.* 2016). On Melville Island, Kangikhokyoak Gulf (Liddon Gulf) is important habitat for Peary caribou and is used for subsistence harvesting by Inuvialuit from November to May (OHTC *et al.* 2016). The area from Ibbett Bay to McCormick Inlet is important year-round habitat for both Peary caribou and muskoxen owing to the dense Arctic willow communities in this area (OHTC *et al.* 2016). Bailey Point (on the northern shore of the mouth of Liddon Gulf) has been identified as "among the best habitats for muskoxen in the Canadian High Arctic [and] refugium for muskoxen during periods of extreme climatic conditions November to March" (OHTC *et al.* 2016: 36).

The inclusion of such information in the CCPs (CSH *et al.* 2000; SHHTC *et al.* 2016; OHTC *et al.*2016) suggests that Indigenous and community knowledge does exist about Peary caribou on high Arctic islands within the NWT (such as Melville, Prince Patrick, and Eglinton Islands).

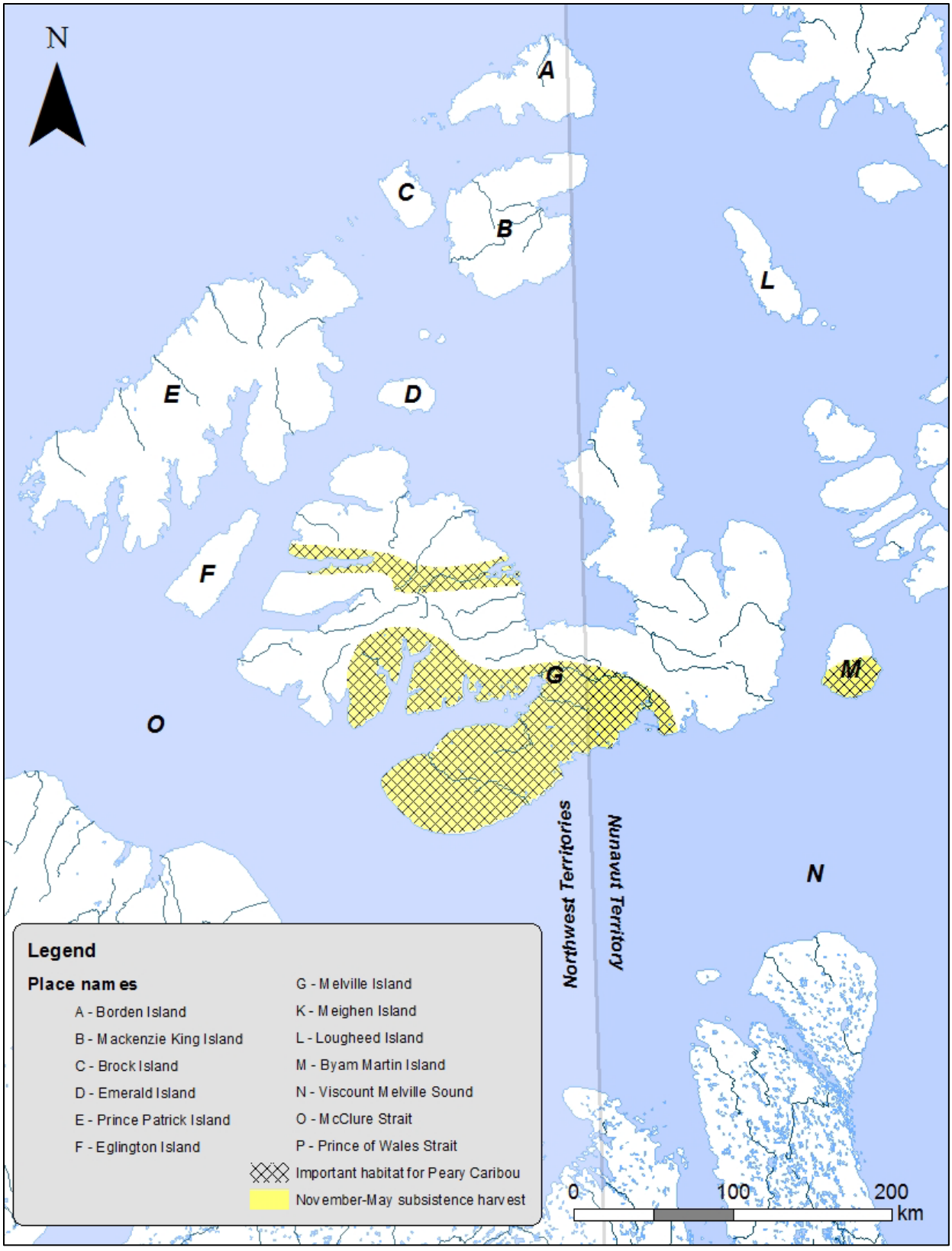

Figure 15. Important areas for caribou on the western Queen Elizabeth Islands identified in the Olokhaktomiut Community Conservation Plan (OHTC *et al.* 2016).

Changes in Distribution

The range of Peary caribou appears to fluctuate in terms of their distance from the communities. However, observed changes in caribou distribution are not consistently comparable to recorded trends in search effort in the sources reviewed, and do not account for potential fluctuations in overall population size. Therefore, it is not possible to distinguish changes in range from changes in search effort or changes in population size.

Victoria Island

Sources describe that the migratory range of caribou on Northwest Victoria Island fluctuated between 1900 and the 1990s, in terms of their distance from Ulukhaktok. When caribou were scarce in one area, reports suggest that they were more abundant in other areas. Sources are vague however, regarding which groups of caribou descriptions pertain to (i.e. Peary caribou, or Dolphin and Union caribou), as in areas such as Prince Albert Sound, both groups might occur.

Caribou were very scarce around 1900 (presumably in the area where Ulukhaktok is now located), but became more numerous by 1920, after which freezing rain caused extensive mortality (CSH *et al.* 2008). A report in 1933, for instance, suggested that to the north of Prince Albert Sound, harvesters found very few caribou and subsisted mostly on fish (Condon 1996: 117). There were plenty of caribou reported, however, on the Northeast portion of Victoria Island at this time (Condon 1996: 118). In 1937, it was reported that harvesters travelled north to the central part of Prince Albert Peninsula to find caribou, but that in the 1950s caribou moved south (CSH *et al.* 2008). Harvesters reported that in the 1950s caribou started coming closer to the coast, travelling towards the southeast (CPCVI 1998). However, in 1952, caribou (possibly Dolphin and Union caribou) were also reported as having been prevalent around Prince Albert Sound for 'quite some time' (Condon 1996: 130). In the 1960s the number of caribou in the Ulukhaktok region was again very low (Condon 1996: 146), but increased in the early 1970s (Usher 1976). At this time, the caribou typically came close to Ulukhaktok and were hunted on the Diamond Jenness peninsula south of Minto Inlet along Kuujjuak River, and along the coast east of Ulukhaktok as far as Kuuk River. Although local residents had not reported range abandonment between 1986 and 1989, the range of the 'Minto Inlet' group of caribou contracted northwards in the early 1990s (CPCVI 1998). At this time, hunters reported that caribou were exceptionally rare in the area, and that they must be 'elsewhere' (Joe Kuneyuna and Ulukhaktok residents *in* Heard 1992: 1). Some speculated they may have even shifted their calving grounds (CPCVI 1998). By 1998, the caribou had returned to their range from the 1940s, further away from Ulukhaktok (CPCVI 1998). More recently, Peary caribou continue to remain far from Ulukhaktok, although a few individuals have been harvested near the

community in recent years, "generating hope among respondents that they will eventually return" (Fawcett *et al.* 2018: 124).

Results of recent community consultations by WMAC-NWT in 2018 and 2020 yielded the following unattributed comments by community participants (identified as "C"):

"C: The past 2 seasons I am going to Minto for hunting caribou. The last 2 falls, seen nice numbers (of caribou) and it seems like it's the same herd each year. There are not too many signs of wolves. 2 years ago, there was a lot of muskox. This year the ice freezes up in the ocean, so the caribou are starting to cross the ice early. Some of the hunters, run into 30 herd of caribou mixed of D-U and Peary, mostly D-U caribou..." (WMAC-NWT 2020a: 5)

"C: Over the past years (first time 1974), a few times at Wynniat bay and across Naqguchiat Peninsula I've seen some caribou but never seen what kind they were. Most likely Peary. I see that there are more caribou, D-U and peary caribou but most of them are peary caribou. After 1974, no more caribou in that area and lately the caribou are coming back and start seeing more again." (WMAC-NWT 2020a: 5)

"C: When I was a child there was no caribou in Prince Albert Sound. My parents went trapping and firsttime seeing caribou when fishing and mother was trying to chase them and didn't stay behind and went after her mother. When I grew up there was quite bit of people they didn't speak much of caribou because there was no caribou. In-laws talk about, they always run out of caribou and some years they come and some years there isn't much caribou." (WMAC-NWT 2018a: 3)

Banks Island

Caribou use almost all of Banks Island at various times of the year (CSH *et al.* 1992). Peary caribou distribution on Banks Island is described by the sources reviewed here as fluctuating in terms of the animals' distance from Sachs Harbour. Most of this fluctuation is in terms of seasonal movements, however, and potential changes in the overall distribution are less clear.

Testimony to the Berger Inquiry indicates that around the 1950s there were hardly any caribou close to Sachs Harbour in the autumn (Andy Carpenter *in* Berger 1976b: 4128). Encroachment by muskoxen also began in the 1950s, which by the 1970s and 80s affected caribou distribution in terms of the animals staying along the coastline rather than going inland (Agnes Carpenter *in* Nagy 2004). Interactions between Peary caribou and muskoxen are discussed further in the *Interactions* and *Threats* sections.

A comparison of accounts from the 1970s with those from 1992-2008 suggests a possible change in the distribution during calving. While statements to the Berger Inquiry indicated that in the 1970s, caribou calved on the north end of Banks Island (Andy Carpenter *in* Berger 1976b: 4025), more recently Sachs Harbour Community Conservation Plans (CSH *et al.* 1992; 2000; 2008; SHHTC *et al.* 2016) indicate additional calving areas around Jesse and De Salis Bays (Figure 12).

The most recent Sachs Harbour Community Conservation Plan (SHHTC *et al.* 2016 :71) describes their seasonal habitat use as follows:

- During winter, the caribou will seek valleys and side hills. The sexes [cows and bulls] will separate;
- During Spring they will move inland, around Jesse Bay;
- In Summer they will be along the coast, and within hills, valleys, slopes;
- During fall migration they will move to Fish lakes area.

During a community tour in 2021, members of the Sachs Harbour HTC commented that while there have been only twelve Peary Caribou sightings in 25 years within Aulavik National Park, they are "now seeing quite a few herds in [the] Park…way more caribou in park than used to be" (WMAC-NWT 2021: 3). They also commented that Peary caribou are "coming near town again, first time in decades" (WMAC-NWT 2021: 1) and hunters are harvesting caribou near the community.

Western Queen Elizabeth Islands

No information from Indigenous and community knowledge sources regarding changes in Peary caribou distribution throughout the WQEI was identified from the resources reviewed for this assessment.

Movements and Dispersal

Peary caribou are described as being highly mobile animals (Peter Esau *in* Berger 1976b; Arctic Peoples, Culture, Resilience and Caribou [ACRC] 2010), that travel in order to find suitable forage (F. Kudlak *in* Riedlinger 2001a). Peary caribou they tend to leave areas for multiple years when forage has depleted but may return when vegetation has grown back (ECCC 2021). Their movements are discussed in this section in terms of regular inter-island movements and intra-island movements.

Inter-island Movements

Inter-island movements of Peary caribou are almost always described as occurring during the winter across frozen straits. However, interviews in Resolute Bay, Nunavut indicate that some caribou may swim between islands in the summer, as is inferred by the word "*singmiujut*", or "caribou migrating through sea water" (Herodier *in* Nunavut Tusaavut Inc. 1997: 57), although no details are offered regarding the distances and locations of crossings.

As Peary caribou are known to be migratory and to travel long distances and between islands, occasional intermixing is likely (ACRC 2010). IQ from Resolute Bay suggests that multi-island use allows Peary caribou population sizes to exceed that of single island use (Resolute Bay HTO 2013, *in* Johnson *et al.* 2016: 102). However, community knowledge suggests that inter-

island movements are less frequent with low populations which may explain the change in frequency of movement over time (COSEWIC 2004; Johnson *et al.* 2016).

Local community knowledge has documented inter-island movements across Peary caribou range in Nunavut and NWT, but this knowledge is frequently qualified with statements such as "*tuktuit* do not follow these lines" (Ljubicic *et al.* 2018). Therefore, the following routes should be considered as general directional indicators as opposed to specific "trails", since *tuktuit* can move anywhere and come from any direction. "*Kingailaup tuktuit* (Peary Caribou) are known to travel long distances and can be found on Qikiqtaq at any time of year, as they do not have a clear migratory pattern" (Ljubicic *et al.* 2018: 225).

Hunters have reported seasonal (winter) movements between Banks Island and Northwest Victoria Island (CPCVI 1998; see Figure 10, 16, and 17). However, the frequency of these movements may have changed over time. Although it was commonplace for caribou to cross between Banks and Victoria Islands in the 1960s and 1970s, such movements were more sporadic by the mid-1980s (CPCVI 1998). Hunters interviewed in 1993 suggested that Peary caribou 'do' move back and forth between Banks and Victoria Islands, implying that this continued into the 1990s (Alex Banksland and Sam Oliktoak *in* Elias 1993).

Peary caribou may occasionally move between Banks Island and the mainland. There have been several observations of movements of Peary caribou out onto the sea-ice south of Banks Island which have also been described as 'desperation movements' (CPCBI 2000). Peary caribou have reached as far as Baillie Island, Cape Dalhousie (near Cape Bathurst), and Hershel Island-*Qikiqtaryuk*, Yukon (F. Wolki *in* CPCBI 2000). Two harvesters also noted some "Peary caribou" moving from Victoria Island to the mainland (Morris Nigiyok and Harry Egotak *in* Elias 1993: 26-7), however, given the ambiguities in terminology, it is possible they were referring to Dolphin and Union caribou.

The 2012 SARC report identified that no records were found of Peary caribou moving between Banks Island and the Queen Elizabeth Islands, although Usher (1971b) noted that this was a possibility. Andy Carpenter (*in* SHCM 1998) reported that, "Some time ago, coming back from Melville Island, there were a number of caribou. There were no caribou tracks coming in from Melville to Holman recently."

Results of recent community consultation in Johnson *et al.* (2016) have confirmed that harvesters have observed the migration of Peary Caribou from both Banks Island and Northwest Victoria Island to the Queen Elizabeth Islands (Figure 10). Several key migration and crossing routes identified for Peary caribou include: Cameron Island (NW Bathurst Island Group) between Bathurst Island and Melville Island (Resolute Bay HTO 2013) and between Bathurst Island and Ellef Ringnes and surrounding islands (Grise Fiord Peary Caribou Workshop 1997; Johnson *et al.* 2016). Byam Martin Island has been identified as a connection between

Bathurst and Melville Islands (CWS 2015; Iviq HTA 2013 in Johnson *et al.* 2016). Numerous sources identify the importance of the east/west inter-island movements of Peary caribou between Prince of Wales Island, Somerset Island and Boothia Peninsula (*Kingailaq*) (Johnson *et al.* 2016; G Ljubicic *et al.* 2018). Figures 16 (SHHTC *et al.* 2016 :54) and 17 (SHHTC *et al.* 2016: 57) illustrate the fall and spring migration of caribou between Banks, Victoria and Melville Islands.

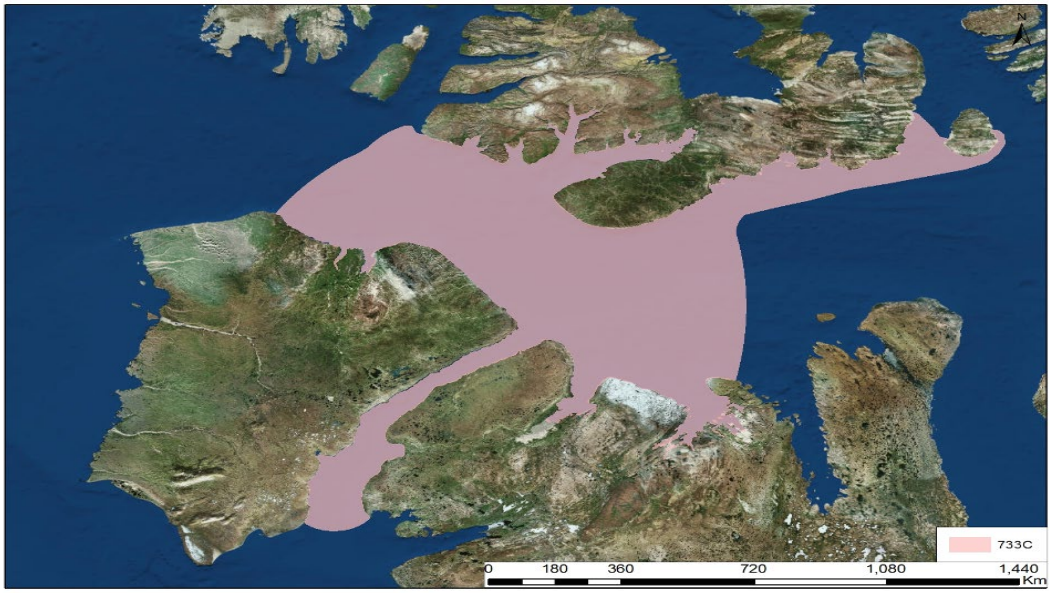

Figure 16. Viscount Melville Sound and adjacent areas. Significant migration area in spring and fall for Peary Caribou (reproduced from SHHTC *et al.* 2016: 54 and OHTC *et al.* 2016: 80 with permission).

Figure 17. Site 734C M'Clure Strait and Viscount Melville Sound, Prince of Wales Strait. Significant migration area in spring and fall for Peary Caribou (reproduced from SHHTC *et al.* 2016: 57 and OHTC *et al.* 2016: 83 with permissions).

Northwest Victoria Island

Community observations from Ulukhaktok indicated that Peary caribou habitat use has not been restricted to the northwest corner of Victoria Island; the seasonal use of other areas in central/eastern Victoria Island and the mainland have also been identified (Johnson *et al.* 2016). Migration routes along the western and eastern coast of Victoria Island were identified, as well as a migration route south of Victoria Island to the mainland (Johnson *et al.* 2016). Peary caribou on Victoria Island make seasonal north-south movements. Alex Banksland reported that seasonal movements of Peary caribou are more regular on Victoria Island than on Banks (*in* Elias 1993). Caribou breed primarily in October and early November and start to migrate north inland in April and May (OHTC *et al.* 2016) to calve in the spring (north and east of Minto Inlet). In the fall animals move south and further east to winter feeding grounds towards the peninsulas (Kuptana 1983; Jimmy Kudlak *in* Elias 1993; CPCVI 1998). During community consultations in 2015 and 2017, Ulukhaktok harvesters described current distribution and movement patterns:

"When there is no caribou in April and May then they have not reached here yet. If you go flying up north, you see plenty of caribou up there because they migrate too. Fall time they migrate back south and in spring May and June they migrate north to calving areas… I've been to Wynniatt Bay area in late April/May, Peary Caribou coming down from each side of Wynniatt Bay and Richard Collinson Bay. They come down steady, east side of Wynniatt Bay. They saw some last year, mostly Peary Caribou." (WMAC-NWT 2015: 4-5)

"Peary caribou are coming back but staying north end of island. In spring, the Peary caribou are coming down from Shaler mountains east side of Wynniatt and Hadley bay area; they wintering on the north-east on Nunavut side- spring heading west…They don't really come this way, they come straight down and fall time they travel towards the Cambridge Bay, Nunavut area, and down towards islands to the east. I would like to see research on them and this area during the summer months so we can understand they don't come closer to us." (WMAC-NWT 2017a: 5-6)

However, a calving ground for Peary caribou is also identified on central Diamond Jenness Peninsula on the south bank of the Kuujjuak River (CSH *et al.* 2008), which may indicate more complex movements.

Banks Island

On Banks Island, movements of Peary caribou are typically described as occurring in a north-south pattern. In the springtime they go north to calve, while in the fall time they return south for the winter (likely to the Fish Lakes area near Sachs Harbour) (Peter Esau *in* Berger 1976b: 4085). Usher (1971b: 68) describes that caribou tend to be in the north and east in the summer, and south and west in the winter. This is roughly consistent with a seasonal range map compiled in 1992 (CSH *et al.* 1992) (Figure 13). The Elders of Sachs Harbour stated that "caribou move with the seasons, heading north in spring on Banks Island", and that this "movement occurs in search of vegetation" (SHHTC 2013). Additional calving areas are also

identified in the Sachs Harbour Community Conservation Plans (CSH *et al.* 2000; 2008; SHHTC *et al.* 2016) around Jesse and De Salis Bays, although most appear to calve on Northwest Banks Island (from the coast inland as much as 50km, from Jesse Bay to Bernard River) (Figure 12 and 14). Caribou may summer along the coast, and although Usher (1971b) noted that caribou were uncommon in the northern and southern extremities of the island, this is not reflected in the 1992 range map (CSH *et al. 1992*) which depicts a widespread distribution across Banks Island at this time, before a fall migration to the southwest (CSH *et al.* 1992). The winter may see the smallest seasonal distribution of caribou, extending from the Storkerson River to the Kellet River and the Fish Lakes (CSH *et al.* 1992).

Changes in the climate may be leading to caribou spending more time in the south of Banks Island around the Fish Lakes (migrating north in the spring slightly later) and returning south slightly earlier (Riedlinger 2001a). Some residents of Sachs Harbour also describe that Peary caribou movements have been affected by increasing numbers of muskoxen on Banks Island. This appears to be linked to caribou staying closer to the coast, and possibly not ranging as far northwards as they had previously. As Agnes Carpenter describes (*in* Nagy 1999b: 161):

"...gradually the muskox moved from the northern part of the island. That's [where] they were breeding, on the northern part of the island. They gradually came down. They kept pushing the caribou herds down and finally in the end we had hardly any caribou left. The caribou used to migrate up to the northern part of the island during the summer months, and they migrated back down towards the fall. In the end we had nothing coming back. Hardly nothing coming back and there, caribou were sort of going, staying along the coast line... there was hardly anything on the inland... It'll take years and years and years for the caribou to come back."

Key Habitats

Peary caribou require vast amounts of land and connectivity between and within islands, and habitat use depends on their annual life cycle and forage accessibility (Johnson *et al.* 2016; ECCC 2021). Peary caribou relocate seasonally to different areas within (and possibly between) islands. On Banks Island, caribou winter in valleys, ravines, and on side-hills (Manning and Macpherson 1958). In spring they use inland areas around Jesse Bay and on the northwest corner of the island. In summer they are found in the hills, valleys, and slopes along the coast, before migrating in the fall to the Fish Lakes area just east of Sachs Harbour (CSH *et al.* 2008). Some important habitats for Peary caribou are identified in the Sachs Harbour and Olokhaktomiut Community Conservation Plans (Figures 10-12; SHHTC *et al.* 2016; OHTC *et al.* 2016). The latter plan also includes important habitats on Melville Island. The proposed federal *Recovery Strategy for Peary Caribou in Canada* (ECCC 2021) identified sea ice areas providing connectivity between populations or key islands with important habitat as candidate critical habitat based on community knowledge and observations. Areas of the Northwest Queen

Elizabeth Islands have also been noted as of possible special importance to Peary caribou by Miller (1990).

Male and female caribou segregate during the winter (CSH *et al.* 1992; 2008), and possibly also in May and June (Manning and Macpherson 1958). Stefansson's (1921) account of differences in fat across genders and seasons may also indicate differences in dietary preferences of males and females at certain times of the year, as well as behaviours related to the reproductive cycle.

Recorded observations from Indigenous and community knowledge sources often pertain to broad landscape features, such as 'vegetation', and records do not specify differences in caribou diets on the basis of activities such as rutting or calving. However, several sources do indicate that the diet of Peary caribou varies throughout the year. Bandringa (2010:269) offers the most comprehensive account of Peary caribou foraging habits, in which various lichens play a key role:

"...Lichens are one group of plants known almost universally as the food of caribou. Lichen species of the genus Cladina (or Cladonia), known broadly as tuktut niqait (tuttut niqingi in Uummarmiutun), are especially referred to as 'caribou food'. Sarah Meyook said, it is 'their grub,' the caribou are 'always eating it'... Caribou also known to eat other kinds of lichen from the ground, such as snow lichen (Flavocetraria nivalis) and the white worm lichen (Thamnolia vermicularis) known as aqiarungat. Elsie Nilgak said that caribou are also known to scrape away and eat various kinds of lichen growing on rocks, known generally as qaviut. Mary Kudlak agreed. Referring to some kinds of leaf-like lichen found on rocks, she said, 'You can find these rock lichen in caribou stomachs.'"

Lichen (which the *Olokhaktomiu*t Community Conservation Plan [Community of Ulukhaktok *et al.* 2008: 69] refers to as *Akeagonak*) is particularly important in the fall and winter.

In June, caribou (non-specified) show some preference for feeding on moss campion (*Silene acaulis*) which grows on sandy locations (it is referred to as *'Ningnak' in* Community of Ulukhaktok *et al.* 2008: 69). Morris Nigiyok (*in* Bandringa 2010: 268) explains that "it grows where the snow melts [and] in early June, they start growing up and caribou start to eat it right away." Moss campion is known by several names by Inuvialuit, depending on which animals eat the plant. When eaten by Arctic hares, the plant is known as '*ukalrit niqautait*' or 'rabbit's food'; when in flower, it is very commonly eaten by caribou, and is known as '*nirnat*'. "Caribou have been known to graze the sweet, pink flowers so much that many Inuvialuit also refer to this plant in English simply as 'caribou food'" (Bandringa 2010: 268).

After snow has gone by mid-July, feeding is more focused on moist sites that include sedges, grass, willows and mountain sorrel (*Oxyria digyna*) or *'Kongolik'* (CSH *et al.* 2008:69; Bandringa 2010). Abundance of mountain sorrel and willow leaves is said to contribute to exceptionally

fat caribou on Bathurst Island in Nunavut (Herodier Kalluk *in* Nunavut Tusaavut Inc. 1997).[9] In addition, Larter (*in* SARC 2012: 23) notes that during fieldwork on Banks Island in the 1990s, local participants focused on flowering legumes (such as pea plants). Agnes Carpenter also emphasized the importance of certain leaves in Peary caribou's diet: "The lichens and the leaves. It's just leaves. Green leaves, round leaves. Delta [leaves that] are long, narrow ones. On the island we got round ones. It's green leaves. You know, like spinach. It's almost something like that. We even use it ourselves, we put in oil" (*in* Nagy 1999b: 162). She attributed peoples' preference for caribou meat to these leaves, as they make meat tender and less strong in taste (Nagy 1999b). The plant referred to above is the mountain sorrel or *kongilik* (WMAC-NWT in SARC 2012: 23).

On Banks Island, harvesters have observed vegetation changes recently, such as "lots of purple saxifrage" and that the "willows [are] getting taller" as high as 4 foot around Sachs river, compared to "only about a foot tall 15 years or so" (WMAC-NWT 2021: 1-3). As a result of increased moisture and rain over the last 10 – 15 year, Sachs Harbour is noticing and increased abundance and diversity of lichen (WMAC-NWT 2021).

In Nunavut, the taste of Peary caribou meat varies depending on the animals' diet (Taylor 2005). Vegetation such as blueberry plants and heather (on Somerset Island) may make caribou meat leaner "and the fat is only slightly oily" while caribou foraging on grasses in the summer (on Prince of Wales Island) have more oily fat (Samon Idlout in Taylor 2005: 95).

Habitat Availability

Community members from Paulatuk, Cambridge Bay, and Grise Fiord discussed how caribou "use a wide range of habitats and have unpredictable migration routes, and thus need access to large areas of landscape considered critical habitat" (Government of Nunavut 2016: 9). Habitat availability is also discussed in the *Distribution* section.

Sources reviewed here do not indicate what proportion of suitable habitat in the NWT is occupied by Peary caribou, or if there are suitable habitats that are unoccupied. Also, sources are unclear as to whether new habitats have become available for the species. Given the increasing difficulties travelling the land (Riedlinger 2001a), and an apparent trend towards hunting more along the coasts, the quality of inland habitats may not be as well known by hunters. In addition, the only sources on the characteristics of habitat on the WQEI are almost a century old. Most of the available descriptive information regarding these islands is from Stefansson's (1921) journal. He notes an abundance of vegetation on Borden, Prince Patrick,

[9] "Yes, compared to this community [Resolute Bay] the area [Bathurst Island] has more vegetation, and I think that is why there are more caribou there. More humid areas usually have a lot more vegetation. It has mountain sorrel plants and willow leaves, though it has no trees (laughs)" (Herodier Kalluk in Arreak 1997: 60)

and Lougheed Islands, and a comparative lack of vegetation on Melville and Meighan Islands. Bernier (1910: 174) also noted that the 'pasturage of moss' around Cape Vesey Hamilton (Northeast of Mercy Bay on Banks Island) was plentiful. From interviews in Nunavut, more humid areas may support more vegetation (Herodier Kalluk *in* Nunavut Tusaavut Inc. 1997).

One hunter from Ulukhaktok suggests that larger islands provide caribou more recourse in times where local snow and ice conditions impede access to forage (Harry Egotak *in* Elias 1993), while testimony to the Berger Inquiry noted the smaller size of Banks Island as problematic for caribou in circumstances where muskoxen were perceived to be foraging competitors (Peter Esau *in* Berger 1976b: 4126). In Nunavut, however, caribou are also reported to relocate to smaller islands when severe weather events impede access to forage on larger islands (Taylor 2005).

Caribou seem to "prefer upland areas and slopes but use lowland meadow communities during the growing season." (OHTC *et al.* 2016: 96). Johnson *et al.* (2016:146) provides a comprehensive summary of Peary caribou preferred terrain and vegetation features that offer forage choices and accessibility under changing conditions:

"In general, Peary caribou select habitat with sparse to moderate vegetation cover dominated by dwarf shrubs, forbs, sedges, grasses, lichens and mosses (Larter and Nagy 2001a; Iviq HTA 2013). Throughout their annual life cycle, Peary caribou predominantly select dry-moist, intermediate to high elevation habitats that are sparsely to moderately vegetated. These habitats are selected over wet habitats independently of biomass, nutritional quality, or species composition, particularly during winter (Thomas et al. 1999; Larter and Nagy 2001b; Iviq HTA 2013). Low productivity sites including ice fields, bare ground and rock fields are avoided (Russell et al. 1979; Gunn 2008; SHHTC 2013)…[Winter] Foraging sites are predominantly on exposed, wind-blown areas at intermediate to high elevations with limited snow accumulation (Miller et al. 1982; Thomas and Edmonds 1983; OHTC 2013)…Peary caribou also do not select habitats with the highest vegetation cover, such as sedge meadows (Parker and Ross 1976; Wilkinson et al. 1976; Russell et al. 1979; Thomas et al. 1999; Larter and Nagy 2001a; Gunn 2008; SHHTC 2013), that have the highest productivity of High Arctic habitats (Parker 1978)."

Habitat Trends and Fragmentation

Habitat trends affecting Peary caribou stem from increased populations of muskoxen and from climate change. According to Indigenous and community knowledge, muskoxen negatively affect caribou forage. Muskoxen are far larger than caribou and eat much more. Further, "they eat right to the roots and they don't leave anything" (Sam Lennie *in* Nagy 1999b:105). On Banks Island, muskox populations greatly increased in the 1960s (Whittles 2005) after a brief poisoning program starting in the late 1950s reduced the number of wolves (Heard 1984; Peter Esau in SHCM 1998). In 1971, Inuvialuit were permitted to harvest 25 muskoxen (Peter Esau in Berger 1976b); this was raised to 150 in 1978 (Nagy 2004), and in 1981 a commercial hunt started (Whittles 2005). Despite this hunting pressure, Muskox population estimates

were higher than Peary caribou and between 1989 and 2010, when they ranged between 30,000-70,000 muskoxen on Banks Island (Davison *et al.* 2010). Muskox numbers have since declined and recent surveys in 2019 estimate approximately 11,000 muskoxen (Davison and Baryluk 2021). The relationship between muskox and caribou are discussed in the *Interactions* section.

Peary caribou habitat can be affected by the characteristics of weather and climate. For instance, deep, hard snow cover can inhibit access to forage and force caribou to feed in more raised wind-blown areas where there is less snow cover (CPCVI 1998). Freezing weather could have a positive effect on the availability of some types of vegetation. As explained by Agnes Carpenter, "…when the greens grow on the island, and before it even has a chance to spoil or the greens turn brown or anything, it freezes. Everything freezes and [the caribou] feed on fresh green pastures. Green pastures without it spoiling" (*in* Nagy 1999b: 162). However, most sources communicate the effects of freezing rain as negative. Rain and associated icing on the ground can lead to caribou starvation in the spring and fall (CSH *et al.* 2008). The effects of freezing rain on the availability of habitat for Peary caribou may be more severe on Banks Island because of its small size. Some Inuvialuit report that the size of Victoria Island affords caribou more options because it is big enough that when freezing rain occurs in the autumn, the caribou can move away to better grazing land within the island (Peter Esau *in* Berger 1976b: 4126; Harry Egotak *in* Elias 1993). Erratic weather is linked to the prevalence of freezing rain, and indications are that erratic weather events are becoming more common on Banks Island due to climate change (Riedlinger 2001a).

Climate change may also play a role in the ability of Peary caribou to cross between islands in search of suitable habitat. Many sources have documented hunters' observations that sea-ice (over which caribou must travel to cross between islands) is becoming less reliable (Riedlinger 1999; 2001a, b; Nuttall *et al.* 2005; Slavik *in* SARC 2012: 25). While such sources do not specify the implications of such changes for Peary caribou, the changes they describe could make inter-island crossings more difficult.

Peary caribou habitat is naturally fragmented given that the animals inhabit an island archipelago. Stefansson (1921) records substantial differences between islands in terms of the quality of forage. As discussed in the previous section on *Inter-island movements*, Caribou travel between islands in the winter. Most reports pertain to crossings between Northwest Victoria Island and Banks Island across the Prince of Wales Strait (CPCVI 1998), and between Banks Island and the mainland (Lawrence Ruben in Manning and Macpherson 1958; CPCBI 2000); one report also notes crossings between Melville and Northwest Victoria Island (Andy Carpenter *in* HCM 1998). Other crossings have been hypothesized between Banks Island and the Queen Elizabeth Islands (Usher 1971b). Caribou may cross between some islands in the summer (as implied by Herodier in Nunavut Tusaavut Inc.1997:57; Johnson et. al. 2016).

POPULATION

Abundance

Observations regarding the abundance of caribou stem from hunters' excursions on the land and are therefore usually localized. Relative assessments of caribou abundance are also influenced by personal experience (Taylor 2005). As such, it is not possible to infer exact population size from comparing observations recorded in the documents reviewed here. Nevertheless, records indicate that residents of both Sachs Harbour and Ulukhaktok considered that populations of Peary caribou were worryingly low in the 1990s (Elias 1993; Nagy 2004). More recently, based on community consultation in response to the species assessment and recovery, residents are observing increases in the population and believe that "Peary caribou are slowly increasing compared to about 6 years ago" (Government of Nunavut 2016; WMAC-NWT 2017b; WMAC-NWT 2018b). No sources contained information on the current abundance of caribou on the WQEI.

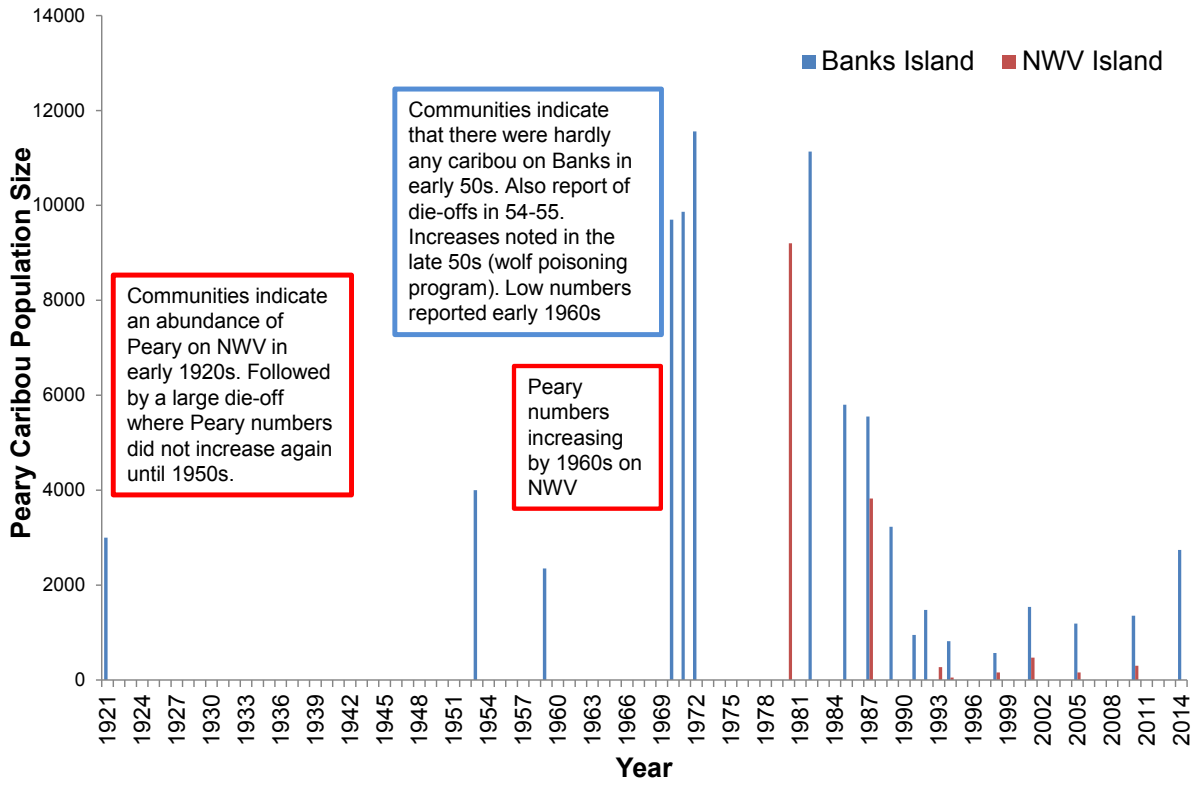

Figure 18. Peary caribou population trend for the Banks/Northwest Victoria Island (NWV) local population. Includes historic data with community information in text boxes and area corrected estimates for each Island based on CWS and GNWT survey data from the 1970s onwards. Available data and community information are presented as a point of reference to evaluate the potential for longer term cycling in this population (reproduced from Johnson *et al.* 2016: 49 with permissions).

Population Dynamics

Sexual maturity occurs between 2 and 4 years of age with adults living to 15 years in the wild (CSH *et al.* 2008; SHHTC *et al.* 2016). Peary caribou are usually seen in small groups of five to ten, but sometimes alone (Usher 1971b). Occasionally larger groups are observed; the largest group reported was 200 animals on Banks Island (Stefansson 1921). According to a community member consulted by WMAC-NWT a "herd of 26 had about 7 bulls" (WMAC-NWT 2018b: 19). Peary caribou in good condition (i.e. sufficiently fat) can calve every year after sexual maturity is reached between 2 to 4 years of age (SHHTC *et al.* 2016). However, if they are in poor condition, they may not calve every year. For example, in the winter and spring of 1952-53 on Banks Island (noted in the CPCBI [2000] as particularly harsh), hunters reported finding no fetuses in harvested caribou (Manning and Macpherson 1958). The available sources do not include any information on possible changes in reproduction or lifespan over time.

Changes in Population Size

Fred Raddi (*in* Slavik 2013) shares his observations of population cycles among different species on Banks Island:

"But not only caribou I seen crash. I've seen the arctic hare right from thousands in a herd, all over on the island, [then] they were scarce for a while. But I think they're starting to come back again. I've seen wolf population, right from very low to very high now again. Over the past twenty years, the wolf population started coming back… So we've seen the Muskox population grow, we've seen the geese population grown, we've seen the caribou population crash and the arctic hare population crash, and what else."

Peary caribou populations fluctuate with periodic crashes or die-offs (ECCC 2021). Many harvesters describe cyclical population fluctuations of Peary caribou (Usher 1971b; Nagy 1999b; Riedlinger 2001a; Taylor 2005; Gunn 2008; Parks Canada 2010). They often describe these fluctuations as connected to the availability of forage, and inversely related to muskoxen populations. Unfortunately, recorded observations of forage quality and quantity are relatively few and are too scattered in temporal and spatial terms to clearly indicate larger trends.

An Elder in Ulukhaktok reports that the caribou population has gone through three cycles over the past 90 years (CPCVI 1998). On Banks Island, John Lucas (*in* Nagy 1999b:165) also refers to "…probably what they call a 30 years cycle that they have the caribou. Cause, eventually I think they'd probably gonna come back." One hunter asserted that "as late as the seventies, [there were] caribou with big racks, now caribou decline… My own way of thinking this is natural. Back in the 50s we had the same thing, other way around" (Robert Kuptana *in* Riedlinger 2001a: 84). Another noted, "You know that [Susie] Tiktalik… She said it was a cycle, after so many years they will come back" (S. Lucas *in* Riedlinger 2001a: 84). In Nunavut as well, many Indigenous knowledge holders report that caribou undergo cyclical changes, that

fluctuation is natural, that die-offs occur periodically, and that low populations will eventually recover (Taylor 2005; Government of Nunavut 2016). However, if declines occur rapidly, recovery or a rebound in the population may be difficult (ECCC 2021).

Some harvesters do not support the idea that changes in caribou numbers are part of a natural cycle. Peter Esau states, "I don't believe there is a cycle with caribou. It has to do with the weather" (*in* SHCM 1998: 4). Elsewhere he also reaffirms that during good weather caribou can also increase rapidly (Nagy 1999b).

Northwest Victoria Island

The abundance of caribou on NW Victoria Island appears to have fluctuated over the last 100 years. For example, an Elder who was a child at Prince Albert Sound recalled that people did not talk much about caribou because there was not any at that time and she recalls "the population going up and down over the years" (WMAC-NWT 2018b).

Caribou were reportedly scarce after the turn of the last century, but became abundant by the 1920s, until a spring rain caused extensive mortality (OHTC *et al.* 2016). Very few caribou were present thereafter until roughly the 1950s (Harry Egotak and Nicholas Aloakyuk in Elias 1993). During this time, hunters had to travel to Central Prince Albert Peninsula towards Richard Collinson Inlet to find caribou. By the 1960s caribou numbers were increasing and apparently peaked in 1972 (CSH *et al.* 2008).

Although the animals were reported as abundant until 1988 (CSH *et al.* 2008; OHTC *et al.* 2016), people in Ulukhaktok believed that the Minto Inlet caribou has been declining gradually since the 1970s (CPCVI 1998). Hunters in Ulukhaktok again had difficulty finding caribou in the winters of 1992-93 (Gunn 2005), and interviews in 1993 recorded their deep concern about a declining population of Peary caribou (Elias 1993). In these interviews, one hunter reported that previously the caribou would be gone for some time but would always return, suggesting that an increase was overdue. Sam [Oliktoak] acknowledged "that the Peary caribou have declined drastically in the last few years. Long ago they would be gone for some time, but always return" (*in* Elias 1993).

The Ulukhaktok Community Conservation Plan reports that some people feel the Peary caribou may have moved, as evidenced by the population recovery that the adjacent Banks Island has shown between 2010 and 2014 (OHTC *et al.* 2016). The 2012 survey of the islands north of Banks Island indicate numbers increased since 1997 (OHTC *et al.* 2016). Community consultations in Ulukhaktok also noted that the "Peary caribou slowly increasing compared to about 6 years ago" (WMAC-NWT 2018b). The knowledge assessment (Johnson *et al.* 2016) indicated an increasing trend over the short term (between 2004-2014) for the Banks-NW Victoria Island population (ECCC 2021).

Banks Island

Reports indicate that Peary caribou abundance on Banks Island has also fluctuated: Peary caribou were rare in the 1950s, became more abundant by the 1970s, and scarce by the 1990s. More recently, Sachs Harbour residents are observing increases in the population (Government of Nunavut 2016; WMAC-NWT 2017b; WMAC-NWT 2021).

Stefansson (1921) reports that he encountered a group of 200 Peary caribou (an unusually large group) on Banks Island in 1915, while muskoxen were almost nowhere to be found. Elders recollect that Peary caribou on Banks Island declined in the early 1950s and 1960s (Gunn 2008). Local perspectives indicate that in the early 1950s there were hardly any caribou on Banks Island. This appeared to be linked to a severe icing event in the winter of 1952 (CPCBI 2000). It was also reported that the caribou had again been dying in the winter of 1954-55 (Bertram Pokiak in Manning and Macpherson 1958).

Hunters reported that caribou numbers began to increase in the late 1950s, which was also the time a wolf-poisoning program eliminated most of the wolves from Banks Island (Andy Carpenter *in* SHCM 1998; Nagy 1999b). However, observations are varied by location. For instance, Frank Kudlak and Martha Kudlak (*in* Nagy 1999a: 16b) explained that around De Salis Bay there were lots of caribou right after freeze up in 1957, but that the next year there were hardly any, instead they were moving towards Sachs Harbour. Through the 1960s and early 1970s, Urquhart (1973) and Usher (1976) noted an abundance of caribou around Sachs Harbour. Although Urquhart mentioned significant mortality in the winter of 1970-71, Usher reported the group to be in generally good condition, with no reproductive failures or signs of detrimental effects from hunting (Usher 1971b).

In the mid-1970s, additional observations of dead caribou were reported, and there was concern that the causes were not well-understood (Berger 1976b). A caribou die-off was also recorded in the winter of 1977-78 after a freezing rain event in November 1977. Andy Carpenter noted that die-offs occurred about every three years through the 1970s and 1980s, and that calves and bulls were most severely affected (CPCBI 2000).

In the fall of 1991, hunters reported that caribou became very difficult to get (Beverly Amos and Lawrence Amos *in* Nagy 1999a: 15a), and Harry Egotak noted in 1993 that the population had declined drastically (*in* Elias 1993). However, other sources assert that the population was stable between 1991 and 1994 before declining by 1998, possibly due to wolf predation (CPCBI 2000).

In 2001, residents of Sachs Harbour reported that the health of caribou had noticeably declined, although the animals were still in fairly good condition. Observed changes, notably the size of the antlers on the bulls (Larter and Nagy 1996), were attributed to the lack of big, old bulls in the group (Riedlinger 2001a). Some hunters also reported seeing changes in the fat

content of caribou. "One thing you notice now, a lot of caribou now, we get them and the fat on them is anywhere from… in the hindquarters about, when you get them in the fall now is half and inch to an inch, but you used to get caribou with two inches easy. You really notice" (Larry Carpenter *in* Riedlinger 2001a: 84). These comments are juxtaposed against those referring to muskoxen, described by a hunter as "all the time fat, even in the wintertime, all fat" (Edith Haogak *in* Riedlinger 2001a: 83).

Some harvesters reported that caribou moved away from Banks Island across to Northwest Victoria Island; this is based on observations that when their numbers declined on Banks, they increased around Ulukhaktok (although no specific timeframes are given; Riedlinger 2001a). However, this observation does not fit with the bulk of the evidence compiled from other sources.

Recent community consultations have documented that Sachs Harbour residents are observing a "notable increase" in Peary Caribou, correlating this observation to a "decreasing Muskox population" (Government of Nunavut 2016: 5). Harvesters have observed larger groups comprising almost thirty animals, as well as thicker antlers on bulls, suggesting this is an indictor of healthy individuals (WMAC-NWT 2021). Of the 18 individuals harvested in the December 2020 community harvest, all the caribou harvested were "in good shape" and free of observable disease (WMAC-NWT 2021:1-2). The community remains invested in the future re-assessment of Peary caribou "because they are observing the recovery of this species" (WMAC-NWT 2017b: 1).

Western Queen Elizabeth Islands

Very few sources discuss population trends specifically on the WQEI. Stefansson (1921) notes an extreme decline in the numbers of Peary caribou on Borden Island between spring 1915 and fall 1916, which he links to a simultaneous increase in the wolf population. Miller's (1990) account also documents a large decline in Peary caribou numbers in the WQEI (based on aerial surveys) between 1961 and 1987. He records that "non-wildlife people who were in the area [NorthWQEI, including Mackenzie King, Borden, and Brock Islands] during summers in the late 1970s and the early 1980s… suggested that caribou were rare there at that time" (Miller 1990: 20). Johnson et al. (2016) and ECCC (2021) documented local knowledge indicating that the short-term trend for Peary caribou of the WQEI was increasing (Resolute Bay HTO 2016 *in* ECCC 2021).

Given the lack of information regarding the WQEI, we include here some accounts of adjacent islands in Nunavut. Taylor (2005) describes reports from hunters in Resolute that Peary caribou were plentiful on Bathurst Island in the 1950s and early 1960s, becoming scarcer by the mid-1970s (prompting a hunting ban). Meanwhile, Lougheed Island was reported to have "plenty of healthy caribou" in the early 1970s (Tony Manik *in* Taylor 2005: 50). In the late 1980s

caribou were again thought to be sufficiently numerous to support hunting on Bathurst Island, although these numbers reportedly declined again after a freezing rain event in the winter of 1994-95 (Taylor 2005). In 1997, however, several residents of Resolute reported a relative abundance of caribou on Bathurst Island (Simon Idlout, Aleeasuk Idlout, Allie Salluviniq, Herodier Kalluk, Issac Kalluk *in* Nunavut Tusaavut Inc. 1997).

Health

Key indicators of body conditions and individual animal health is the quantity and quality of fat on each animal, the quality of fur, thickness of antlers on bulls, the presence/absence of insects and the presence/ absence of illness and infection, such as brucellosis (WMAC-NWT 2018a, WMAC-NWT 2018b, WMAC-NWT 2020a: 6).

WMAC-NWT (2018a) noted that body condition positively correlates to cold/cool weather and the absence of insects:

"This year there was fat caribou in Prince Albert Sound because of the cold weather and no bugs. It was colder this year…Last year the caribou was pretty fat and 2 years ago it was hot and they weren't fat…About 8 years ago PAS there was rain on top of the snow -ice and they were skinny." (WMAC-NWT 2018a: 3)

"This year caribou were healthy, fat - Maybe because it was a cool summer… Couple of years ago summer was really hot and caribou were skinny." (WMAC-NWT 2018b: 20)

Rescue Effects

Peary caribou only exist in the Northwest Territories and Nunavut. Northwest Territories and Nunavut cannot count on a rescue effect from each other, because Peary caribou numbers are low across their entire range. See additional information in *Movements and Dispersal.*

THREATS AND LIMITING FACTORS

Indigenous and community knowledge sources indicate several contributing factors to Peary caribou population declines on Banks and Northwest Victoria Islands. These include past overharvesting, severe weather events, competition with muskoxen, and predation by wolves. Of these, past overharvesting, severe weather, and competition with muskoxen are the best documented. While overharvesting was important in the past, it is not seen as a current threat.

The effects of industrial development have also been consistently seen as a threat to Peary caribou and increased marine shipping due to an extended ice-free season in the Northwest Passage is creating new concerns. Other factors, such as disease, inter-island movement, and drowning, are noted in a small number of sources. While the effects of each of these are described in sources, their cumulative impacts are not well understood (CPCBI 2000; Riedlinger 2001a).

Some differences are evident between threats on Banks Island and Victoria Island, while little information is available regarding the Queen Elizabeth Islands.

Past Overharvesting

Regarding historical caribou declines, Sandlos (2007) argues that many official reports have overstated the impact of the Indigenous subsistence harvesting. However, Peary caribou have been and continue to be a preferred source of food for people in Ulukhaktok and Sachs Harbour (Condon 1996; CPCBI 2000; Nagy 2004). Indeed some have suggested that female caribou are preferred year-round because they provide meat that is more tender and higher in fat (CPCBI 2000). As described below, several hunters report that general overharvesting contributed to Peary caribou declines on Northwest Victoria Island, and some harvesters from Banks and Northwest Victoria Islands suggest that harvesting females may be detrimental to Peary caribou populations.

On Northwest Victoria Island, human harvest has often been implicated in local perspectives of past caribou declines. The CPCVI (1998: 7) states, for example, that "people in Holman believe that the [caribou] decline was caused by the high harvests that occurred in the 1980's". More efficient hunting with the arrival of rifles has also been reported as one reason for high harvest, improving success rates because Inuit could hunt from further away (Ljubicic *et al.* 2018; Guy Hologak *in* Berger 1976a).[10] As rifles became available sometime before 1923 (Farquharson 1976), this suggests that high harvest levels could have begun even before the 1980s. Within the neighbouring Kitikmeot region, the acquisition of rifles was described as a major influence on the Peary caribou population: "Early in the 1900s, I was told that there were plenty of Peary caribou in Gjoa Haven on King William Island… But after the gun was given to Inuit people, they killed many" *(Akkikungnaq* 2013 *in* Ljubicic *et al.* 2018*).* Elders cautioned against the interpretation that it was primarily Inuit overharvesting that caused the decline of Peary caribou on Qikiqtaq, believing that the noise of the rifles scaring them away was a considerable factor in driving them off the island, "especially in those earlier times when the slightest sound would alert *tuktuit* to run" (*in* Ljubicic *et al.* 2018: 219).

Prior to 1987-88, harvest numbers for Peary caribou were recorded only sporadically. Roy Goose, however, reported that in the early 1970s, an average of six caribou were taken per family during the early winter, or 200-225 caribou in total per year (*in* Berger 1976a).

In a series of interviews with hunters in Ulukhaktok, new technologies such as snowmobiles and rifles, in addition to the growth of the community itself, were reported to have facilitated

[10] "In those years when they start getting their first rifles they had a lot of shells so they were slaughtering caribous in those days and that's the reason why in those days they ran out of caribou. The caribou were extinct for a while in those days. That's when they first get their rifles they got too smart, they kill them off." (Guy Hologak in Berger 1976a)

overharvesting and wastage of caribou on Northwest Victoria Island (Alex Banksland, William Kagyut, Jimmy Kudlak, Jimmy Memogana, and Nickolas Aloakyuk *in* Elias 1993).[11] For instance, Alex Banksland attests "it is because of heavy hunting, carelessness and wastage. Snowmachines make it easier to travel long ways in a short time and it is easier to kill and carry more." Nickolas Aloakyuk does note, however, that some of this hunting pressure was directed at the Mainland (Dolphin and Union) caribou (*in* Elias 1993). One harvester, Jimmy Kudlak, recommends that female caribou and calves should not be harvested (*in* Elias 1993).

Although overharvesting has been an important factor in past declines on Northwest Victoria Island, the current harvest of Peary caribou is now much lower than in the past. Since 1987, the reported harvest of Peary caribou (the 'Minto Inlet Herd') on Northwest Victoria Island has declined to virtually nothing. This is in part on account of an NWT-wide harvest quota being introduced in 1990, and a zero-harvest policy initiated by the Olokhaktomiut Hunters and Trappers Committee in 1993 for Northwest Victoria Island (Governments of Northwest Territories and Nunavut 2011) that is enforced by GNWT legislation (Table 3; GNWT 1993b). In 2015/16, an annual quota of 10 animals from the Minto Inlet management area was established (Figure 19; ENR 2019: 10). Harvest quotas will be addressed further in the *Positive Influences* section.

On Banks Island, one report indicates a harvest of 15-20 Peary caribou in 1960 (Usher 1966). Between 1962 and 1972, an average of 279 caribou were harvested each year, the majority being female (Urquhart 1973). From the 1970s until the late 1980s, each of the 15 families in Sachs Harbour would take 20-25 (mostly females) per winter; this amounted to about 300-450 animals per year (CPCBI 2000: 17).

The numerous hunters and Elders interviewed for the Aulavik Oral History Project (Nagy 1999b) did not make any statements suggesting that the primary causes of declining Peary caribou on Banks Island were overharvesting or the preferential hunting of females. However, in another document, Larry Carpenter did suggest that hunting (especially females) may have had an impact on caribou on Banks Island (*in* SHCM 1998)[12].

A voluntary male dominated hunting quota has been implemented on Banks Island since 1990 (Gau pers. comm. 2022), and harvests have been less than this number since 1994 (see Table 3). However, because the quota is male dominated, some residents of Sachs Harbour expressed concern that there may not have been enough mature bulls to breed all the cows in the population (CPCBI 2000: 8). Nunavut resident Liza Ningiuk (*in* Taylor 2005) also voiced

[11] "People population increase in one settlement such as Holman is the main cause of Peary caribou decline. [It has led to] hunting competition caused by Inuit coming from 26 different regions to Holman." (Jimmy Memogana *in* Elias 1993)

[12] "I think we had a lot to do with it. Families would take 20-25 cows a winter - about 30. Almost always cows - few bulls." (Larry Carpenter *in* SHCM 1998: 3)

concern at male-only hunting quotas, given the importance of older male caribou to herd survival.

During 2016 community consultations in Sachs Harbour, participants raised concerns that overharvesting is a concern for the Sachs Harbor HTC including illegal harvesting or not reporting captures. Participants mentioned that "Quotas are not respected [and] HTC by-laws are not respected neither enforced" (Government of Nunavut 2016: 8).

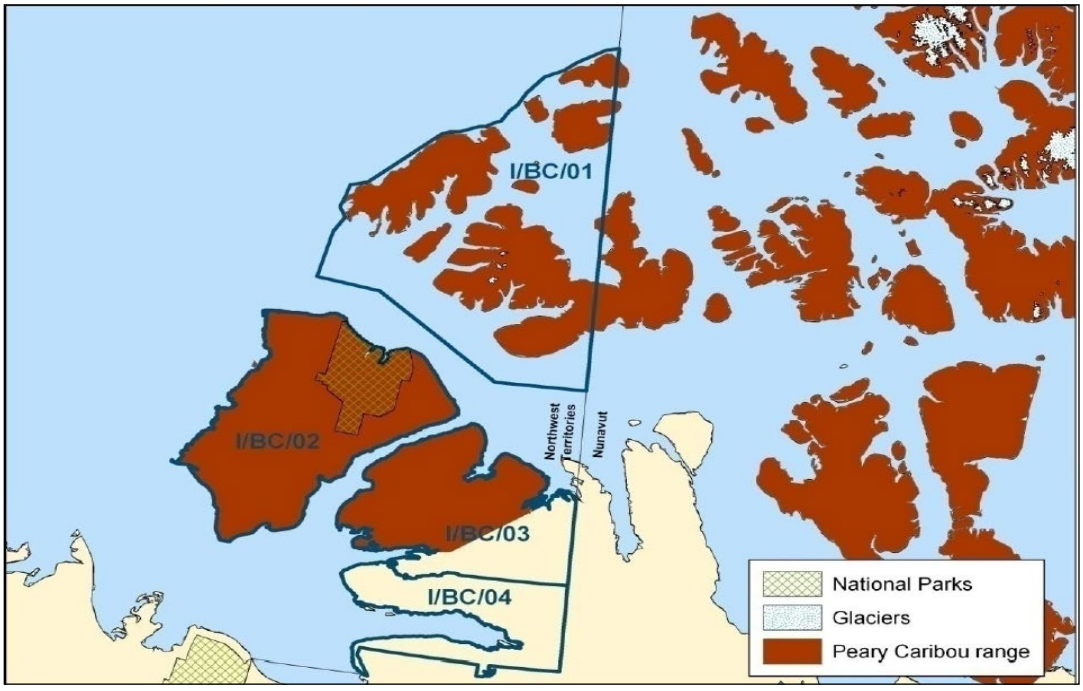

Figure 19. Caribou Wildlife Management Areas in the Inuvialuit Settlement Region (reproduced with permission from Government of the Northwest Territories and Government of Nunavut 2010).

In 2018, six Peary caribou were harvested and reported by the community of Paulatuk. During 2016 community consultations in Paulatuk, subsistence harvesting was not identified as a threat, but cautioned that "in the southern range of Peary caribou, where they mix with other caribou (ex. Bluenose), it could become a threat if hunting resumes for caribou currently under restrictions. Hunting pressure could increase on Peary and Dolphin and Union caribou" (Government of Nunavut 2016: 8).

Unreported mortalities and disregard for HTC by-laws are a concern and could potentially lead to declines in Peary caribou (SHHTC 2016; ECCC 2021). However, as outlined in *Positive Influences*, the subsistence harvest of Peary caribou is not considered a threat under current management conditions due to the success of co-management and recovery efforts including voluntary restrictions established by hunter and trapper organizations in response to small population sizes (COSEWIC 2015; Johnson *et al.* 2016).

Table 3. Number of Peary and Dolphin Union caribou harvested in the ISR by management area, July 2000 to June 2019 (ENR 2021).

Management Area		Quota Year *(1 July to 30 June)*																				Status
		01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	
WQEI *(I/PC01[d])*	Population Estimate *(non-calf)*	—	—	—	—	—	—	—	—	—	—	6,000	—	—	—	—	—	—	—	—	—	**Listed as Endangered federally and Threatened in NWT [c]; Unknown**
	Total harvest	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	
	Quota																					
Banks Island *(I/PC/02[d])*	Population Estimate *(non-calf)*	1196	—	—	—	929	—	—		1097	—	—		2,234	—	—	—	—	—	1,913	—	**Listed as Endangered federally and Threatened in NWT [c]; Reduced but recovering**
	Total harvest[a]	27	≤20[a]	23	3	7	3	7[a]	12[a]	1	6[a]	5[a]	?	13	20	≤72[a]	14[a]	21[b]	≤72[a]	47	71[a]	
	Quota	36	36	36	36	36	36	36	36	36	72	72	72	72	72	72	72	72	72	72	72	
Minto Inlet *(I/PC/03[d])*	Population Estimate *(non-calf)*[d]	1272	—	—	—	835	—	—	—	580	—	—	—	—	N/E [b]	—	—	—	176	—	—	**Endangered / Threatened [c]; Decline, likely due to weather events**
	Total harvest [a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0	10	9	1	
	Quota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	10	10	10	10	
Prince Albert Sound *(I/DU/04[d])* *(Dolphin Union)*	Population Estimate *(non-calf)*	—	—	—	—	—	27,787	—	—	—	—	—	—	—	18,413	—	—	—	4,105	—	—	**Listed as Special Concern [c]; declining**
	Total harvest [a]	>148	240	113	298	360	170	188	32	59[e]	?[e]	?[e]	?[e]	?[e]	?[e]	?[e]	?[e]	?[e]	?[e]	?	?[e]	
	Quota [c]																					

[a] Based on tags returned to ENR, tags not returned are considered used, 15/16 - 29 reported.; 18/19 - 3 reported; 20/21 - 23 reported.
[b] Survey conducted but no estimate was able to be calculated.
[c] Under federal Species at Risk Act listed as endangered, under SARA(NWT) listed as Threatened.
[d] Subzone changed 14th May 2015 to separate Dolphin-union and Peary caribou zones.

Competition with Muskoxen

Inuvialuit have identified competition with muskoxen as a major threat to Peary caribou. Substantial Inuvialuit knowledge relates to the interspecific interactions between muskoxen and Peary caribou, Peary caribou avoidance of muskoxen and displacement of Peary caribou when muskoxen populations are high (COSEWIC 2015). Many residents of Sachs Harbour report that increased numbers of muskoxen have had a detrimental effect on caribou on Banks Island, either due to competition for food, their trampling caribou forage, or their strong odor (see the *Relationship within and among species* section). Nagy (2004) and Whittles (2005) note that many Inuvialuit Elders have seen a correlation between high muskoxen populations and low caribou populations, suggesting that muskox and caribou naturally cycle opposite to each other (Nathoo pers. comm. 2021). The Sachs Harbour Community Conservation Plan (SHHTC *et al.* 2016: 29) indicate that "the Community Working Group would like to see Peary caribou protected from disturbance because of the small size of the herd. They believe the growing muskox population is threatening the caribou, which therefore need to be protected from disturbance." Concerns have been documented that high muskoxen populations attract and maintain high numbers of wolves (Gunn 2005; CWS 2013 *in* Johnson *et al.* 2016: 18). While some hunters agree that muskoxen compete with Peary caribou on Northwest Victoria Island, such indications are generally stronger on Banks Island.

Perspectives on the negative implications of increasing numbers of muskoxen for caribou on Banks Island have been most thoroughly presented by Murielle Nagy (2004), who summarizes Sachs Harbour residents' perspectives from transcripts recorded in the Aulavik Oral History Report. A central figure in hunters' testimony is Susie Tiktalik, who had warned people that the muskox population should be kept low in order to have caribou on Banks Island (Nagy 2004). Several hunters in Sachs Harbour connect increases of muskoxen on the island with declines of caribou and vice versa (Sam Lennie, Sam Oliktoak, Agnes Carpenter, Frank Carpenter, Andy Carpenter, Sarah Kuptana, David Nasogaluak, and Michael Amos in Nagy 2004). Agnes Carpenter explains (*in* Nagy 1999b: 157):

"I've known for years. Like we've known for years on the island that the hunters and trappers, when they first started seeing the muskox, the elders were talking about it from past experience. Especially we were going back to the elders in the community at that time. They used to talk about muskox that used to completely wipe out the caribou herd because they were competing for the same food when we saw the signs of muskox coming in to Banks Island.".

Given these perspectives, many hunters feel that the muskox population on Banks Island should be tightly controlled (Nagy 2004).

Stefansson (1921) reports that the muskox population on Banks Island was extremely low in 1915, while Nagy (2004) presents accounts that suggest they were more numerous at some

previous time. Andy Carpenter relates a historical decline in muskoxen around the time of early European explorers (who harvested many muskoxen for food), although he did not think that "man had a great impact. It was just that there would be so many, the population would crash" (*in* SHCM 1998: 3). Nagy (1999b), however, speculates that Inuvialuit may have deliberately managed muskoxen in order to promote caribou during the 1800s and earlier. By the late 1950s, muskox populations were increasing on Banks Island (Nagy 2004), numbering 800 in 1967, 1800 in 1974, and 25,000 by 1985 (Whittles 2005). However, relatively strict hunting restrictions on muskoxen remained in place until the 1980s (Sam Oliktoak *in* Nagy 2004; Sandlos 2007). As early as the 1960s, hunters from Sachs Harbour had begun to seek a muskox quota (Agnes Carpenter *in* Nagy 2004), and in 1971 were permitted to harvest 25 muskoxen (Peter Esau *in* Berger 1976b); this was raised to 150 in 1978 (Nagy 2004). Such small quotas have been blamed for allowing an explosion in muskox numbers since the 1970s (Nagy 2004; Whittles 2005). Although a commercial harvest program was initiated in 1981 and quotas were raised substantially, the muskox population (non-calf animals) on Banks Island climbed to 53,000 in 1992 (Larter *et al.* 2009), peaking at more than 64,000 in 1994 (Larter and Nagy 2001c). Muskox were estimated to number 36,676 in 2010 (Davison *et al.* 2010) and approximately 11,000 in 2019 on Banks Island (Table 4; Davison and Baryluk 2021).

The limited size of the Arctic islands may be one factor that leads to competition between muskoxen and Peary caribou. Peter Esau, for instance, hypothesized that "Maybe the island [Banks Island] maybe not big enough; maybe that's why something is getting over-populated, like maybe muskox. Every time we go trapline we start seeing dead caribou" (*in* Berger 1976b: 4126). However, cumulative effects are also implicated by Peter Esau, who concluded "I don't think [the muskoxen] really pushed the caribou away", instead blaming severe weather in the autumn for increased mortality of young caribou (*in* Nagy 2004: 104).

There is some indication that muskoxen are considered a threat to Peary caribou on Northwest Victoria Island, but views on the relationship between caribou and muskoxen are more mixed in Ulukhaktok than in Sachs Harbour (CPCVI 1998).

In 1992, it was reported that many people believed that the high muskox densities near Ulukhaktok were responsible for the low caribou densities (Heard 1992). At the time, the OHTC had proposed regulation changes to increase the commercial harvest of muskoxen near Minto Inlet in the hopes of reducing muskox numbers and thereby leading to an increase in caribou density (Heard 1992). However, among hunters interviewed in Ulukhaktok in 1993, Frank Kuptana asserted that although caribou may not like the smell of muskoxen, this was not a cause of the caribou decline (*in* Elias 1993).

Table 4. Number of muskoxen harvested by management area in the ISR, July 2016 to June 2021 (ENR 2021: 14).

Management Area		Quota Year *(1 July to 30 June)*					Total	Status
		16/17	17/18	18/19	19/20	20/21		
Melville Island *(I/MX/01)*	Population Estimate *(non-calf)*	—	—	—	—	—	—	**Unknown**
	Total harvest	0	0	0	0	0	0	
	Quota	12	12	12	12	12	60	
Banks Island *(I/MX/02)*	Population Estimate *(non-calf)*	—	—	—	~10,979	—	—	**Declining (2019)**
	Total harvest	56	79	112	33	N/A	362	
	Quota	10,000	10,000	10,000	10,000	10,000	50,000	
Northwest Victoria Island *(I/MX/03)*	Population Estimate *(non-calf)*	—	—	>5,766	—	—	—	**Declining (2019)**
	Total harvest	241	243	200	164	132	980	
	Quota	1,000	1,000	1,000	1,000	1,000	5,000	
Tuktoyaktuk *(I/MX/05)*[a]	Population Estimate *(non-calf)*	—	—	—	—	—	—	**Stable but change between 2009 and 2021**
	Total harvest	32	53	31[a]	4	0	120	
	Quota	50	50	50	50	50	250	
Inuvik *(I/MX/05)* [a]	Population Estimate *(non-calf)*	—	—	—	—	—		
	Total harvest	—	—	—	—	0	0	
	Quota	—	—	—	—	3	30	
Paulatuk *(I/MX/06)*	Population Estimate *(non-calf)*	—	—	—	—	—	—	**Stable or increasing between 2009 and 2021**
	Total harvest	3	15	11	15	7	51	
	Quota	50	50	50	50	50	250	

[a] March 2019 I/MX/05 boundary changed and requirement for tag for subsistence harvest was removed.
N/A indicates that the total harvest for Banks Island (I/MX/02) was not available.

Muskoxen populations on Northwest Victoria Island increased from approximately 9,540 in 1980 to almost 20,000 in 1994 (CPCVI 1998). In the late 1990s, Muskox replaced caribou as the primary source of meat because of the scarcity of caribou and the close proximity and abundance of muskox to the community (Fawcett *et al.* 2018). The muskox harvest quota for Northwest Victoria Island (management unit I/MX/03) was set at 1,000 animals in 1993; harvestable year-round (GNWT 1993b). Between 2005 and 2016 there was a reported decrease in the number of muskoxen near Ulukhaktok. This was attributed to increased harvest pressure as the importance of muskoxen increased in both subsistence and economic importance (e.g. sport hunting, meat resale, and the sale of horns and cash incentives that were being offered for hides) (Fawcett *et al.* 2018). In addition, natural cycles amplified muskox population declines including increased predation by wolves, grizzlies, and grolar bears (grizzly–polar hybrid) (Fawcett *et al.* 2018). As a result, hunting muskoxen has become difficult and expensive and harvest success has decreased on Banks Island and Northwest Victoria Island (Table 4) (ENR 2011; ENR 2021: 14). In 2019/20 the population estimate of muskox on Banks Island was ~10,979 and between 2014/15 and 2019/20 the annual harvest quota was 10,000 animals. Between 2014/15 and 2019/20, the 6-year cumulative harvest rates for muskox

on Banks Island was 495 animals (ENR 2019: 14; ENR 2021: 14). Over this period, the highest annual harvest was 133 (2014/15) and lowest was 33 animals (2019/20) (ENR 2019: 14; ENR 2021: 14). Between 2014/15 and 2020/2021, the 7-year cumulative harvest rates for muskox on Northwest Victoria Island was 1,396 animals and the annual quota was 1,000 animals (ENR 2019: 14; ENR 2021: 14). Over this period, the highest harvest was 322 (2015/16) and lowest was 132 animals (2020/21) (ENR 2019: 14; ENR 2021: 14).

Weather and Climate

Climate change is considered to be one of the greatest threats to Peary caribou in both Inuvialuit knowledge and western science (Miller and Gunn 2003; Gunn 2008; CWS 2013; ECCC 2021). Riedlinger (2001a) describes many changing characteristics of weather and climate in the Arctic islands posing challenging to Peary caribou including severe weather events and receding sea-ice (see also: Urquhart 1973; CPCVI 1998; Nagy 1999b; CPCBI 2000; Taylor 2005). However, the effects of weather may be difficult to gauge because of compounding factors like natural population cycles, inter-species interactions, harvesting and predation (Riedlinger 2001a). To Riedlinger's question: "Do you think that those changes you are talking about - more rain and longer summers - do you think that has an impact on caribou and muskox?" Andy Carpenter replies that "It is hard to see that - because when changes start occurring here, well… the caribou population is down, and so how can you really tell?" (*in* Riedlinger 2001a)

The effects of weather and climate can be both positive and negative for caribou. Lena Wolki explains there is "Lots of bad weather in the summer now, but in the winter we have good weather" (*in* Riedlinger 2001a). Sachs Harbour harvesters hypothesized that "increased temperatures might have a positive impact on vegetation but might not be food that caribou eat/prefer as shrubs are expected to increase" (Government of Nunavut 2016). Sachs Harbour residents have reported "lots of moisture and rain last 10-15 years, [so there's] more lichen now" (WMAC-NWT 2021: 3). They are reporting an increase in lichen diversity and abundance, as well as other vegetation changes such as an increase in purple saxifrage (*Saxifraga oppositifolia*; known as "aupilatunguat" in Inuinnaqtun (Badringa 2010: 228)). They are also documenting taller willows (*Salix spp.* known as "naunruq" or "uqpik" (Badringa 2010: 228)) along river banks such as Big River, Sachs River, and Capron trail, with heights of up to four feet (WMAC-NWT 2021). However, while some seem to infer that an earlier green-up of vegetation on Banks Island is potentially beneficial to the forage available for caribou (Riedlinger 2001a; Berkes and Jolly 2001), it has also been suggested that an earlier onset of green-up can lead to a reduction in important nutrients for calves and a decrease in their rate of survival (Parks Canada 2010). Also, new species of mushrooms have been observed, some which may be poisonous to caribou or muskox (Government of Nunavut 2016).

Severe Weather Events

Residents of Sachs Harbour and Ulukhaktok have identified severe weather events as threats to Peary caribou populations in the NWT. Severe weather events affect the ability of Peary caribou to access forage (Larter and Nagy 1994). This can occur through harsh winters, during which deep hard snow cover forces animals to forage in more raised wind-blown areas where snow cover has been reduced (CPCVI 1998), or when rain falls on top of the snow, freezing it into a layer that is difficult to penetrate (Nagy 1999b).

Especially on Banks Island, Inuvialuit report significant effects from severe weather on Peary caribou. Frank Carpenter explains (*in* Nagy 1999b):

"[Regarding] caribou, sometimes [...] in the fall, we get freeze-up on the whole island. Then, before the snow is really deep, we get our mild weather and rain. Then it's cold enough for the rain to freeze on top the snow and that's when the caribou try to leave the island, even go out into the ocean. 'Cause they were eating mostly ice. We were still here when one year it happened. When dogs started seeing the caribou, they'd be running. Nothing wrong with them but they'd just stop and start kicking. They have too much water in their stomach, their heads are spinning. So a lot of big bulls died off by spring... there was even one year, that worst year that time, the cows didn't have any calves, they didn't. That hit them just before the rutting season."

Rains may be particularly harmful in the spring for newborn caribou (Peter Esau in Nagy 1999b). However, most freezing rains seem to occur in the autumn, which affects bulls and young calves most significantly (Riedlinger 2001a). Cows and young bulls have been described as comparatively more resilient (P. Esau in Riedlinger 2001a), although after one particularly bad episode of freezing rain just before the rutting season, the cows did not have any calves the following spring (Nagy 1999b).

In the interior of Banks Island, autumn rain is more prevalent when warm weather follows the first snowfalls (Lawrence Amos *in* Nagy 1999b). On Banks Island, freezing rain in the autumn has been associated with caribou remaining in the south longer the following spring before migrating north, and then also returning south later the next fall (Riedlinger 2001a). Freezing rains also cause Peary caribou to move off the island, out onto the sea-ice (F. Kudlak in Riedlinger 2001a). In Nunavut it has been speculated that freezing rain may also drive caribou to search for other islands, explaining carcasses found out on open ice (Taylor 2005).

Inuvialuit knowledge correlates severe winter weather with major population declines in Peary caribou as a result of starvation (SHHTC 2013; Johnson *et al.* 2016). Years when deep snow and freezing rain were reported to have severely reduced forage availability for wildlife on Banks Island include the winters of 1951-1954, 1971, and 1977-1978 (Urquhart 1973; CPCBI 2000; Riedlinger 2001a). In 1952, a harsh winter on Banks Island was associated with a large number of Peary caribou going southwards onto the sea-ice (CPCBI 2000; Riedlinger 2001a), some of

which later returned starving (Manning and Macpherson 1958). Regarding the winter of 1977-78, it is also recorded that while caribou were healthy through the fall, thirty were found later to have died of starvation (CPCBI 2000), and harvesters recall that it was mostly calves and mature bulls that died (Peter Esau and Andy Carpenter *in* SHCM 1998). During the winter of 1993-1994, freezing rain covered 50% of caribou range on Banks Island (Larter and Nagy 1994), and two orphaned calves found in poor condition led to concerns about a wider winter die-off. Several female calf caribou were then collected, but found to be in reasonably good condition (Larter and Nagy 1995), and despite a low cow-calf ratio, calf survival over the winter was high (CPCBI 2000: 9-11).

Observations indicate that severe or unseasonal weather events are becoming increasingly common on Banks Island. This is described in terms of changes in the frequency, timing, and severity of weather events (Riedlinger 2001a: 68). Such changes are most noticeable in the transitional seasons of autumn and spring. At both times, rainfalls have increased, rains fall for longer and more frequently (Riedlinger 2001a: 71). Autumn also features more storms and a faster freeze-up of sea-ice, while ice breaks up faster in spring (Riedlinger 2001a). Riedlinger (2001a) reports that most concerns about weather events as they relate to caribou are in terms of more freezing rains in the spring and fall.

In contrast to accounts from Banks Island, the CPCVI (1998) asserted that no die-offs of Peary caribou had occurred during severe winters from 1980-1993 on Northwest Victoria Island, and reported that although harvesters were aware of starvation of caribou on Banks Island, there was no Indigenous knowledge to indicate that die-offs occurred during unusual winters or that deaths occurred from starvation or malnutrition on Victoria Island (see also: Andy Carpenter and Morris Nigiyok *in* HCM 1998). However, some harvesters did note implications of weather events on Northwest Victoria Island. Observations from Nickolas Aloakyuk, Alex Banksland, and Jimmy Memogana attest that caribou disappear, move away, or starve when there have been freezing rains on the ground (*in* Elias 1993). One such event was reported in the mid-1960s. The *Olokhaktomiu*t Community Conservation Plan (OHTC *et al*. 2016) also records that a spring rain in the 1920s caused "extensive mortality".

On the mainland, Inuvialuit communities have observed more freezing rain in the winter (Inuvik and Paulatuk as referenced *in* GNWT 2014). However, there seems to be general consensus among communities that icing events have become less frequent in the 2010s compared to the past (Table 5; CWS 2015). Local communities have also reported increases in the frequency, magnitude and duration of high winds, particularly in autumn and winter (Nichols *et al.* 2004; CWS 2015).

Warmer summers are magnifying the prevalence and impacts of flies and mosquitoes on caribou. However, climate change may also result in more wind, which is said to make it easier for caribou to cope with mosquitoes in the summer (Riedlinger 2001a). Community led studies

and monitoring programs are being conducted to inventory, identify and document insect diversity in the ISR (Heron *et al.* 2018). Sachs Harbour, Ulukhaktok and Cambridge Bay are observing new types of insects and are concerned about the effects of parasites and diseases (Government of Nunavut 2016). Sachs Harbour residents linked the interactions between muskox and migratory birds, referencing the "big die-off of muskox recently" (Government of Nunavut 2016: 6) with parasites and diseases confirmed in other woodland and barren-ground caribou (Government of Nunavut 2016).

Table 5. Summary of icing events reported through community information and the scientific literature and associated impact on Peary caribou for Banks and Northwest Victoria Islands (reproduced from Johnson *et al.* 2016 with permissions).

Year	Icing event	Peary caribou population event
Banks Island		
1951-52		Many Banks Island Caribou died from starvation during latter part of December and January, trappers reported caribou did not breed during the rut, very few calves seen in spring 1952[1]
1952-53		Large numbers of dead caribou found in January; no calves spring 1954[1]
1954-55		Trappers reported caribou dying over the winter; dead, weak, emaciated animals found during January and February; low calf crop predicted based on low pregnancy rate of hunter-killed caribou[1]
1969-70		Large number of carcasses on Banks Island in June 1970; based on count, estimate 1000-2000 or 9-18% mortality during previous winter[1]
1971-72		February 1971, Sachs Harbour trappers reported dead caribou (mostly bulls and calves); in November 1970
		trappers reported caribou on the sea ice and many dead caribou, mostly calves and bulls, on the land.[6] Urquhart (1973) reported unusually heavy snowfall in mid-October 1970, estimated 1,000-2,000 caribou died in winter 1970-71.[6]
1977-78	Freezing rain in November 1977 covered forage with up to 5 mm of ice[1]	Trappers report widespread mortality; many carcasses in February/March[1]
1978		Population-wide effect of the freezing rain and icing in 1978 is unknown[6]
1983-84	Localized icing conditions along northwest coast of Victoria island and parts of Banks Island[1]	Caribou carcasses found in April 1984 along Victoria Island coast; some Banks island caribou in poor condition[1]
1987-91	Freezing rains in winters of 1987–88, 1988–89, and 1990–91[6]	60-300 caribou deaths recorded annually[6]
1993-94	October/ November freezing rain covering about 50% of caribou winter range.[2] Inuvialuit hunters reported freezing rains during October 1993[4]	Productivity was reduced, as the calf:100 cow ratio was 24:100 in 1994 compared to the 1992-2006 mean of 52 calves:100 cows, however, overwinter survival of calves for winter 1993-94 was high[6]
2003	October icing event led to ground fast ice;[6] Inuvialuit hunters reported freezing rains during October 2003[4] Winter icing event 2003-04[3]	No die-off associated with icing event for caribou, but high muskox mortality[5] Rain on snow (October 2003) led to ground fast ice, and was followed by lower calf productivity in 2004[6]
Northwest Victoria Island		
1980-93		No die-offs of Peary caribou occurred during severe winters from 1980-93 on NWV[6]; because Victoria is such a large island, Peary caribou have no problem finding ice-free vegetation[7]
2002-03 2003-04	Icing events in winters 2002-03 and 2003-04[3]	2001-2005 - declining caribou numbers over this period likely the result of cumulative impact of the icing events[3]

1.McLean 1992; 2. Nagy et al. 2013; 3. Nagy et al. 2009; 4. Gunn et al. 2006; 5. Nagy and Gunn 2009; 6. SARC 2012; 7. Gunn 2005.

Receding Sea Ice

Riedlinger (2001a) documents Sachs Harbour residents' concerns about more treacherous ice conditions. Residents report less sea-ice (annual and multi-year), fewer ice floes, less landfast ice, and more open water in winter and spring (Riedlinger 2001a). Residents link these conditions to warmer weather in winter, and to changes in wind direction, strength and frequency (Riedlinger 2001a). F. Kudlak explains (*in* Riedlinger 2001a: 57):

"Long ago there was always ice all summer. You would see icebergs all summer… ice moving back and forth this time of year. Now no ice. Should be icebergs. You used to be able to see that old ice from the West side to Sachs. No more. Now between Victoria Island and Banks Island there is open water. Shouldn't be that way."

Kitikmeot communities have also reported ice-free conditions in areas which normally had ice in the past, including north of King William Island, and around Prince of Wales Island and the Boothia Peninsula (CWS 2013; Johnson *et al.* 2016). During community consultations in 2016, some Kitikmeot communities spoke about the "need for caribou to migrate between islands or to access large areas of landscape (to mate, give birth, feed, and escape bad weather conditions), and expend effort navigating for crossing locations or sometimes die trying to cross between islands if the ice is too thin or there is no ice for them to get across" (Government of Nunavut 2016).

While residents do not explicitly connect such sea-ice conditions to the health of Peary caribou, less secure sea-ice would likely inhibit caribou to some degree from moving between islands. F. Kudlak also notes that after an autumn rain caribou "even go to open water, try to go someplaces. Must be hungry, starving I guess" (*in* Riedlinger 2001a: 72). Therefore, caribou may be less able to cope with severe weather events when sea-ice conditions are less robust.

Predation by Wolves

Harvesters have cited predation by wolves as a significant factor in caribou declines, particularly on Banks Island. On Northwest Victoria Island, hunters report that wolves feed primarily on caribou. Wolf populations have fluctuated over the years and were reported to be increasing on both Banks Island and Northwest Victoria Island in the 1990s.

Around 1954, Morris Nigiyok and Peter Esau observed many wolves on Banks Island, before a poisoning program reduced their numbers drastically (*in* Nagy 1999b: 92, 156). The poisoning program on Banks (from 1955 to 1959) was part of a larger effort across much of the Northwest Territories (from 1951 to 1961), which ended when it was deemed that wolf 'control' had been achieved (Kelsall 1968; Heard 1984). Peter Esau links the decline of wolves with the growth of the muskox population on Banks Island. After the control program ended wolves began to recover on Banks during the 1980s and 1990s (Haogak, Carpenter, and Esau *in* NWT Peary

Caribou Technical Committee 2004). Hunters like Sam Olikoak observe that such an abundance of wolves has an effect on the caribou. "Lots of them would get together and kill a caribou and eat it. That's why the caribou are depleting" (*in* Nagy 1999b). The CPCBI (2000) agrees that predation by wolves is implicated in a caribou decline between July 1994 and July 1998. It further specifies hunter reports of significant wastage of caribou and muskox meat by wolves, and that wolf numbers were increasing in the 1990s.

Increasing wolf populations impact caribou especially when caribou numbers are low or declining (Riedlinger 2001a). Peter Esau and Larry Carpenter considered wolf predation near caribou calving grounds in the north of Banks Island to be a particularly serious risk (*in* SHCM 1998). The inter-relationships between wolves, muskoxen, and Peary caribou are clearly complex on Banks Island, as wolves are also noted as preying mostly on muskoxen (Larry Carpenter *in* SHCM 1998; Riedlinger 2001a; SHHTC 2013; Paulatuk HTC 2013; Johnson *et al.* 2016). Some communities believe Peary caribou are preferred over muskox because Peary caribou do not form defensive circles as muskoxen do and therefore are easier prey (CWS 2013).

Wolf predation also occurs on Northwest Victoria Island, and hunters reported in 1990 that wolves feed primarily on caribou as opposed to muskoxen (John Kuneyuna, David Kuptana, Allen Joss, Roy Inuktalik, Alex Banksland, George Okheena, Patsy Ekpakohak, and John Alikamik *in* Adjun 1990). Nevertheless, harvesters did not describe wolf predation as contributing significantly to Peary caribou declines on Northwest Victoria Island. One hunter (Morris Nigiyok) interviewed in 1993 asserted that it was not a significant factor, while none of the other Ulukhaktok hunters interviewed mentioned wolves as influencing caribou populations on Northwest Victoria Island (*in* Elias 1993).

Wolf populations on Northwest Victoria Island were high in the 1930s and 1940s (CSH *et al.* 2008), and again in the 1980s and 1990s (CPCVI 1998). Specifically, hunters reported higher wolf populations in December 1990 relative to 10-20 years before (John Kuneyuna, David Kuptana, Allen Joss, Alex Banksland, George Okheena, Patsy Ekpakohak *in* Adjun 1990). More recently, there has been an increase in the presence of wolves, near the community and further inland, increasing predation pressure on muskox (Fawcett *et al.* 2018). As a result, the "season has opened year-round for [wolf] harvesting" (OHTC *et al.* 2016: 105). Ulukhaktok has raised concerns about "industries and exploration activities pushing wolves and other predators north" (Government of Nunavut 2016: 6).

Between 2014/15 and 2018/19, a 5-year cumulative total of wolf samples and hides submitted by subsistence harvesters (as a proxy for individual animals harvested) were 57 from Sachs Harbour and 149 from Ulukhaktok (ENR 2019: 16).

Paulatuk, Ulukhaktok, Sachs Harbour (public only, not the SHHTC) have expressed concerns about the high and increasing number of predators – mainly wolves – on Peary caribou (Government of Nunavut 2016; CWS 2015). In many communities wolves are considered a problem for caribou and they are hunted to minimize the effect of predation on Peary caribou (SHHTC 2013; Paulatuk HTC 2013; OHTC 2013). In addition to wolf number, some communities are seeing changes to wolf pack structure. Cambridge Bay noted that wolf packs were getting bigger, and the wolves were healthy and brave (Government of Nunavut 2016). However, in Sachs Harbour (where caribou numbers were noted to be increasing) wolves were observed to be "thin and packs getting smaller." (Government of Nunavut 2016: 6)

On the other hand, many Elders and communities interviewed across the Inuvialuit and Kitikmeot range believe that wolves are a part of the natural system and are not responsible for the major declines in Peary caribou and may have positive effects on population fitness (Taylor 2005; SHHTC 2013; Resolute Bay HTO 2013; Iviq HTA 2013; Spence Bay HTO 2013; Taylor 2005).

Although the CPCVI (1998) referred to wolf predation as a potential cause of caribou decline, it cites a lack of information regarding the seasonal diets of wolves in the area and the effect of wolf predation on the caribou population.

Industrial Development

Community Conservation Plans are community-based planning documents that are intended to provide guidance on conservation and resource management, however, these plans are not legally binding (OHTC *et al.* 2016; SHHTC *et al.* 2016). The Olokhaktomiut and Sachs Harbour Community Conservation Plans (OHTC *et al.* 2016; SHHTC *et al.* 2016) record community concerns regarding development in sensitive caribou habitat. In a formalization of 'Community Values', for instance, conservation is listed first; "All uses of the land in the Planning Area, including renewable and non-renewable resource development, must recognize conservation of the renewable resource base as the foremost priority" (OHTC *et al.* 2016: 21; SHHTC *et al.* 2016: 17). An incremental scale of land designations also reflects concern regarding development, exemplified by the most stringent classification (Category E) which specifies "Lands and waters where cultural or renewable resources are of extreme significance and sensitivity. There shall be no development on these areas" (OHTC *et al.* 2016: 23; SHHTC *et al.* 2016: 17). Despite this, during community consultations in Sachs Harbour, residents "gave an example where calving areas were identified by the community as conservation areas where the company should not go, but the company did work there anyways" (Government of Nunavut 2016).

Many areas of potential development identified in these plans pertain to the offshore oil industry, and thus Peary caribou are seldom specified as being potentially impacted by such

developments. However, the premise is clear that development presents a threat to wildlife more broadly.

These concerns are not new and past exploration and mining activities coincided with declining caribou populations, starting the 1970s (ECCC 2021). Testimonies against oil exploration were made in the 1970s to the Berger Inquiry (i.e., Jimmy Memoganak, Paul Pagotak, Simon Kataoyak, Isaac Aleekuk, Roy Goose, Bill Goose, Annie Goose [*in* Berger 1976a], Peter Esau, William Kuptana, Fred Carpenter, David Nasogaluak, Noah Elias, Andy Carpenter [*in* Berger 1976a,b]). William Kuptana, for instance, warns "if this exploration goes on and there happens to be some accident of some sort, the animals will die", while Noah Elias describes finding a caribou ensnared in wire left by seismic crews (*in* Berger 1976b: 4044, 4065). Andy Carpenter also explains that exploration should not happen in the spring and summer when the animals are looking after their young (*in* Berger 1976b: 4097). A 1973 report on oil exploration and Banks Island wildlife was also specifically motivated by the trappers on Banks Island expressing their concern that oil exploration would threaten their livelihood (although the report concluded that Inuvialuit in the area had not seen noticeable effects of oil exploration activities on the availability of caribou by the end of the study) (Urquhart 1973).

Communities have raised concerns regarding the disruption of migration routes and direct habitat loss associated with resource extraction activities (Figure 20). Johnson *et al.* (2016: 107) identifies resource extraction activities of particular current concern in critical areas such as calving grounds on Banks Island (SARC 2012; SHHTC 2013). As of 2021, there are no active prospecting permits/licences or oil/gas/coal developments in the ISR except for one south of Paulatuk (Nathoo pers. comm. 2021). However, the demand for minerals could increase in the future, and combined with increased accessibility, resource extraction may become a threat to Peary caribou (ECCC 2021).

Proposed coal mining near high density areas of Peary caribou on Axel Heiberg Island and the Fosheim Peninsula are also of concern (CWS 2013; Iviq HTA 2013). Specific concerns from communities include stress on caribou from low-flying helicopters performing geological surveys and increasing interest in coal exploration driven by demand from Asian markets (Gau *in* SARC 2012: 46).

Along the NWT-Nunavut border in the Sabine Peninsula on Melville Island is a petroleum resource deposit that has been identified as a concern by communities regarding consultation and impact on wildlife (Community of Ulukhaktok *et al.* 2008: 34; OHTC *et al.* 2016). Although, there has not been any recent activity or plans for the proposed Melville Island gas pipeline, there is still potential for this site to generate interest (Harlow pers. comm. 2022). The Ulukhaktok Community Working Group is concerned that future oil and gas activity or development on Melville Island will have a negative impact on wildlife habitat (OHTC *et al.* 2016).

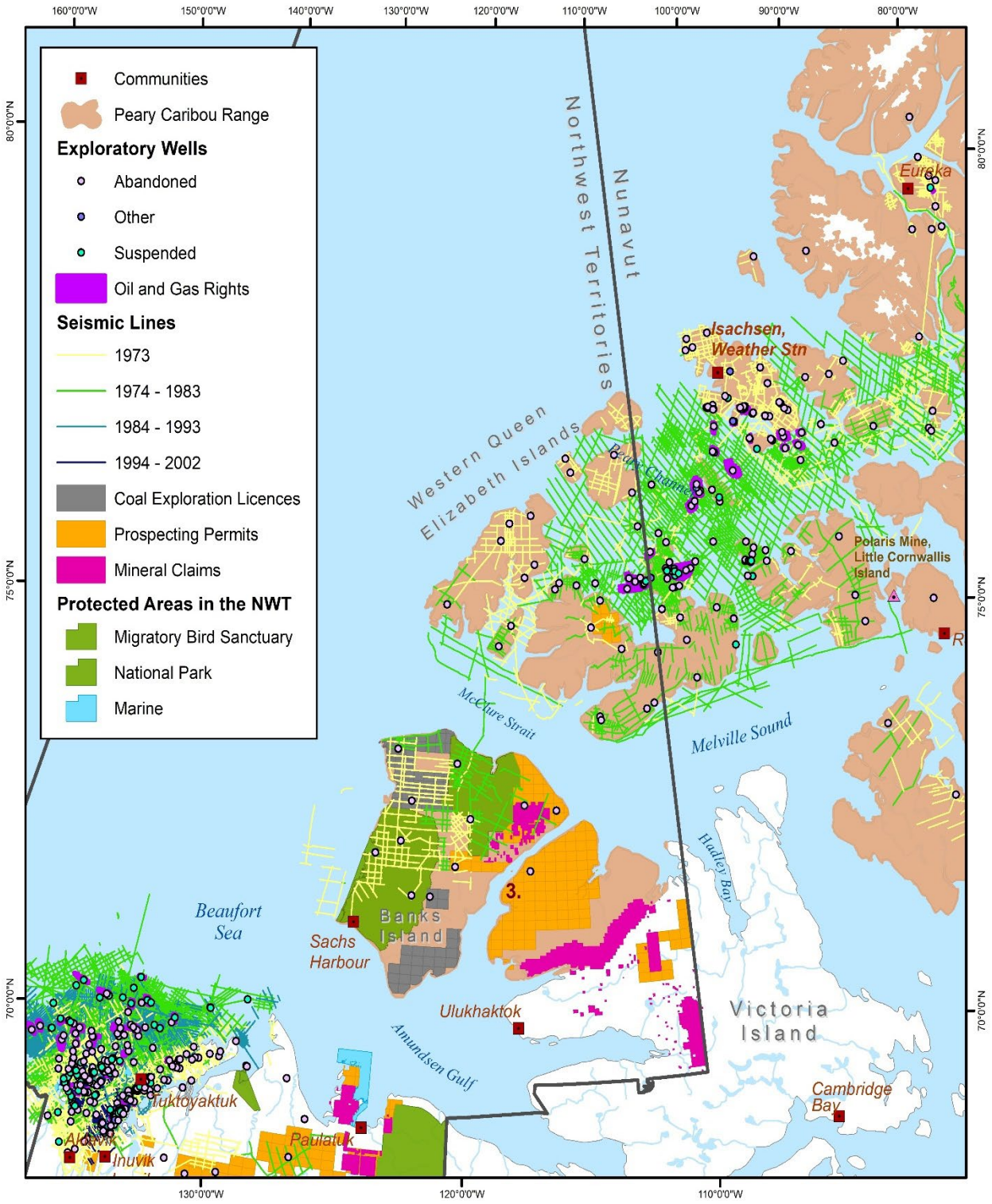

Figure 20. Map of current and historical resource development operations, permits, and claims as of 2022 (data provided by the Department of Industry, Tourism and Investment [ITI] and the National Energy Board [NEB]). Note that all "historical development" permits, licenses, and claims relating to coal, prospecting, and mineral claims have expired. Map courtesy B. Fournier, ENR.

Communities have identified other direct negative impacts of industrial activities on Peary caribou, which may cause the caribou to move away from seismic sites. These include consumption of vegetation from contaminated sites, and sensory disturbance from the noise and smell of explosions used for seismic exploration or mining (Taylor 2005; SHHTC 2013 CWS 2013; Johnson et. al 2016; ECCC 2021). Avoidance behaviour due to sensory disturbance from exploration, seismic activity and low-level flying and land vehicles could negatively affect habitats and body condition. Peary caribou flee and generally move away from industrial disturbances including seismic explosions, mineral exploration and resource extraction sites (Taylor 2005; CWS 2013; Johnson *et al.* 2016; SHHTC *et al.* 2016).

Noise was the main concern among the communities related to increasing intensity and frequency of flyovers by helicopters and planes, as well as the seasonal timing of flights (calving season, hunting season-for subsistence) and minimum height above ground. One community noted that even if flight guidelines are given to the industry/pilot, best management practices are not always being followed (Government of Nunavut 2016). Communities also expressed concerns about sensory disturbance associated with military exercises during critical life stages for Peary caribou (Government of Nunavut 2016).

In Nunavut, fluctuations in Peary caribou and muskoxen distributions were attributed by local hunters in part to petroleum exploration (Taylor 2005). In particular, more numerous ground vehicles, aircraft, and dust from seismic activities (especially on Bathurst Island) were reported to have detrimentally affected wildlife (Taylor 2005; Simon Idlout *in* Nunavut Tusaavut Inc. 1997: 26). Concerns are evident regarding the potential effects of noise, dust, and pollution from further exploration (Ludy Pudlu and Herodier Kallak *in* Nunavut Tusaavut Inc. 1997: 51, 56). Johnson *et al.* (2016: 107) documented that Nunavut communities have indicated that "mineral exploration and mining development may have caused population declines on Prince of Wales, Somerset and Bathurst Islands and localized disturbance to Peary caribou near the Polaris Mine on Little Cornwallis Island (Grise Fiord Peary Caribou Workshop 1997; Spence Bay HTO 2013)". Resource extraction activities can cause habitat loss for Peary caribou, and it is possible that the functional loss of habitat may cause Peary caribou to abandon ranges or movement routes in order to avoid resource extractions activities (Iviq HTO 2013 *in* ECCC 2021).

Shipping Traffic

Increased future shipping traffic is identified as a major threat for Peary caribou with particular concern over increased shipping in the Northwest Passage between Banks and Victoria Islands and the mainland (SHHTC 2013; Paulatuk HTC 2013, in Johnson *et al.* 2016: 108) (Figure 21). "More ships of different types (cargo, cruise ship, sailboat, coast guard, etc.) are going through

the ocean, opening the water longer than it normally would be" (Government of Nunavut 2016).

The Ulukhaktok and Sachs Harbour Community Working Groups are concerned that Prince of Wales Strait, which is part of the Northwest Passage, could be used for year-round shipping by domestic and foreign ships and tankers and "have concerns about Canada's ability to prevent foreign tankers from using the Passage" (SHHTC *et al.* 2016: 58). The working groups also expressed concern over marine traffic through Emangyok Sound negatively impacting wildlife and traditional use in the area. Specific concerns relate to the impact of ship noise and the potential for spills or contamination if tanker traffic is allowed" (SHHTC *et al.* 2016: 55). Open water shipping channels would also be dangerous to Inuit travelling on the ice (SHHTC *et al.* 2016).

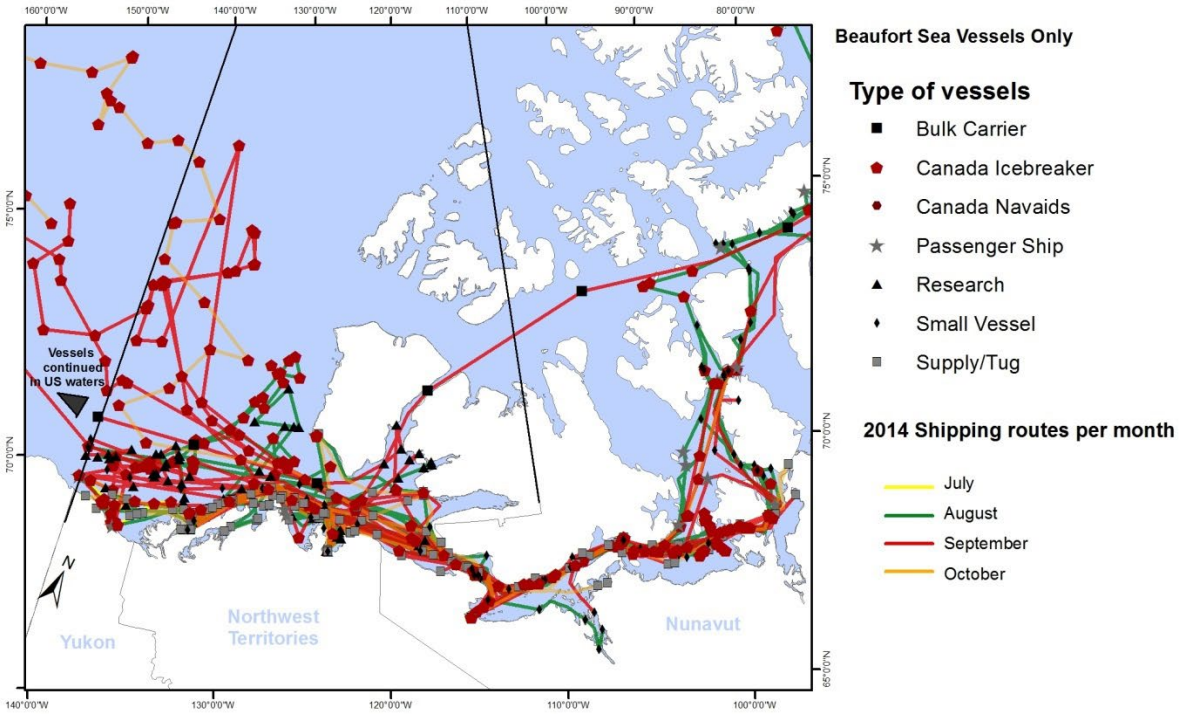

Figure 21. Vessel transit through the Beaufort Sea by type of ship and month from ENR 2022. Data derived from NORDREG 2015.

Communities have stressed the importance of identifying the Peary caribou migration routes and working with other governments and management authorities to mitigate shipping impacts (Government of Nunavut 2016). One Community Working Group recommended "that no winter ship traffic be allowed through the Prince of Wales Strait (November to June inclusive)" (CSH *et al.* 2008: 57).

Other Threats

Human disturbances other than industrial development are also indicated as threats to Peary caribou. This includes military exercises or the possibility of increasing tourism, which is noted as a risk to some habitats such as calving areas (CSH *et al.* 2016; ECCC 2021). Inuvialuit communities have also expressed a strong concern regarding the handling and collaring of Peary caribou for scientific research which may contribute to unnecessary stress and harm to the animal and has "a metaphysical impact on their well-being" (Johnson *et al.* 2016: 109; ECCC 2021). In the NWT, Peary caribou in the ISR have not been collared since 2003, however community projects in the near future are looking at collaring Peary caribou to resolve data gaps and to update information on movements (Davison pers. comm. 2022).

Disease is not reported as a factor in Peary caribou declines, and very few indications of abnormal diseases were found in the sources reviewed here. Andy Carpenter did report that hunters were finding frequent tapeworm cysts in caribou in the 1980s, but the tapeworms appeared to die off after a few years (SHCM 1998). The CPCVI (1998), the CPCBI (2000), and Gunn (2005) all specifically affirm an absence of serious diseases in Peary caribou populations in the NWT. Communities have also expressed concerns that interactions with migratory birds could increases parasite and diseases in Peary caribou (OTHC 2016; SHHTC 2016; ECCC 2021).

Harvesters reported caribou drowning while crossing between islands in the 1950s, and some suspect such events to be a cause of the decline in caribou (William Kagyut in Elias 1993; Kassam 2009). Harvester reports indicate that recent declines have not been accompanied by observations of carcasses on the landscape (SHCM 1998); this could imply that caribou either relocated or drowned. Changing weather patterns causing Peary caribou to move onto sea-ice and less stable ice between islands may lead to further drowning events similar to past observations (William Kagyut *in* Elias 1993; Kassam 2009).

The risk from current and emerging airborne contaminants (including smoke and dust from forest fires in the NWT or surrounding areas) and contaminated sites to the health of Peary caribou has also been identified by communities as a priority for further investigation and monitoring (CWS 2013; 2015; Government of Government of Nunavut 2016; Johnson *et al.* 2016: 19).

POSITIVE INFLUENCES

Indigenous and community knowledge sources indicate that several factors may have a positive influence on Peary caribou populations in the NWT. These include reduced hunting pressure on Peary caribou, some hunting pressure on muskox populations (particularly on Banks Island), proactive conservation and marine management initiatives, and some aspects of climate change. Community-based health monitoring through mandatory harvest sample

submission provides information to help monitoring population health including body condition, diet, sex and age of harvested Peary caribou in the NWT (ECCC 2021).

Community conservation plans are prepared and updated regularly for all six ISR communities. These plans identify important areas for Peary caribou and designate the highest degree of protection to calving areas, they also identify community uses and conservation objectives to inform future decision making (SHHTC *et al.* 2016; ECCC 2021).

Additionally, Peary caribou are currently listed as Endangered in Canada under the Federal *Species at Risk Act* (SARA) (www.sararegistry.gc.ca) based on the Committee on the Status of Endangered Species in Canada's (COSEWIC) 2004 species assessment. This process raised the profile of the Peary caribou, and has prompted engagement of wildlife managers in the ISR and collaboration with the communities of Sachs Harbour and Ulukhaktok to better understand the circumstances behind the Peary caribou decline and identify strategies to facilitate their recovery (Gau *in* SARC 2012: 47). In November 2015, Peary caribou was re-assessed as Threatened by COSEWIC. A proposed national Recovery Strategy for Peary Caribou in Canada was posted in 2021 will be adopted under both the Federal and Territorial Species at Risk Acts when finalized (ECCC 2021).

In addition, the *Inuvialuit Settlement Region – Cruise Ship Management Plan 2022-2025* proactively sets standards to manages cruise ships in a way that respects Inuvialuit lands, water and people (Inuvialuit Regional Corporation 2022). The Cruise Ship Management Plan welcomes visitors to the ISR from July through September to avoid travel when sea ice is crucial for caribou migration/movement and for harvester safety (Inuvialuit Regional Corporation 2022).

Reduced Hunting Pressure

Interestingly, an RCMP report from 1933 indicates that certain areas on Victoria Island were not hunted for several generations in the late 19th century due to local taboos (in Condon 1996).[13] As described in *Past Overharvesting*, Peary caribou harvesting in the NWT is managed at very low levels. The OHTC in 1993 restricted Peary caribou hunting north of Kuukyuak/Kuujjua River. Gunn (2008) reports that restrictions on harvesting did lead to increases in Peary caribou numbers on Banks Island and Northwest Victoria Island before 2003-04. In 2015 on Northwest Victoria Island a Peary caribou quota (n=10) was implemented with mandatory sample submission and target of a male dominated harvest (OHTC *et al.* 2016). The goal of the

[13] "Apparently, there is a taboo on the northeast part of Victoria Land. The story is to the effect that a very long time ago, there were large herds of caribou and plenty of Eskimos in this part of the country. The different tribes fought battles amongst themselves and since then the natives will not go into this section of the country. This is all supposed to have happened when the present generation of men were small boys. It is quite possible that there may still be large herds of caribou there yet, as the country is well suited and wonderful feeding grounds." (RCMP Patrol Report 1933 in Condon 1996: 118)

*Olokhaktomiu*t Community Conservation Plan is to support a Peary caribou harvest on a "sustainable basis, and in manner consistent with recommendations of the OHTC" (OHTC *et al.* 2016: 98). The OHTC has committed to implement restrictions on caribou hunting where required and to develop management plans for Peary, Dolphin and Union caribou (OHTC *et al.* 2016).

Since 1990, Peary caribou have been under quota on Banks Island. The annual quota for Banks Island between 2010 to 2019 was 72 caribou from Banks Island and the WQEI combined (Table 1; ENR 2011). Tags are issued by the Sachs Harbour Hunters and Trappers Committee with mandatory sample submission targeting a male dominated harvest.

The Sachs Harbour Community Conservation Plan (SHHTC *et al.* 2016) lists the following conservation measures for Peary caribou):

- Do not shoot cows or calves;
- Share your hunt and use all parts;
- Do not harvest more than quota;
- Maintain current quota (72, male dominated) until population goals reached;
- Selectively harvest muskox from important caribou wintering areas;
- If caribou numbers continue to decline, do not hunt them at all;
- Until population reaches 5,500 animals, harvest should be managed to allow caribou population growth;
- Continue to harvest wolves as normal; the Community does not support systematic wolf control or elimination;
- Continue regular population censuses;
- Identify and protect important habitats from disruptive land uses.

Management of Muskox and Wolf Populations

Nagy (2004:96) includes many statements of harvesters in Sachs Harbour suggesting a need to rigorously control muskox populations on Banks Island. There may be precedence for deliberate control of muskox populations by Inuvialuit hunters:

"Michael Amos recalled that Susie Tiktalik often said that three years after people killed off the muskox, the caribou started coming back: 'they never saw any more muskox, they cleaned them right out that time. The muskox, they had been killing them all that time because there was going to be no more caribou' (MA: Aulavik-78A:3). Sarah Kuptana also heard from her husband William Kuptana that 'long ago they finished the muskox by doing that. The Qangmalit [eastern Arctic people] would surround big herds and kill them. Then, there was no more muskox, but the herds grew again."

As of 2021, the muskox harvest quotas for Western Queen Victoria Islands, Banks Island and Northwest Victoria Island are undergoing review collaboratively with ENR, WMAC (NWT), IGC and the local hunters and trappers' committees (Gau pers. comm. 2022). The intention is that Inuvialuit harvesters in the ISR will not have a quota for subsistence use except for the quota on Northwest Victoria Island of 300 Muskoxen for subsistence use and further allocations by the local HTC (Gau pers. comm. 2022).

According to wildlife management legislation, wolves can be hunted by Inuvialuit on Banks, Northwest Victoria, and the Queen Elizabeth Islands (areas I/WF 01, 02, 03, and 04) from August 15 to May 31 (GNWT 1993a). The Sachs Harbour Community Conservation Plan (SHHTC *et al.* 2016) recommends continuing "to harvest wolves as normal; the Community does not support systematic wolf control or elimination." Recently, the incentive to harvest wolf on Victoria Island has doubled from $300 to $600 per animal to address predation pressure on the Dolphin and Union caribou (Nathoo pers. comm. 2021).

A management plan for Grizzly Bear in the Inuvialuit Settlement Region will be updated in 2021 and includes measures to address the impact of this new predator on Victoria and Banks Island (Nathoo pers. comm. 2021).

Conservation of Habitat

Community-based planning documents called Community Conservation Plans have been created under the objectives of the 1988 Inuvialuit Renewable Resource Conservation and Management Plan to help ensure the conservation of Peary caribou and other species' habitat. Conservation priorities for local wildlife have been formalized in these plans (CSH *et al.* 1992; 2000; 2008; SHHTC *et al.* 2013; 2016; OHTC *et al.* 2013; 2016). The 2016 versions recommend that "all uses of the land in the Planning Area, including renewable and non-renewable resource development, must recognize conservation of the renewable resource base as the foremost priority. This applies to uses of the land by the community and by other interests" (SHHTC *et al.* 2016: 17). This indicates community resolve for responsibly managing the local landscape with a long-term view. Specific conservation measures in 2016 included recommendations that harvesters "identify and protect important habitats from disruptive land uses" (SHHTC *et al.* 2016: 72). Additionally, Aulavik National Park has been established on northern Banks Island, protecting 12,000 km^2 of the island from development (Government of Canada 1992).

Proposals for development projects within the range of Peary caribou may be screened by the Inuvialuit Land Administration (ILA), Environmental Impact and Screening Committee (EISC), and reviewed by the Sachs Harbour and Olokhaktomiut Hunters and Trappers Committees and any co-management partners and other interested parties as part of the EISC public commenting period (Nathoo pers. comm. 2021). The ILA normally requires the approval of the

HTCs before approving project proposals and permits, and also can attach conditions on the projects to ensure that land and resources are not harmed (SHHTC *et al.* 2016).

Aspects of Climate Change

Some of the effects of climate change may benefit Peary caribou. Warmer summers and more rain mean more vegetation, which is good for animals (Berkes and Jolly 2001), and warmer winters are also better for caribou and muskoxen (Riedlinger 2001a) (presumably because they require less energy and fat reserves to survive). Peter Esau reports that when there is 'good weather' in the spring, caribou numbers can 'increase very fast' (in Nagy 1999b).[14] Riedlinger (2001a: 82) summarizes several local observations on this topic:

"Vegetation has increased on the [Banks] Island as a result of warmer temperatures and increased rain. This is evidenced by the fact that muskox are staying in one place longer. This increase in vegetation is most noticeable in the flats and along the rivers. There is more moss around. This will be good for the caribou. Vegetation is increasing despite the high muskox numbers."

Another effect of climate change is reported to be more wind, which is said to make it easier for caribou to cope with mosquitoes in the summer (Riedlinger 2001a).

[14] "...in the fall time, spring time, when the weather is not good, the ones that are born, they just freeze when the weather is not good. When it's bad weather in the spring time, they don't really increase. And then when it's good weather, they could increase very fast all right." (P. Esau in Nagy 1999b: 164)

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Dan Slavik (M.Sc, P. Biol) is a graduate of the combined Environmental Conservation Sciences and Native Studies (B.Sc./B.A) degree at the University of Alberta. In 2013, he completed his M.Sc. degree in Environmental Sociology in the Dept. of Rural Economy at the University of Alberta, with a thesis that explored Inuvialuit knowledge and indicators of polar bear population health. With strong, interdisciplinary training in the social and natural sciences, his research and work experience has developed his expertise in Indigenous knowledge studies and land-use mapping. From 2012 to 2015, he led the Beaufort Sea program for an international environmental non-governmental organization and contributed to fieldwork and conservation programs in Alaska, Yukon, and the NWT. These experiences have given him a good working knowledge of the history, geography, and ecology of the region, as well as an understanding of local environmental processes, community concerns, and co-management initiatives.

He currently works for Golder Associates Ltd. as the Senior Traditional Studies and Indigenous Relations Specialist for the Prairies and Northern region.

SCIENTIFIC KNOWLEDGE COMPONENT

ABOUT THE SPECIES

Names and classification

Scientific Name:	*Rangifer tarandus pearyi* J.A. Allen 1902
Common Name (English):	Peary caribou
Common Name (French):	Caribou de Peary
Inuvialuktun	Tuktu
Inuinnaqtun	Tuktuinak
Siglitun	Tuktuaraaluit
Ummarmiutun	Tuttunguluurat
Populations/subpopulations:	1. Western Queen Elizabeth Islands (Melville, Prince Patrick, Eglinton, Emerald, Borden, Mackenzie King, Brock) 2. Banks Island/Northwest Victoria Island (Minto Inlet)
Synonyms:	Caribou
Class:	Mammalia
Order:	Artiodactyla
Family:	Cervidae (deer)
Life Form:	Animal, vertebrate, mammal, deer, caribou

Peary caribou (*Rangifer tarandus pearyi*) (Wilson and Reeder 2005) are a small distinctive form of caribou found on the Canadian Arctic Islands.

Systematic/Taxonomic/Naming Clarifications

The current taxonomy (Manning 1960; Banfield 1961; Wilson and Reeder 2005) identifies Peary caribou as a subspecies of caribou . The Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2011) assigned Peary caribou to their own Designatable Unit (DU), defined as a "discrete and evolutionarily significant unit of a taxonomic species" (COSEWIC 2013).

In terms of evolutionary history, Peary caribou belong to the Beringian-Eurasian Lineage, along with barren-ground and Dolphin and Union caribou (COSEWIC 2011; Taylor *et al.* 2020). Peary caribou may have diverged from Beringian-evolved caribou ~96,000-185,000 years ago,

and may have occupied potential refugia in the High Arctic and on Banks Island during the last ice age (Eger *et al.* 2009; Klütsch *et al.* 2017).

Peary caribou are genetically distinct from barren-ground caribou and Dolphin and Union caribou (McFarlane *et al.* 2014; Jenkins *et al.* 2018). Further, Peary caribou on the high Arctic Islands (e.g. WQEI) are genetically distinct from and genetically less diverse than Peary caribou on the low Arctic Islands (e.g. Banks, Victoria) (McFarlane *et al.* 2014; Klütsch *et al.* 2017; Jenkins *et al.* 2018). Genetic diversity for Peary caribou is positively related to unglaciated island size and negatively related to distance from the mainland (Jenkins *et al.* 2018). Higher inbreeding coefficients for Peary caribou suggest a recent bottleneck in the population (Taylor *et al.* 2020). Peary caribou on Banks Island and northwest Victoria Island are admixed, indicating an intergradation between Peary caribou and barren-ground caribou (McFarlane *et al.* 2014; Klütsch *et al.* 2017). Estimates of gene flow imply a southward trend of caribou movement from the High Arctic Islands, which suggests that Peary caribou in the southern portion of their range may not disperse northward into high Arctic Islands (McFarlane *et al.* 2014).

Description

Peary caribou are highly recognizable and can be easily distinguished from both barren-ground (mainland) and Dolphin and Union caribou. Peary caribou are small in stature, standing about 1 meter at the shoulder (Thomas *et al.* 1976, 1977), and have noticeably short legs and faces. The distinctive winter coat is white with pale brown on the back in early winter. In summer, the coat is slate above and does not have the pronounced flank stripe typical of barren-ground caribou (Figure 22). The belly is white and the legs are white except for a narrow frontal stripe. The pale gray antler velvet is a striking distinguishing characteristic of Peary caribou and Dolphin and Union caribou compared to the brown velvet of barren-ground, boreal or northern mountain caribou. Caribou are unique within the deer family in that both males and females grow antlers.

On the basis of skull size and shape, Manning (1960) found a stepped gradient from north to south with the smallest caribou in the Queen Elizabeth Islands through Banks Island to the Dolphin and Union caribou of Victoria Island, to mainland barren-ground caribou.

Figure 22. Peary caribou in summer pelage on Banks Island (photo A. Gunn, ENR).

Life Cycle and Reproduction

Peary caribou bulls typically mate with more than one cow; however, it is unknown whether a bull defends a harem or if or how the breeding strategy changes after caribou abundance declines. The rut occurs in late September to mid-October in the WQEI, and late October to early November in the Banks/Northwest Victoria Island subpopulation (Johnson *et al.* 2016). Calves are typically born in the second and third week of June in the WQEI, and in late May to the third week in June in Banks/Northwest Victoria Island (Johnson *et al.* 2016). Calves generally remain with their mothers until they are 1 year old.

Most information on reproduction for Peary caribou is from caribou harvested in the 1970s on the WQEI (Thomas *et al.* 1976, 1977; Thomas and Broughton 1978; Thomas 1982). For Peary caribou, accessibility of forage affects a caribou cow's body condition, which in turn determines the age of first pregnancy and the annual likelihood that a cow will conceive (Thomas 1982). Peary caribou cows usually first breed at 2 years of age and therefore first calve at 3 years of age, although under conditions of an abundance of forage and a corresponding high rate of body growth, cows can calve at 2 years of age (Thomas 1982). With high forage availability, cows can have a single calf every year. Peary caribou cows can cope with occasional years of restricted forage access either by not becoming pregnant, or by

weaning a calf prematurely, as lactation uses the cow's protein reserves. Variation between condition of individual cows and reproductive output may be high (Moyes *et al.* 2011).

Peary caribou are relatively long-lived, with females living as long as 15 years (ECCC 2021), and males living a few years less (Thomas *et al.* 1976, 1977; Thomas and Broughton 1978). Using the International Union for the Conservation of Nature (IUCN 2019) definition of generation time as the average age of parents of the current cohort, COSEWIC (2015) suggested a generation time of 9 years for Peary caribou, based on life expectancy.

Peary caribou life-history strategies likely include female survival taking precedence over reproduction if forage is restricted (Russell and White 2000). Although there is no information available on Peary caribou annual adult survival rates, Peary caribou survival may be affected during years of environmental extremes when adult survival and productivity may be low. The winters of 1952/53, 1954/55 and 1977/78 experienced environmental extremes where snowfall was deeper than average and/or icing had occurred. Together these events reduced forage availability and harvesters reported finding carcasses of adult Peary caribou on southern Banks Island when fall snowfall was deeper than average and icing had occurred, which together reduced forage availability (McEwan 1955; Morrison 1978; McLean 1992). Such die-offs are usually more extreme for adult males and juveniles than for adult females (Miller and Gunn 2003). If a die-off resulted in a preponderance of adult females, the subsequent rate of increase for the subpopulation could be high (Heard 1990). However, after a freezing rain event in November 1977 on Banks Island, half of the adult carcasses found were females (Morrison 1978).

Information on adult male composition is limited to four composition surveys on Melville Island (1998-2000, 2004) and nine composition surveys on Banks Island (1994-2000, 2004, 2006; Larter and Nagy 2003; Gunn and Williams 2006; Nagy and Gunn 2009). Ratios of bulls/100 cows were highly variable ranging from 15-107 bulls/100 cows on Melville Island, and 21-153 bulls/100 cows on Banks Island. When only surveys with more than 70 caribou were classified are considered, ratios ranged from 52-76 bulls/100 cows on Melville Island and 21-85 bulls/100 cows on Banks Island.

Calf production and recruitment is discussed in *Population Dynamics*.

Physiology and Adaptability

The physiology and adaptability of Peary caribou in the NWT has not been specifically studied. Although Peary caribou are adapted to extreme cold, their tolerance of heat is unknown. Peary caribou have relatively broad hooves for their body mass (Manning 1960), which is a likely adaptation to snow-covered forage for 8-9 months a year. Their molariform tooth row is relatively long for their skull size (Manning 1960), which may be an adaptation for relatively sparse vegetation and consequently higher levels of dust on the forage. Their small body size,

short legs, and shorter, broader muzzle are likely adaptations for reducing heat loss through reducing surface area of extremities. During winter, adult reindeer/caribou coats include thick hollow guard hairs with air-filled cavities and thin woolen underfur, providing insulation, which is the primary mechanism in how adult reindeer/caribou thermoregulate in the cold (Soppela *et al.* 1986). Their hollow fur also keeps them buoyant when swimming.

Annual variability in winter conditions is characteristic of Peary caribou habitat (Larter and Nagy 2001a). Dry or moist summer weather can affect the timing of snowmelt and summer forage quality (Larter and Nagy 2001b). Peary caribou are adapted to this variability through their foraging strategies, which include local or long-distance movements and migrations when winter snow and ice conditions are exceptionally restrictive (Miller 1990). Peary caribou foraging strategies also include shifting between foraging on legumes or mountain avens (*Dryas octopetala* and *D. integrifolia*), which differ in digestibility and protein content (Larter and Nagy 2001b).

In order to attain full adult size in two years, winter growth may be necessary for high arctic caribou and reindeer. In barren-ground caribou, growth occurs in summer but ceases in winter (Dauphiné 1976). However, Larter and Nagy (1995) showed evidence suggesting that Peary caribou calves continue to grow during winter, similar to what has been implied from Svalbard reindeer based on growth curves (Tyler 1987).

Unlike other members of the deer family, female caribou grow antlers. Presence of antlers on females likely evolved in response to competition for access to feeding craters during winter. In group situations, a caribou can be displaced from a feeding crater that it dug, by another caribou. At winter feeding sites in Quebec, female caribou with antlers were successful in almost all their interactions at feeding craters with males that had shed their antlers, even though the males were larger in body size (Barrette and Vandal 1986).

Interactions

Forage

Peary caribou forage on a wide variety of plants (Shank *et al.* 1978; Thomas and Edmonds 1983; Larter and Nagy 1997, 2004). Based on faecal fragment analysis, Peary caribou on Banks Island feed extensively on willow (*Salix arctica*) during summer (June to August), while legumes (*Astragalus* spp. and *Oxytropis* spp.) and entireleaf mountain-avens (*Dryas integrifolia*) make up a large part of the winter diet (Larter and Nagy 1997, 2004). Sedges are also an important component of the diet throughout the year (Larter and Nagy 1997, 2004). During summer, willow leaves are highly digestible and contain high levels of crude protein and low levels of lignin (Larter *et al.* 2002). During winter, legumes are more digestible and have higher crude protein levels than *Dryas integrifolia* (Larter *et al.* 2002). On the WQEI (Melville, Prince Patrick, Eglinton), wood-rushes and mosses were the dominant plant species in rumens during

March/April from 1974 to 1977 (Thomas and Edmonds 1983). Observations of a feeding site on Melville Island in August 1974 indicated that Peary caribou were foraging on seed heads of purple saxifrage (*Saxifraga oppositifolia*) and arctic poppy (*Papaver radicatum*; Thomas and Edmonds 1983).

Unlike other caribou in the NWT (barren-ground, boreal, northern mountain), which forage primarily on lichens during winter, a study on Banks Island showed that lichens do not appear to be a key part of the winter diet of Peary caribou because they are scarce on the Arctic Island (Larter and Nagy 2004). On Melville Island, lichens made up <3% of plants in rumens in three of four years of sampling, but in one year lichen represented almost a third of plants in rumens (Thomas and Edmonds 1983). The amount of lichen in the winter diet of Peary caribou on eastern Melville Island varied depending on snow conditions – in years with deeper harder snow there was a lower occurrence of lichen in the diet (Thomas and Edmonds 1983). However, a recent study of carbon and nitrogen isotope composition in Peary caribou and muskoxen (*Ovibos moschatus)* bone collagen on Banks Island suggests that sedges and yellow lichen (*Cetraria tilessi*) make significant contributions to bone collagen in both caribou and muskoxen, while willow does not (Munizzi 2017). For caribou, forbs are also a significant contributor to bone collagen (Munizzi 2017). Because of its high digestibility, lichen may be underrepresented in rumen and faeces. High lignin content of shrubs results in lower digestibility and therefore shrubs make up a greater component of plant material in rumen and faeces.

Peary Caribou

Information on Peary caribou interactions with each other is mostly based on information collected during aerial surveys. During summer surveys (July to August), caribou are either found individually or in small groups. Group size varies with generally ≤15 caribou, but groups of as many as 75 have recently been observed (e.g., Nagy *et al.* 1996; Larter and Nagy 2000a; Davison and Williams 2013, 2016; Davison *et al.* 2013, 2017; Davison and Baryluk 2021). On Banks Island, as the Peary caribou population declined from 1982 to 1991, mean group size decreased from 4-5 caribou to ~2 caribou and post-calving aggregations that were prevalent in the northwestern portion of the island disappeared (Nagy *et al.* 1996).

Interactions with Other Herbivores

Peary caribou share their ranges with smaller-bodied herbivores. Arctic hare (*Lepus arcticus*), ptarmigan (*Lagopus* spp), and lemming (*Dicrostonyx groenlandicus, Lemmus trimucronatus*) numbers fluctuate on the Arctic Islands. On Banks Island, data from the Inuvialuit Harvest Study suggests that both Arctic hare and ptarmigan numbers were high in 1986-87 and 1993-94 and that ptarmigan numbers were high in 1996-97 (Nagy *et al.* 1998). Arctic hares feed almost exclusively on willow in winter, and in summer they feed on pea plants, other flowers,

willow and sedges (Larter 1999). Ptarmigan forage on willows during the winter. Lemming numbers were high in summers 1993 and 1996, and during those two years their summer diet was almost exclusively mountain avens (Larter 1998). However, it is uncertain how or under what conditions the smaller-bodied herbivores affect foraging of Peary caribou or, as alternate prey, sustain predation on Peary caribou.

Lesser snow geese (*Anser caerulescens caerulescens*) and Ross's geese (*Chen rossii)* are potential competitors to Peary caribou because they can significantly damage vegetation by eating whole plants, including roots (Canadian Wildlife Service 2013 *in* ECCC 2021b). Lesser snow geese have been increasing on Banks Island since the 1970s and are currently categorized as hyperabundant (CWSWC 2020). Although it is unclear how the increase in snow goose numbers may be affecting Peary caribou populations, impacts will likely be localized (Johnson *et al.* 2016).

On Victoria Island, Peary caribou share the island with Dolphin and Union caribou. Peary caribou are found in the northwestern portion of the island throughout the year, while Dolphin and Union caribou typically spend most of the fall and winter in the southern half of the island or on the mainland (Gunn and Fournier 2000a; Gunn 2005). During summer, Dolphin and Union caribou move as far north as Barnard Point/Richard Collinson Inlet, but none of the radio-collared Dolphin and Union caribou overlapped with radio-collared Peary caribou (see Nagy *et al.* 2009d; Gunn and Fournier 2000a; Davison *et al.* 2013). The apparent lack of overlap between Peary caribou and Dolphin and Union caribou could potentially be an artefact of limited data on Peary caribou seasonal movements, and of a focus on radio-collaring the portion of the Dolphin and Union caribou population that migrates to the mainland..

Muskoxen co-exist with Peary caribou on most of the Arctic islands in the NWT. On Banks Island, Peary caribou and muskoxen select different habitats during winter with caribou selecting primarily upland habitats and muskoxen selecting wet sedge meadows (Larter and Nagy 2001a). Although annual diets of the two species on Banks Island were similar, muskoxen foraged predominantly on sedge and willow, while caribou foraged on sedge, willow, *Dryas intefrifolia* and *Oxytropis maydelliana* (Larter and Nagy 1997). Sedge made up a greater component of the diet in areas of low muskoxen density than areas of high muskoxen density (Larter and Nagy 2004). Willow was reported in both caribou and muskoxen diets on Banks Island when muskoxen densities were high in the mid-1990s (Larter and Nagy 1997, 2004), and in the early 1970s, when muskoxen densities were lower and caribou densities higher (Wilkinson *et al.* 1976; Shank *et al.* 1978). Overall, it appears that the similarity between Peary caribou and muskoxen diets tends to be higher in areas of high muskoxen density and during winters with deeper snow. Under these conditions, muskoxen may increase their use of upland habitats, potentially reducing forage availability for caribou (Larter and Nagy 2001a). Larter *et al.* (2002) concluded that on Banks Island, "the potential for caribou numbers to increase may

be constrained by the availability of suitable forage in the presence of muskoxen". Recent carbon and nitrogen isotope analysis of muskoxen bone collagen on Banks Island suggests yellow lichen (*Cetraria tilessi*) plays a greater role in muskoxen diet than suggested from faecal and rumen analysis (Munizzi 2017). Less information is available about muskoxen diet and habitat use in the WQEI, but rumen and faecal analysis suggests that sedges and willow are important in summer, and that sedges are important in winter (Parker 1978 in Robus 1981).

Muskoxen increased on Banks Island from about 12,500 in 1982, to highs of about 66,300 in 1994 and 68,600 in 2001, then decreased to about 11,000 by 2019 (Nagy *et al.* 2006c, 2009a, 2013ab; Davison and Baryluk 2021). Similarly, on Northwest Victoria Island, muskoxen increased from about 6,400 in 1983, peaked in 1998 (~22,800) and 2001 (~21,800), then decreased to 5,500 in 2019 (Jingfors 1985; Nagy *et al.* 2009 d, e; Davison and Williams in prep.). On the WQEI, muskoxen numbers have fluctuated since 1973, with increases on Melville, Prince Patrick and Eglinton Islands between the two most recent surveys in 1997 and 2012 (Davison and Williams 2016). Muskoxen presence on Byam Martin Island is sporadic, but no muskoxen were seen on the island in 1997 or 2012 (Davison and Williams 2016). Trends in Peary caribou abundance relative to trends in muskoxen abundance are discussed in *Population - Trends and Fluctuations*.

Predation

Arctic wolves (*Canis lupus arctos*; hereinafter referred to as "wolves") prey on caribou and muskoxen (Nagy and Larter 2000), but there is essentially no direct information on wolf predation rates on Peary caribou. The only indicator that could be used to assess arctic wolf predation pressure is sightings of wolves during aerial surveys and the number of harvested wolves.

Poisoning programs conducted in the 1950s resulted in reduced wolf numbers on Banks Island (McEwan 1955; Zoltai *et al.* 1980 in Nagy *et al.* 1996; Nagy *et al.* 1998). Wolves were rarely seen on Banks Island during the late 1970s (Vincent and Gunn 1981), but wolf numbers likely increased on Banks Island during the 1980s and 1990s (Larter and Nagy 2003). Wolf sightings during island-wide aerial surveys increased from less than 10 in the early 1990s to 30-50 from the mid-1990s to 2010 (Table 6). As well as increases in wolf sightings during aerial surveys, the number of wolf observations increased during annual Banks Island fieldwork from 1993-1999 (Larter *in* SARC 2012: 71). Most wolves seen during aerial surveys in 1994, 1998, and 2001 were in areas of high muskoxen density in the Thomsen River drainage. Larter and Nagy (2003) commented that as caribou move south from calving and summer ranges, they pass adjacent to a high wolf density area. During an aerial survey in 2010, no wolves were sighted in the Thomsen River drainage although wolves were seen elsewhere on Banks Island (Davison *et al.* 2010).

On northwest Victoria Island, harvesters reported seeing more wolves in the 1980s than before (C. Adjun *in* Gunn 2005). Wolf sightings during surveys increased from 5 to 19 between the late 1990s and 2010 (Table 6).

Table 6. Wolves observed during aerial surveys on Banks Island, Northwest Victoria Island and the Western Queen Elizabeth Islands, 1985-2012.

Islands (Area)	Year	Total	Adults	Pups	No. of Groups	Reference
Banks	1985	13	9	4	2	Nagy *et al.* 1998
	1987	0				McLean 1992
	1989	13	8	5	3	McLean and Fraser 1992
	1992-93	2	2		1	Nagy *et al.* 1998
	1992	7	7	0	2	Nagy *et al.* 2009b
	1994	23			11	Nagy *et al.* 2006a
	1994	47	38	9	14	Nagy *et al.* 1998
	1998	26			11	Nagy *et al.* 2006b
	1998	50	46	4	13	Nagy *et al.* 1998
	2001	40			11	Nagy *et al.* 2006c
	2005	28			10	Nagy *et al.* 2009c
	2010	34	28	6	13	ENR unpubl. data 2010
	2014	16	16		10	Davison *et al.* 2017
	2019	8			4	Davison and Baryluk 2021
NW Victoria	1998	5			1	Nagy *et al.* 2009d
	2001	11			5	Nagy *et al.* 2009e
	2005	12			5	Nagy *et al.* 2009f
	2010	19	18	1	8	ENR unpubl. data 2010
	2015	16			7	Davison and Williams 2019
	2019	4			3	Davison and Williams in prep.
Prince Patrick	1997	3	3	0	2	Gunn and Dragon 2002
Eglinton	1997	3	3	0	1	Gunn and Dragon 2002
Melville	1997	32	20	12	7	Gunn and Dragon 2002
	2012	17	17	0	5	Davison and Williams 2016

The level of wolf predation on the WQEI is unknown. However, wolves are often seen during field research activities (Miller and Reintjes 1995). Thirty-two wolves were observed during the survey of Melville Island in 1997 (Gunn and Dragon 2002), 12 wolves were observed on a ground survey of Melville Island in 1998 (Larter and Nagy 2000a), and 17 wolves were observed on Melville Island in 2012 (Davison and Williams 2016).

Aerial surveys are usually conducted with standardized methodologies. The number of wolves observed during aerial surveys is potentially an index to wolf abundance. Such an index might include the number of wolves observed within transect or on transect per 100 hours of flying (Heard 1992b). The index could not be calculated for this report due to differences in how flying hours and wolf sightings were reported, especially opportunistic observations collected during ferry flights.

The increase in muskoxen numbers and wolf sightings on Banks and northwest Victoria islands during 1972-2001 was coincidental with the Peary caribou decline (see *Interactions with other herbivores*, *Population – Trends and Fluctuations*). The extent to which increasing abundances of muskoxen support increased wolf numbers and potentially increased predation rates on Peary caribou is unknown. Muskoxen was found in ~90% of wolf scats or stomachs during the increase and peak phases of muskoxen on Banks Island, and during the peak phase of muskoxen abundance on northwest Victoria Island (Larter 2013). Caribou was found in 11% and 8% of wolf stomachs on Banks Island and Northwest Victoria Island respectively, but not in any wolf scats (Larter 2013). Although caribou made up a small component of the wolf diet compared to muskoxen, wolf predation could have contributed significantly to Peary caribou mortality rate at a time when caribou numbers were at their lowest.

Although grizzly bear presence on Arctic Islands has been noted in the past (e.g. a grizzly bear was shot on Bank Island in the winter of 1951/52 [Manning and Macpherson 1958]), grizzly bears have expanded their range in the Canadian Arctic (Doupé *et al.* 2007; SARC 2017). Grizzly bear sightings have increased in frequency on the NWT Arctic islands, including sightings on Melville Island in 2007 (Canadian Wildlife Service unpubl. data 2012), on northwest Banks Island in 2010 (ENR *in* SARC 2012: 71), on northeast Banks Island in 2014 (1 bear, Davison *et al.* 2017), and on northwest Victoria Island in 2019 (1 bear, Davison and Williams, in prep.). On Banks and Victoria Island there is no quota for grizzly bear, however harvest records are kept. Between July 2016 and June 2021 one grizzly bear was harvested on Banks Island, and in the ISR portion of Victoria Island annual grizzly bear harvest has been between 1 and 5 animals for a total of 17 harvested grizzly bears over 5 years (ENR 2021). Given that grizzly bears are known to eat barren-ground caribou, particularly in the spring and fall (Gau *et al.* 2002), it is possible that grizzly bears are also a predator of Peary caribou. Although grizzly bear predation is likely, the contribution of grizzly bear predation to mortality of Peary caribou is not known. Local knowledge holders from southern Victoria Island indicated an increase in the

proportion of muskoxen predation mortalities attributed to grizzly bears (Tomaselli *et al.* 2018).

Peary caribou are also an important food source for Arctic foxes, which scavenge dead caribou (Urquhart 1973).

Parasites and Disease

Little information is available on the prevalence and intensity of parasite infections and diseases in Peary caribou or on the conditions under which they could become prevalent and have population-level effects such as affecting pregnancy or survival rates. More information is available for Dolphin and Union caribou on Victoria Island and for muskoxen on Banks and Victoria islands, which could provide an indication of diseases and parasites in Peary caribou, at least for those on northwest Victoria and Banks islands.

On Melville and Prince Patrick islands, 11 and 16% of Peary caribou, respectively, collected in 1974-79 had warble larvae (Thomas and Kiliaan 1990). No information is available on warbles on Peary caribou on Banks or northwest Victoria islands. For barren-ground and Dolphin and Union caribou, higher abundance of warble larvae was associated with reduced body condition of adult females, and reduced the probability of being pregnant (Thomas and Kiliaan 1990; Hughes *et al.* 2009). Also, for Dolphin and Union caribou, higher levels of abomasal nematode parasites were associated with reduced body weight (Hughes *et al.* 2009).

Blood samples from six Peary caribou on Banks Island were negative for brucellosis and had slightly elevated levels of potassium, calcium, and magnesium; urea nitrogen and glucose levels were also slightly elevated (Larter and Nagy 1996). On Banks Island, harvesters reported tapeworm cysts in the muscle of Peary caribou during some years (Nagy *et al.* 1998). The primary hosts of tapeworms are wolves or foxes (*Vulpes* spp), and numbers of cysts in the caribou vary and may be related to fox cycles (Nagy *et al.* 1998). Activity of some parasites, such as warble flies, and corresponding harassment increases with warmer temperatures (Hagemoen and Reimers 2002). Because Banks Island has warmer summers than Melville and Prince Patrick islands (Maxwell 1981), higher levels of warble flies in Peary caribou may be expected.

Dolphin and Union caribou tested during sampling from 2015 to 2019 on Victoria Island had been exposed to six of the seven pathogens tested (Table 7; Carlsson *et al.* 2019, Aguilar and Kutz 2020). The most prevalent pathogen, alphaherpes-virus, was detected in 87% of animals tested, which was higher than in other Arctic caribou populations (Carlsson *et al.* 2019). Exposure to *Brucella* was also higher for Dolphin and Union caribou than for other Arctic caribou populations (Carlsson *et al.* 2019). Body condition and pregnancy rate were lower in caribou with antibodies to *Brucella* than in caribou without the antibodies (Aguilar and Kutz 2020). The relatively high seroprevalence of three reproduction-limiting pathogens (*Neospora*

caninum, *Toxoplasma gondii*, *Brucellis suis*) in Dolphin and Union caribou was detected when the population was declining (Carlsson *et al.* 2019). Animals that were seropositive for Pestivirus were more likely to test positive for exposure to *Neospora caninum* than animals that tested negative for Pestivirus (Carlsson *et al.* 2019).

Table 7. Seroprevalence of pathogens in adult female Dolphin and Union caribou (adapted from Carlsson *et al.* 2019, and Aguilar and Kutz 2020).

Agent[1]	Type	Effects in *Rangifer*	%	95% CI
Pestivirus	Virus	Poorly studied. Loose bloody stools, laminitis	21[2]	16-28[2]
Alphaherpes-virus (CvHV2)	Virus	Oral lesions, infectious keratonoconjuctivitis, pneumonia, abortion	87[2]	79-92[2]
Paramyxo-viruses (PI3 and BRSV)	Virus	Unknown	0[3]	0-9[3]
Neospora caninum	Protozoan	Unknown (but causes abortions, mummified foetuses and weak calves in domestic animals)	22[3]	10-38[3]
Toxoplasma gondii	Protozoan	Abortion, lethal enteritis	5[2]	0-26[2]
Brucella suis biovar 4	Bacteria	Abortion, weak calves, joint disease, orchitis, abscesses	14[2]	10-20[2]
Erysipelothrix rhusiopathiae	Bacteria	Arthritis, endocarditis or sudden death	22[2]	17-29[2]

[1] BRSV = Bovine herpes virus type 1; CvHV2 = Cervid Herpes Virus 2; PI3 = Parainfluenza virus type 3.
[2] From Aguilar and Kutz 2020 (data from 2015 to 2019).
[3] From Carlsson *et al.* 2019 (data from 2015 and 2016).

For muskoxen, on Banks Island *Yersinia pseudotuberculosis* was implicated in muskoxen deaths in the late 1980s, especially during hot summers (Blake *et al.* 1991, McLean *et al.* 1992). *Erysipelothrix rhusiopathiae* was first detected on Banks and Victoria islands in muskoxen in good body condition that had died during summers from 2009 to 2013 (Kutz *et al.* 2015). Subsequent analysis of archived samples indicated that *E. rhusiopathiae* has been present across the range of muskoxen, and in muskoxen on Banks Island since samples were first collected in 1976 and 1991 respectively (Mavrot *et al.* 2020). High numbers of mortalities associated with *E. rhusiopathiae* and population declines coincided with increasing seroprevalence of *E. rhusiopathiae* on Victoria Island from 2011 to 2015 and high seroprevalence on Banks Island in 2012 (Mavrot *et al.* 2020).

E. rhusiopathiae was detected on Prince Patrick Island in 2017 in six Peary caribou carcasses, five adult muskoxen carcasses and one Arctic fox carcass (Kutz 2018).

Giardia is found in muskoxen but not in caribou although another protozoan parasite, *Cryptosporidium* was found in 22% of Peary caribou fecal samples from Banks Island in the 1990s (Nagy *et al.* 1998).

A type of lungworm (*Varestrongylus spp.)* that affects both caribou and muskoxen was found for the first time on Victoria Island in 2010 (Kutz *et al.* 2014) and a stomach parasite *Teladorsagia boreoarcticus* was found on Banks and Victoria Islands (Hoberg *et al.* 2012; ECCC 2021b).

Humans

Harvesting is part of Indigenous culture and Inuvialuit harvesters have preferential rights to Peary caribou (GNWT 2020). Most Peary caribou harvesting in the NWT occurs on Banks Island and northwest Victoria Island. Currently, Peary caribou are rarely hunted on the WQEI because there are no communities on those islands and their remoteness makes them difficult to reach.

On Banks Island, during the 1960s and 1970s-1980s, people annually harvested an estimated 250-300 and 300-450 caribou respectively, mostly cows (Usher 1971; Nagy *et al.* 1998). Between 1987 and 1992, Peary caribou on Banks Island decreased from 4,251 to 1,018 and from 1987 to 1991 approximately 1,000 caribou were harvested (Nagy *et al.* 1996; 2009b). In 1990, an initial quota of 150 caribou was set in response to the decline in Peary caribou abundance and that quota was reduced to 30 males after the July 1991 survey (Nagy *et al.* 1998). At the request of Sachs Harbour Harvesters and Trappers Committee, in 1992 the quota was increased to 36 males, or one per household in the community. The quota was increased to 72 in 2010/11 with mandatory sample submission. Since 1991, annual harvest was under 25 caribou during most years, except in 1993/94 when 48 caribou were harvested and in 2019/20 when 47 caribou were harvested (Table 8). With population size ranging from about 900 to 1,100 adult caribou from 2001 to 2013, and about 2,000 adult caribou from 2014 to 2019 (see *Population trend*), the annual harvest rate has been <1-3% since the early 2000s.

Table 8. Reported harvest of Peary caribou in the NWT (compiled from GNWT 1993a, b; Nagy *et al.* 1996; CPCVI 1998; GNWT and GN 2011; ENR 2011; ENR 2019; ENR 2021). QEI = Queen Elizabeth Islands; Minto Inlet = Northwest Victoria Island; n/a = no quota.

Year	Western QEI	Banks Island		Minto Inlet	
	Harvest	Quota[1]	Harvest	Quota	Harvest
1987-88	?	n/a	615[2]	n/a	600
1988-89	?	n/a		n/a	405
1989-90	?	n/a	361[2]	n/a	420
1990-91	?	150		n/a	329
1991-92	0	30	21	n/a	192
1992-93	0	36	21	n/a	155
1993-94	0	36	48	n/a	0
1994-95	0	36	24	0	7
1995-96	0	36	14	0	0
1996-97	0	36	17	0	0
1997-98	0	36	17	0	23
1998-99	0	36	9	0	?
1999-2000	0	36	8	0	?
2000-01	0	36	13	0	?
2001-02	0	36	27	0	0
2002-03	0	36	20	0	0
2003-04	0	36	23	0	0
2004-05	0	36	3	0	0
2005-06	0	36	7	0	0
2006-07	0	36	3	0	0
2007-08	0	36	7	0	0
2008-09	0	36	12	0	0
2009-10	0	36	1	0	0
2010-11	0	72	6	0	0
2011-12	0	72	5	0	0
2012-13	0	72	?	0	0
2013-14	0	72	13	0	0
2014-15	0	72	20	0	0

Year	Western QEI	Banks Island		Minto Inlet	
	Harvest	Quota[1]	Harvest	Quota	Harvest
2015-16	0	72	29[3]	10	3
2016-17	0	72	14	10	6
2017-18	0	72	21	10	0
2018-19	0	72	3[3]	10	10
2019-20	0	72	47	10	9
2020-21	0	72	23[3]	10	1

[1] Banks Island quotas are voluntarily male dominated (GNWT 1993a; SHHTC *et al.* 2016; Gau pers. comm. 2022).
[2] Harvest estimates of non-calf caribou from July 1987 to June 1989, and from June 1989 to June 1991, are from Fabijan (unpublished data in Nagy *et al.* 1996).
[3] Based on tags returned to ENR: 15/16 - 29 harvest reported; 18/19 – 3 harvest reported; 20/21 – 23 harvest reported.

On Northwest Victoria Island, caribou are a preferred subsistence food for people in Ulukhaktok and the annual harvest in the 1960s was 150 to 200 caribou. Harvest levels then increased, and by 1983-84 the annual harvest for Peary caribou from Northwest Victoria Island was 738 caribou (but it is unclear whether these include Dolphin and Union caribou; RWED 1998). The harvest then declined to 192 in 1991-92 and 155 in 1992-93 (RWED 1998; ENR 2010). In 1993, the Olokhaktomiut (Ulukhaktok) Harvesters and Trappers Committee initiated a voluntary zero harvest on Peary Caribou from Northwest Victoria Island to help ensure that only Dolphin and Union caribou were harvested from the island (RWED 1998). In 2015/16, a quota of 10 Peary caribou (either sex) was established for harvesting area I/PC/03, which includes Northwest Victoria Island (Table 8; Figure 22). Since 2015/16, Peary caribou harvest in area I/PC/03 ranged from 0 to 10 (Table 8; ENR 2021). Based on the 2019 estimate of 176 adult Peary caribou (see *Abundance*), the harvest since 2015/16 has averaged 2.2% (range = 0-6%) of the adult population. Although the quota of 10 Peary caribou applies to area I/PC/03, Peary caribou harvesting is also open in the area to the south in I/PC/04. Therefore, total harvest of Peary caribou on Victoria Island in the NWT may be higher than the harvest reported for I/PC/03.

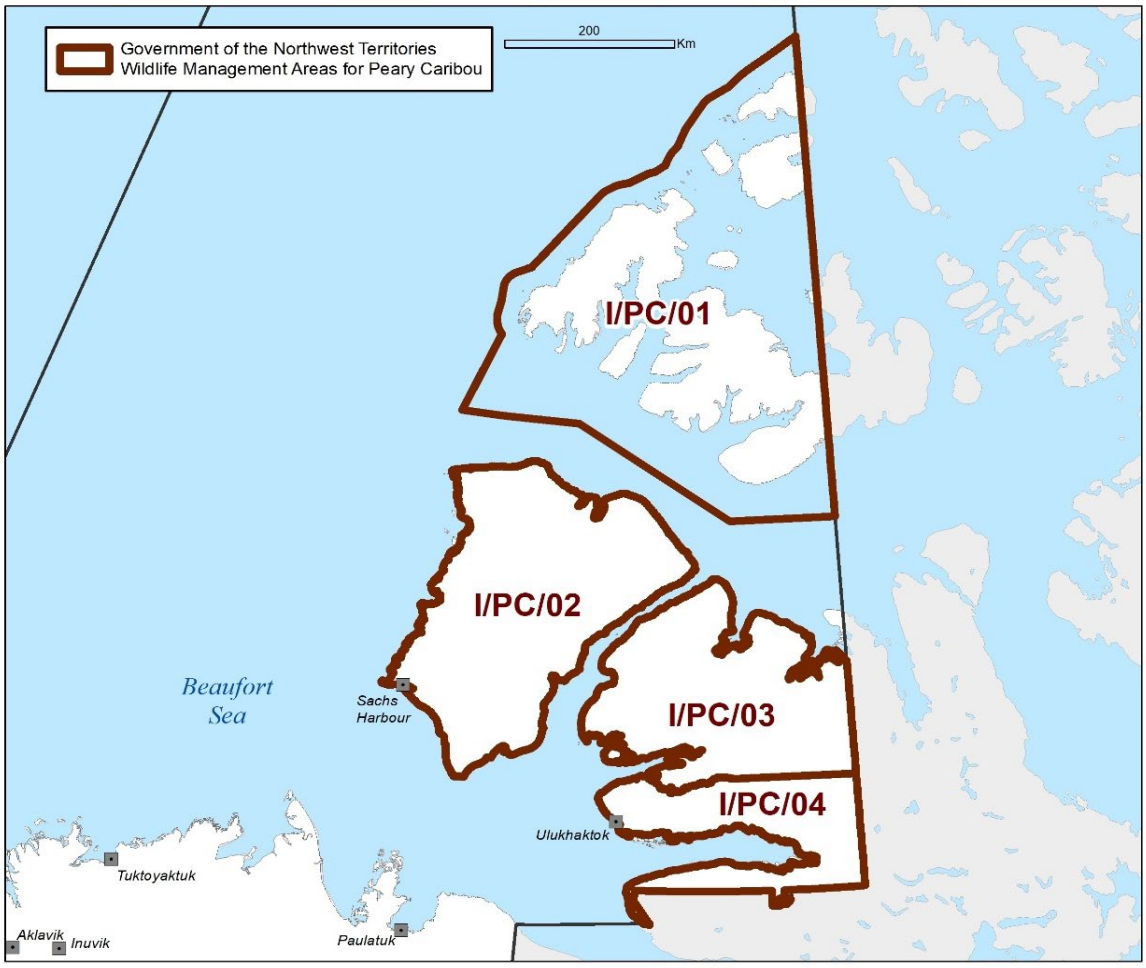

Figure 23. Government of the Northwest Territories Wildlife Management Areas for Peary Caribou. Map courtesy B. Fournier, ENR.

On the WQEI, between 1974 and 1977, Inuvialuit harvesters harvested 36, 36, and 7 caribou on Melville Island, Prince Patrick Island, and Eglinton Island (1975 only) respectively (Thomas and Edmonds 1983). Thomas and Edmonds (1983) did not indicate if these numbers represent total harvest during that period or just the animals that were sampled and historically harvest studies do not distinguish between zones (Nathoo pers. comms. 2021). Quotas do not apply to I/PC/01 and there is little to no hunting pressure in this area as people rarely travel to the WQEI to harvest (Nathoo pers. comms. 2021). No Peary caribou have been harvested on the WQEI since 2005-06 except in 2013/14 when six Peary caribou were harvested (Table 8; ENR 2020).

Harvested caribou provide an opportunity to collect information about Peary caribou health and condition, which is otherwise unavailable. Harvesters from Sachs Harbour have monitored caribou health and condition since 1994 by collecting information on caribou sex and age, amounts of back, rib cage and kidney fat, and collecting samples of rumen, fecal pellets and a long bone. Sample sizes are low, and the data have not yet been compiled (Davison pers. comm. 2021).

PLACE

Distribution

World and Canadian Distribution

Peary caribou only occur in Canada, except for occasional sightings on the northwest Greenland coast (Figure 24). COSEWIC and Environment and Climate Change Canada (ECCC) include all of Victoria Island and portions of the northern mainland coastline in NWT and Nunavut between Cape Bathurst and the Boothia Peninsula in the distribution of Peary caribou in Canada based on aerial survey data and Indigenous knowledge (COSEWIC 2015; Johnson *et al.* 2016; ECCC 2021b; see Figure 25 in *NWT Distribution*). The proposed federal *Recovery Strategy for Peary Caribou in Canada* (ECCC 2021) identifies a core range, or high use area, for Peary caribou that includes the High Arctic (Queen Elizabeth Islands) and the mid-Arctic islands (except Baffin Island where occurrences are rare) as well as King William Island (Figure 25; ECCC 2021b). Outside of the core range the distribution of Peary caribou also includes the northern extension of the mainland (Boothia Peninsula, Pearce Point and the Parry Peninsula) (ECCC 2021b). In Canada, Peary caribou only occur in the NWT and Nunavut with a few sporadic historic sightings in the Yukon Territory.

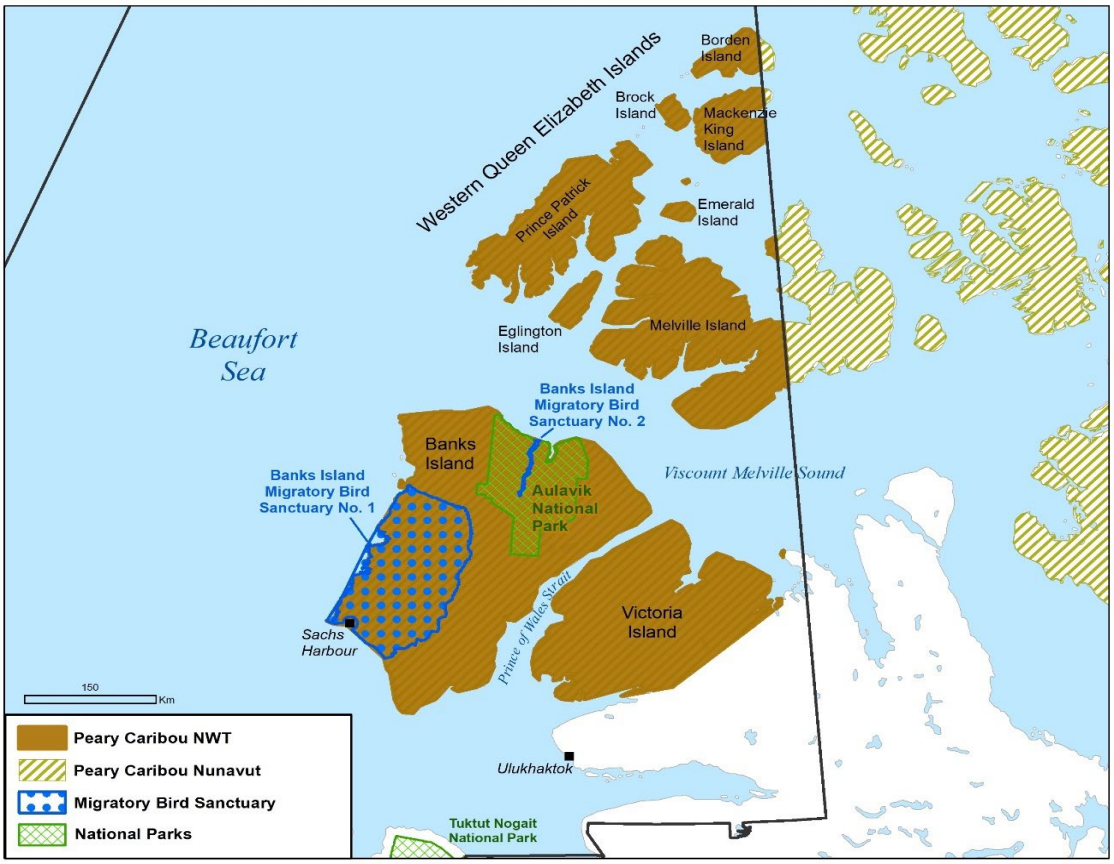

Figure 24. Distribution of Peary caribou in the Northwest Territories. Map courtesy B. Fournier, ENR.

NWT Distribution

Peary caribou are found on all the Arctic islands within the NWT (Figure 24). This includes the NWT portion of the WQEI (Melville, Prince Patrick, Eglinton, Emerald, Mackenzie King, Brock, Borden), Banks Island, and Northwest Victoria Island.

Little recorded information is available on historic distribution (prior to aerial surveys that started in the 1960s and 1970s). European explorers reported caribou on Melville, Banks and northwest Victoria islands, but the scattered nature of the sightings adds little to known distribution based on more recent aerial surveys and Inuvialuit observations. Archaeological evidence has not yet been compiled.

Because Peary caribou in the NWT live on the Arctic Islands, their distribution is naturally discontinuous (fragmented). Geographically, Peary caribou on the NWT WQEI are relatively isolated from Banks and northwest Victoria islands by the 100 km wide Viscount Melville Sound, which is at least a partial barrier to movements because it is rough multi-year ice in most years. The ice conditions suggest that seasonal movements across Viscount Melville Sound are unlikely. However, desperation movements during extreme winter weather have been reported historically and traditional knowledge holders have indicated that there is some movement (Davison pers. comm. 2022). Peary caribou on the WQEI are genetically distinct from Peary caribou on Banks and Victoria islands (McFarlane *et al.* 2014; Klütsch *et al.* 2017; Jenkins *et al.* 2018; see *Systematic/Taxonomic/Naming Classifications*).

Environment and Climate Change Canada (ECCC) defined two subpopulations within Peary caribou distribution in the NWT based on genetic analyses, inter-island migrations, and scientific and local expert input: the WQEI (which also includes islands in Nunavut), and Banks/Northwest Victoria (Johnson *et al.* 2016; ECCC 2021; Figure 25).

In the NWT, the WQEI subpopulation includes two island groups: 1) the Melville Island Group, which includes Prince Patrick (NWT), Eglinton (NWT), Emerald (NWT), Melville (NWT/NU), and Byam Martin (NU) islands; and 2) the Prime Minister Island Group, which includes Brock (NWT), Mackenzie King (NWT/NU) and Borden (NWT/NU) islands (Johnson *et al.* 2016). Peary caribou are known to move between islands in the Melville Island Group. Based on seasonal aerial surveys and dye-marked caribou in the early 1970s, many caribou wintered on Prince Patrick Island and migrated in spring to Eglinton, Emerald, Melville and Byam Martin islands for the summer (Miller *et al.* 1977b). Inter-island movements were also documented for Peary caribou between Mackenzie King and Borden islands in the Prime Minister Island Group, based on tracks across the sea ice observed during surveys in 1961 (Tener 1963).

Peary caribou on Banks and Northwest Victoria islands have been alternately considered as a single subpopulation (COSEWIC 2004), and as two geographic subpopulations (SARC 2012). Prior to the 1980s when caribou numbers were still high, tracks of caribou crossing the ice

between Banks and northwestern Victoria islands were observed suggesting mixing between caribou on the two islands (Miller 1986; Nagy *et al.* 1998, RWED 1998). However, there is little information on the scale of the movement and no evidence of crossings since the 1980s. Irregular coastal flights in early June 1982, 1983 and 1985 (triggered by plans to ship Beaufort Sea oil though Prince of Wales Strait) did not find caribou or tracks crossing between Banks and Northwest Victoria islands (Kiliaan and Thomas 1983; Miller 1986), and the last big movements observed by people from Ulukhaktok occurred in the late 1980s (Nagy *et al.* 1998). More recently, fewer people are travelling between Banks and Northwest Victoria islands (Davison pers. comm. 2022). Lack of recent observed crossings could be related to the relatively low population size based on recent surveys (see *Population*). The current recognition of Peary caribou on Banks and Northwest Victoria islands as a single subpopulation is based on genetic analyses, known movements and community knowledge (Johnson *et al.* 2016).

In the Western Queen Elizabeth subpopulation, three islands straddle the NWT/Nunavut border: Melville, Mackenzie King and Borden islands, although only small portions of Mackenzie King and Borden Islands sit within Nunavut. Surveys cover the whole of each of those islands and caribou are not distinguished between those in the NWT and those in Nunavut. Other than Byam Martin Island (NU), which is part of the Melville Island Group, the closest Peary caribou in Nunavut to the NWT are in the Bathurst Island Group, which contains about 1,500 caribou (Johnson *et al.* 2016). Peary caribou are known to move between the Bathurst Island Group and the Melville Island Group (Johnson *et al.* 2016).

The Banks/Northwest Victoria subpopulation is relatively isolated from Peary caribou in Nunavut to the east. The closest Peary caribou are on Prince of Wales Island, but that population may have either declined to critically low numbers or emigrated (Gunn and Dragon 1998; Jenkins *et al.* 2011; Johnson *et al.* 2016; Anderson 2016a).

Small numbers of Peary caribou have sporadically appeared on the mainland as far west as Old Crow, Yukon, during or shortly after winters with fall icing on Banks Island and/or Victoria Island (Banfield 1961; Youngman 1975). Youngman (1975) reported a small caribou killed by a hunter from Old Crow, Yukon that matched Peary caribou and Dolphin and Union caribou skeletal measurements. Between 30 and 40 Peary caribou were reported at Herschel Island (Yukon), Baillie Island (NWT) and Cape Dalhousie (NWT) in the early 1950s; the movement from Banks Island to the mainland was thought to be a response to fall icing events on Banks Island, which made it difficult for Peary caribou to access food (McEwan 1952; 1955). Youngman (1975) also reported that Kutchin (Dene) harvesters from Old Crow often commented on the occasional occurrence of small caribou mixed with groups of larger animals. A "Banksland caribou" was seen amongst a group and harvested during a community hunt for barren-ground caribou out of Tuktoyaktuk in 1995 (Larter *in* SARC 2012: 60).

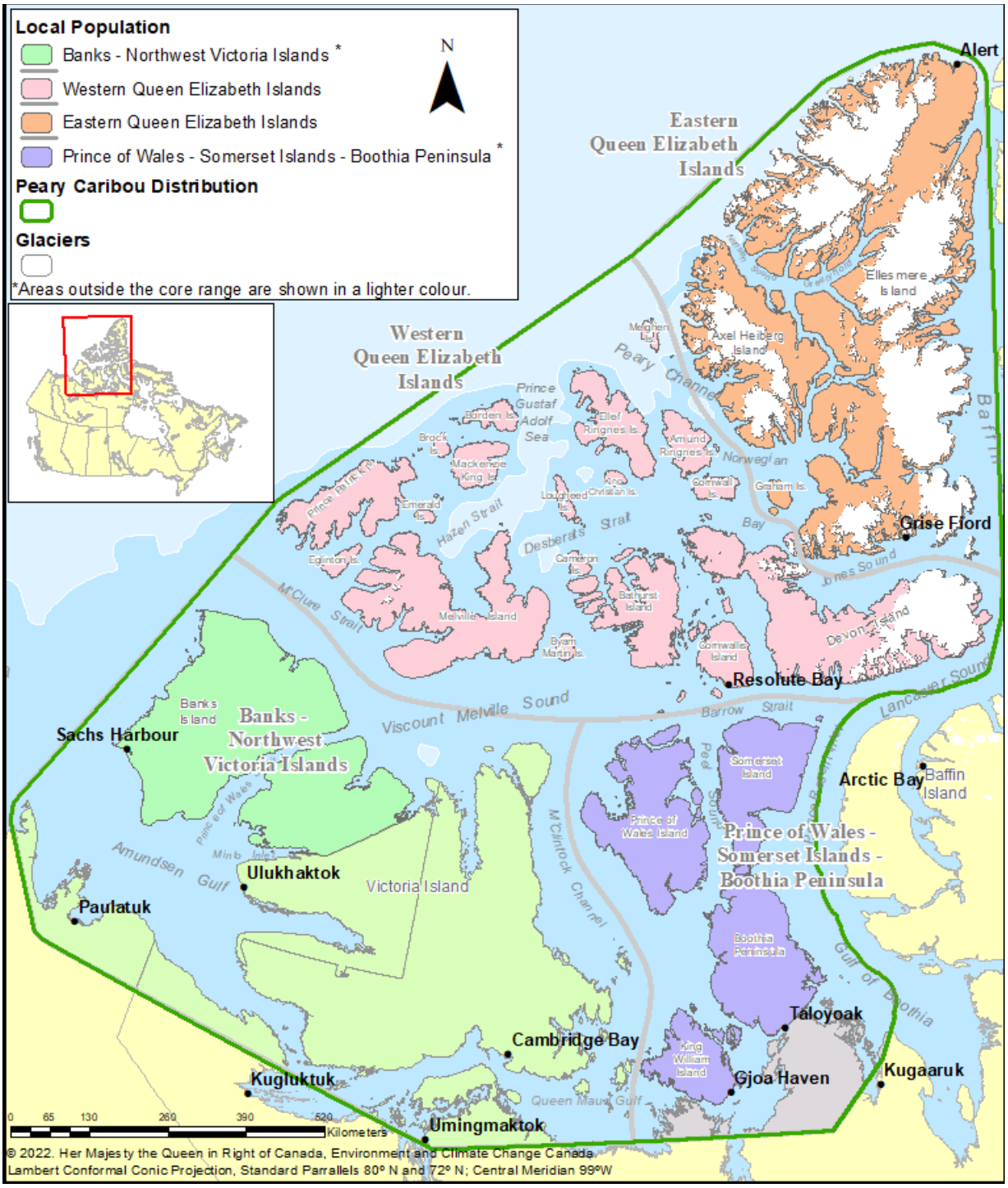

Figure 25. Subpopulations of Peary Caribou in Canada, as defined by Environment and Climate Change Canada (Johnson *et al.* 2016). (Map from ECCC 2015).

Extent of Occurrence

The Species at Risk Committee (SARC) defines 'extent of occurrence' as 'the area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a species' (SARC 2020). The extent of occurrence for Peary caribou in NWT is 237,022 km^2, which includes the area of islands where Peary caribou have been observed since 1961 (see Appendix B), and the ocean between the islands within each subpopulation to include areas of sea-ice used for travel between islands. For Melville Island, only the NWT portion of the island was included. The sea-ice between Banks and northwest Victoria islands was also included as a migratory corridor (approximately 8,000 km^2).

Area of Occupancy

'Area of occupancy' is defined as 'the area within 'extent of occurrence' that is occupied by a species, excluding cases of vagrancy' (SARC 2020). The area of occupancy for Peary caribou in the NWT is 158,293 km^2, which includes the area of occupied islands in the NWT, excluding the sea. 'The index of area of occupancy (IAO) is a measure that aims to provide an estimate of area of occupancy that is not dependent on scale. The IAO is measured as the surface area of 2 km x 2 km grid cells that intersect the actual area occupied by the wildlife species (i.e. the biological area of occupancy)' (SARC 2020). The IAO for Peary caribou in the NWT is 167,492 km^2; however, the standard 2 x 2 km cell size used by SARC may not be the best spatial scale for Peary caribou because aerial survey transects are generally 5 km apart.

Seasonal Distribution

Information on seasonal distribution of Peary caribou in NWT is primarily limited to spring and summer, when most of the surveys have been conducted (Appendix B). On Banks Island, aerial surveys in 1971 and 1972 identified calving on the northwest corner (Ballast Beach), Jesse Harbour on the east coast and scattered low density calving on northeast Banks Island (Urquhart 1973). Calving at Jesse Harbour was also confirmed in June 1985 (Miller 1986). The 10 Peary caribou cows fitted with satellite collars in 1999 had dispersed calving sites mostly on the southern half of the island with only one returning to the northwest calving area around Ballast Beach (ENR unpubl. data 2011). During post-calving and summer, the northwestern, northeastern and central portions of the island were the most consistently used areas based on surveys conducted from 1982 to 2019 (late June to late July), with less use in the southwestern and west-central portion of the island (Nagy *et al.* 1996, 2006a,b, 2009c, 2013a, b; Nagy and Gunn 2009; Davison *et al.* 2013, 2017). During some years, caribou were also found along the west-central coastline (Nagy *et al.* 2009c, 2013a, b; Nagy and Gunn 2009; Davison *et al.* 2013). Distribution of caribou during a late August survey in 1992 was similar to post-calving distribution (Nagy *et al.* 2009b). Rutting areas on Banks Island are believed to occur in the northwest and the west coasts, which were the only areas where cast prime bull antlers were found in 2004 (Gunn and Williams 2006). During late winter aerial surveys in the early 1970s,

Peary caribou were found primarily in the southern portion of Banks Island on the western side (Urquhart 1973).

Based on four satellite collared cows from 1987 to 1989 and aerial surveys from the 1980s to 2019, Peary caribou were distributed in the Minto Inlet area of northwest Victoria Island in winter, and used areas further north for calving and summering (Gunn and Fournier 2000a,b; Nagy *et al.* 2009d, e, f; Davison and Williams 2013, in prep.). Aerial surveys in the 1980s indicated that caribou distribution during calving was primarily in the area inland from Dean Dundas Bay (Gunn and Fournier 2000b).

During post-calving/summer, Peary caribou may be found on all of the WQEI in the NWT (Tener 1963; Miller *et al.* 1977a; Davison and Williams 2016). Miller *et al.* (1977a) believed that post-calving aggregations of Peary caribou moved from the coastal areas in eastern Melville Island to the higher inland plateaus of eastern Melville Island and the Dundas Peninsula. Surveys in 1998, 1999, and 2000 indicated congregations of Peary caribou in the south-central uplands of Dundas Peninsula (Larter and Nagy 2000a; Larter and Nagy 2003). The basis for describing calving areas on eastern Melville Island is unsystematic aerial searches in 1973-74 (Miller *et al.* 1977b; Gunn and Fournier 2000a). On Melville Island, caribou rut in coastal areas based on the distribution of shed prime bull antlers (Miller and Barry 1992). During winter, Peary caribou in the Melville Group were found primarily on Prince Patrick Island (Miller *et al.* 1977a).

Locations

SARC defines 'location' as 'a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the species present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a species is affected by more than one threatening event, location should be defined by considering the most serious plausible threat.' SARC (2020). For Peary caribou in the NWT, Banks Island, northwest Victoria Island, and the NWT WQEI can be considered three extant locations using this definition, because the regional climate and harvesting differ among the three areas (see *Threats*). In addition, different climate patterns within each area could be the basis for several more locations.

Search Effort

Distribution of Peary caribou in the NWT is largely based on sightings during systematic aerial surveys (Appendix B) conducted since 1961 (WQEI), 1972 (Banks Island) and 1980 (northwest Victoria Island). The aerial surveys are island-wide except for northwest Victoria Island where only the northwestern most portion of the NWT side of the island is surveyed. Distribution on northwest Victoria Island and Banks Island is also based on locations of satellite radio-collared

cows from 1987 to 1989 (Gunn and Fournier 2000a), and from 1999 to 2002 (ENR unpubl. data 2011) respectively.

Within each Peary caribou range, the search effort to measure spatial distribution is based on the coverage of each island in a group, where coverage is a function of transect spacing, transect width, flight altitude and speed. Coverage during surveys conducted for Peary caribou within the NWT has varied among areas and over time (Table 9). Most recent surveys use a 500 m transect width on each side of the aircraft. Although some of the earlier surveys had very low coverage (e.g., 4-6%), current surveys generally aim for 20% coverage (5 km spacing on transects, 1 km total strip width) with increased coverage in higher density strata. Standardization of survey methods has facilitated more equitable comparison of results over time.

The systematic effort and extent of coverage during surveys make it unlikely that there are unexplored areas (at the scale of tens of kms) that could contain Peary caribou. The negative data (areas searched and Peary caribou not found) are available in individual survey reports. However, because individual surveys only provide a snapshot in time with respect to distribution, the lack of observations of caribou in an area during a survey does not necessarily indicate that caribou are absent from that area (except maybe ice caps on western Melville Island), since they could potentially occupy that area the following week, month or year. The frequency that aerial surveys have been conducted has varied among island groups, with long gaps between surveys on the NWT WQEI (Table 9). Seasonally, most surveys have been conducted during summer months.

Table 9. Years and aerial survey coverage for Peary caribou subpopulation in the NWT, 1961-2019.

Survey Month Year	Coverage (%)	Comments	Reference
Western Queen Elizabeth Islands			
Northwestern Queen Elizabeth Islands (Mackenzie King, Brock, Borden)			
Aug 1961	4		Tener 1963
Apr 1973	~25-50		Miller *et al.* 1977a
Apr 1974	~25-50	Brock, Borden islands not done	Miller *et al.* 1977a
Jul 1997	20	Borden island not done	Gunn and Dragon 2002
Southwestern Queen Elizabeth Islands (Melville Group)			
Jul 1961	4	Byam Martin not done	Tener 1963
Mar-Apr 1972	~25-50	Prince Patrick, Emerald islands not done	Miller *et al.* 1977a
Aug 1972	~25-50	Prince Patrick, Emerald islands not done	Miller *et al.* 1977a
Mar-Apr 1973	~25-50		Miller *et al.* 1977a
Jul-Aug 1973	~25-50		Miller *et al.* 1977a
Apr 1974	~25-50	Melville Is. not done	Miller *et al.* 1977a
Jul-Aug 1974	~25-50	Emerald not done	Miller *et al.* 1977a
Jul 1986-87	27		Miller 1988
Jul 1997	20		Gunn and Dragon 2002
Jul-Aug 2012	18		Davison and Williams 2016
Banks/Northwestern Victoria Island			
Banks Island			
Jun 1970	Unknown	Northern Banks	Kevan 1974
Sep 1972	6-25		Urquhart 1973
Mar 1979-80	25-26		Vincent and Gunn 1981
Jul 1982	15		Latour 1985
Jul 1985	9-24		McLean *et al.* 1986
Jun 1987	5-15		McLean 1992
Jun 1989	10-20		McLean and Fraser 1992
Sep 1990	5		McLean *et al.* 1992
Jun-Jul 1991	10		Fraser *et al.* 1992
Aug 1992	20-40		Nagy *et al.* 2009b
Jul 1994	20-40		Larter and Nagy 2001d
Jul 1998	20-40		Larter and Nagy 2001d
Jul 2001	20		Nagy *et al.* 2006c
Jul 2005	20		Nagy *et al.* 2009c
Jul 2010	20		Davison *et al.* 2013
Jul 2014	20		Davison *et al.* 2017

Jul 2019	17		Davison and Baryluk 2021
Northwest Victoria Island (Minto Inlet)			
Jun 1987	6		Gunn and Fournier 2000a
Mar 1992	10-31		Heard 1992a
Mar 1993	5-10		Gunn 2005
Jun 1993	10		Gunn 2005
Jun 1994	10-30	Stratum IV of W Victoria	Nishi and Buckland 2000
Jul 1998	20		Nagy *et al.* 2009d
Jul 2001	20		Nagy *et al.* 2009e
Jul 2005	10-20		Nagy *et al.* 2009f
Jul–Aug 2010	20		Davison and Williams 2013
Apr-May 2015	20		Davison and Williams 2019
May 2019	17		Davison and Williams, in prep.

Distribution Trends

There is limited technical information available to determine whether there have been any long-term changes in distribution of Peary caribou in the NWT on individual Arctic Islands. Distribution of Peary caribou in the NWT is primarily based on infrequently conducted aerial surveys, which provide general information on seasonal presence and abundance, but do not necessarily indicate absence (see *Search Effort*). Detecting overall distributional changes is also difficult because there is only one year (1987) when almost the entire range of NWT WQEI, Banks Island, and the calving distribution on northwest Victoria Island were surveyed. Seasonal distribution may also be influenced by a number of factors including plant phenology, weather, and population size. For example, caribou winter ranges typically contract when populations decline (Bergerud *et al.* 2008).

For Peary caribou in the NWT, aerial surveys have been conducted since the 1960s, providing a longer-term dataset than for just the last three generations (27 years) that can be used to assess changes in distribution. The longer-term dataset is useful for understanding changes on Banks Island, where a population decline pre-dates the past 27 years (see *Population trend*), and for the WQEI, where islands have only been surveyed once or twice over the last 27 years (see Table 9).

One documented change in distribution is that migrations of Peary caribou between eastern coastal Banks and northwest Victoria islands appeared to have halted in the late 1980s (Miller 1986; SARRAMT 2004). In November 1950 and during the mid-1970s people in Ulukhaktok saw caribou crossing the ice between Banks and Victoria islands (McEwan 1952, Nagy *et al.* 1998). Movements back and forth between Banks and Victoria islands occurred during the early 1980s, and the last movements were observed in the late 1980s (Nagy *et al.* 1998; RWED

1998). However, there is insufficient information to interpret whether migration between Banks and northwest Victoria islands (Manning and Macpherson 1958; Wilkinson and Shank 1974; Nagy *et al.* 1996) ceased due to a change in behaviour, a contraction of the range of Peary caribou on Banks Island or northwest Victoria Island or lack of observation. The post-calving aggregation in the northwest portion of Banks Island diminished from 1982 to 1991 as the population declined (Nagy *et al.* 1996), but larger numbers of caribou were seen in the northwest portion of Banks Island later in the 1990s, 2000s and 2010s (Nagy *et al.* 2006, 2013a,b; Nagy and Gunn 2009; Davison *et al.* 2013, 2017). However, using information from post-calving and summer aerial surveys within an island to examine trends in distribution is complicated by annual variation in the timing of plant phenology (Larter and Nagy 2001b), which influences caribou movements (e.g., timing of movement inland to higher elevations or to the coast).

The low numbers of Peary caribou recorded on northwest Victoria Island since the 1990s and their scattered dispersion make it difficult to describe any changes in seasonal distribution.

Reduced use of smaller islands during times of reduced abundance is likely for Peary caribou (Miller *et al.* 1977b). There is some evidence (one year's data) to suggest a contraction in summer range in the NWT WQEI. In 1997, Peary caribou were not seen on three islands (Brock, Eglinton and Emerald islands) during aerial surveys covering the island complex, although carcasses were seen on Emerald Island (Gunn and Dragon 2002). Peary caribou had been consistently seen on those islands in 1961, 1972-74 and 1987-88 aerial surveys, and were seen there again in 2012 (Appendix B). In addition, on Eglinton Island, two Peary caribou were observed in July 2006, and a group of 11 caribou were observed in June 2007 (ENR and Environment Canada, unpubl. data 2011).

Movements

Connectivity and access to movement corridors on both land and sea ice are important to Peary caribou. Peary caribou undergo seasonal movements on individual islands or between islands and use different areas for winter/summer ranges, calving and rutting, seasonal forage and to escape extreme weather events or bad environmental conditions (ECCC 2021; see also *Indigenous and Community Knowledge component – NWT Distribution* Figure 10).

Inter-island movements are part of regular annual seasonal migration or occur sporadically in response to adverse environmental conditions (Miller 1990) and correspond to when and where quality and concentration of fast ice is highest (Jenkins and Lecomte 2012). Sea ice surrounds Canadian Arctic Islands for more than 8 months a year (Miller *et al.* 2005), and spring and early winter migrations occur from about April to June, and November to December, respectively (Mallory and Boyce 2018). Ungulates are thought to undertake seasonal migration as a strategy to access higher abundance or quality of forage (McCullough 1985), or to reduce

the risk of predation (Fryxell and Sinclair 1988). Snow is considered a driver of migration in many areas.

In the early 1970s when Peary caribou abundance on Banks Island was higher, Urquhart (1973) recorded caribou migrating in groups between the winter ranges on southern Banks Island and calving and summering ranges on the northern and eastern portions of the island, based on five island-wide seasonal aerial surveys in 1971 and 1972 and observations of small groups of caribou moving north in early May. Subsequent surveys have been conducted primarily during early post-calving (late June-early July) and therefore only provide information on distribution (with concentrations in the northwestern, central and northeastern portions of the island) and not movements (see *Seasonal distribution*). However, only one of the 10 cows fitted with satellite collars in 1999 migrated across Banks Island, where this cow moved from summering in the southwest to wintering in the northwest in 2 of 4 years of monitoring; the other collared caribou generally remained year-round on southern and western Banks Island (ENR unpubl. data 2011). These telemetry data have not been analysed or reported. The difference in the scale of migratory behaviour between the aerial survey data and the collared cows may be a consequence of low densities and or variability in migratory behaviour between individual caribou. As caribou numbers decline, the advantages of gregarious calving such as safety in numbers from predation may be decreased, causing caribou to reduce length of their seasonal migrations. At lower densities, the proximity of seasonal habitats may be sufficient to allow caribou to occupy relatively small home ranges. On Bathurst Island (Nunavut), for example, Peary caribou remained year-round within individual home ranges either within a single island or a group of islands (Miller 2002; Miller and Barry 2003).

On northwest Victoria Island, Peary caribou cows moved between summer and winter ranges, based on satellite-collared caribou (Gunn and Fournier 2000a).

Prior to the 1980s, Peary caribou moved between Banks Island and northwestern Victoria Islands (see *Distribution trends*). Peary caribou also move between islands in the NWT WQEI (Tener 1963; Miller 1977a). Although movements are typically over sea-ice, movements of Peary caribou swimming between islands during summer months have also been recorded (Miller 1995).

Little is known about Peary caribou dispersal between islands. Dispersal is usually defined as innate or environmentally forced, directional movement (as opposed to migration). Environmentally forced dispersal could relate to forage inaccessibility due to high densities or imposed by icing and snow conditions. Throughout their annual cycle Peary caribou remain dispersed across the landscape at low densities, even during calving and rutting (ECCC 2021). As such, no information is available for dispersal at high densities, but there are a few sightings to support environmentally forced dispersal during winters with above average snowfall or icing. For instance, harvesters/trappers reported that Banks Island Peary caribou were seen on

the sea-ice west of Banks Island in 1952/53 and 1970/71 and on the mainland in 1952/53 (McEwan 1955; Urquhart 1973; see also *NWT Distribution*); although their subsequent survival is unknown. In October 1995, after heavy snowfall on the group of islands off the northwest coast of Bathurst Island, NU, a satellite-collared cow left the islands she had previously used and moved northwest roughly 250 km over sea-ice to Lougheed Island, NU and then to Borden Island, NT, but she died in December 1995 (Poole *et al.* 2015). Similar unusual movements during fall icing are known from Svalbard reindeer; the scale of the movements is related to the extent of icing (Stien *et al.* 2010).

Habitat Requirements

Peary caribou habitat and habitat requirements are documented through studies during the 1970s and 1990s on Banks Island (Wilkinson *et al.* 1976; Shank *et al.* 1978; Larter and Nagy 2001a, b, c), and a short-term study on Melville Island (Parker 1978). The approach to assessing habitat requirements is dependent on describing diet, distribution of forage by habitat types, and the distribution of caribou feeding craters relative to snow conditions and habitat type (Wilkinson *et al.* 1976; Shank *et al.* 1978; Larter and Nagy 1994, 1997, 2001abc, 2004; Larter *et al.* 2002). Various studies described diet, summer habitat use and responses of Peary caribou foraging to threefold variation in snow conditions on south central Banks Island between 1993 and 1998 (Larter and Nagy 2001a). Some information on diet and habitat selection was collected on western Melville Island in the early 1970s (Parker 1978) and eastern Melville Island (Thomas *et al.* 1999).

Peary caribou use a relatively wide variety of habitats (terrain and vegetation types). The range of Peary caribou in the NWT is located within the Northern Arctic Level II Ecoregion, with most Northwest Victoria Island and most of Banks Island in the Mid-Arctic Level III Ecoregion, and the northwestern and northeastern areas of Banks Island and the WQEI in the High Arctic and High Arctic-oceanic Level III Ecoregions (Ecosystem Classification Group 2013). Available habitat includes mostly creeping dwarf-shrubs and lichens and mosses (Gould *et al.* 2003). Ranges are snow-covered from September to May (Banks Island) or mid-late June (Melville Island). Consequently, a key habitat requirement is terrain and vegetation features that offer choices as caribou adjust their foraging to changing snow conditions. On Banks Island, the key habitat requirement for winter foraging was upland habitats with a shallow snow-cover, even though vegetation was sparse (Larter and Nagy 2001a). Similarly, on eastern Melville Island, caribou in winter used sparsely vegetated upland ridges with sedges and lichens (Thomas *et al.* 1999). The amount of lichen in the winter diet of Peary caribou on eastern Melville Island varied depending on snow conditions – in years with deeper harder snow there was a lower occurrence of lichen in the diet (Thomas and Edmonds 1983). During winter, legumes (*Astragalus* spp. and *Oxytropis* spp.) are important dietary items high in nitrogen (Larter and Nagy 1997, 2001b, 2004). A recent pilot project in Aulavik National Park on Banks Island

suggests that Peary caribou favour mesic sedge-herb habitats during late winter (Frandsen and Leblond 2021).

Habitat requirements during the snow-free season appear to be tied to forage selection for the flower and leaf buds and newly emerged leaves and flowers (Larter and Nagy 2001b; see *Interactions – Forage* for a discussion on forage quality). Peary caribou select leaves and flowers such as purple saxifrage (*Saxifraga oppositifolia*) and arctic poppy (*Papaver radicatum*) to maximize protein intake in summer. Willows (*Salix* spp) comprise almost half the summer diet on Banks Island (Larter and Nagy 2004) and in Aulavik National Park, caribou select *Dryas* snowbanks during summer (Frandsen and Leblond 2021). On the WQEI, Peary caribou move first to higher elevations then to coastal areas during the summer, which appears to be tied to plant phenology (Miller *et al.* 1977a). On eastern Melville Island, caribou in summer were associated with willow and arctic poppies as well as lichens and forbs (Thomas *et al.* 1999).

Little is known about the habitat requirements for calving areas other than the generalities that calving areas are mainly associated with major drainages and coastal sites with varied terrain providing snow-free or shallow snow-covered sites, at least shortly before and during calving each year (Urquhart 1973; Miller *et al.* 1977a; Gunn and Fournier 2000a,b). The question of fidelity to calving areas and the degree of gregarious behaviour is covered in the section on *Life cycle and reproduction*.

Habitat requirements for fall and rutting areas are only known in general terms, although Peary caribou on Banks Island select habitats where they feed on sedges (*Carex* spp), pea plants (*Astragalus spp*, *Oxytropis spp*), and mountain avens (*Dryas spp*) (Larter and Nagy 2004).

In addition to terrestrial habitat requirements, Peary caribou require reliable sea-ice for moving between islands (Jenkins and Lecomte 2012). The characteristic sea ice required for successful caribou crossing are >90% sea ice cover in the area and t least 10 cm ice thickness (Poole *et al.* 2010; Johnson *et al.* 2016; ECCC 2021).

Habitat Availability

Although island-wide vegetation mapping has been completed for Banks Island (Larter *et al.* 2009), habitat availability has only been partially addressed in other range studies of Banks Island. Larter and Nagy (2001c) described the distribution of forage plant species among different habitat types and found that it varied according to local topography. The authors acknowledged that plant standing crop and quality would need to be incorporated to assess habitat availability; these data have been collected but not thoroughly analyzed. Information is lacking on habitat availability for Peary caribou on Northwest Victoria Island and the NWT portion of the WQEI. However, two calving areas on Banks Island and one on Northwestern Victoria Island have been identified as Important Wildlife Areas for Peary caribou in the NWT (Figure 26; Wilson and Haas 2012).

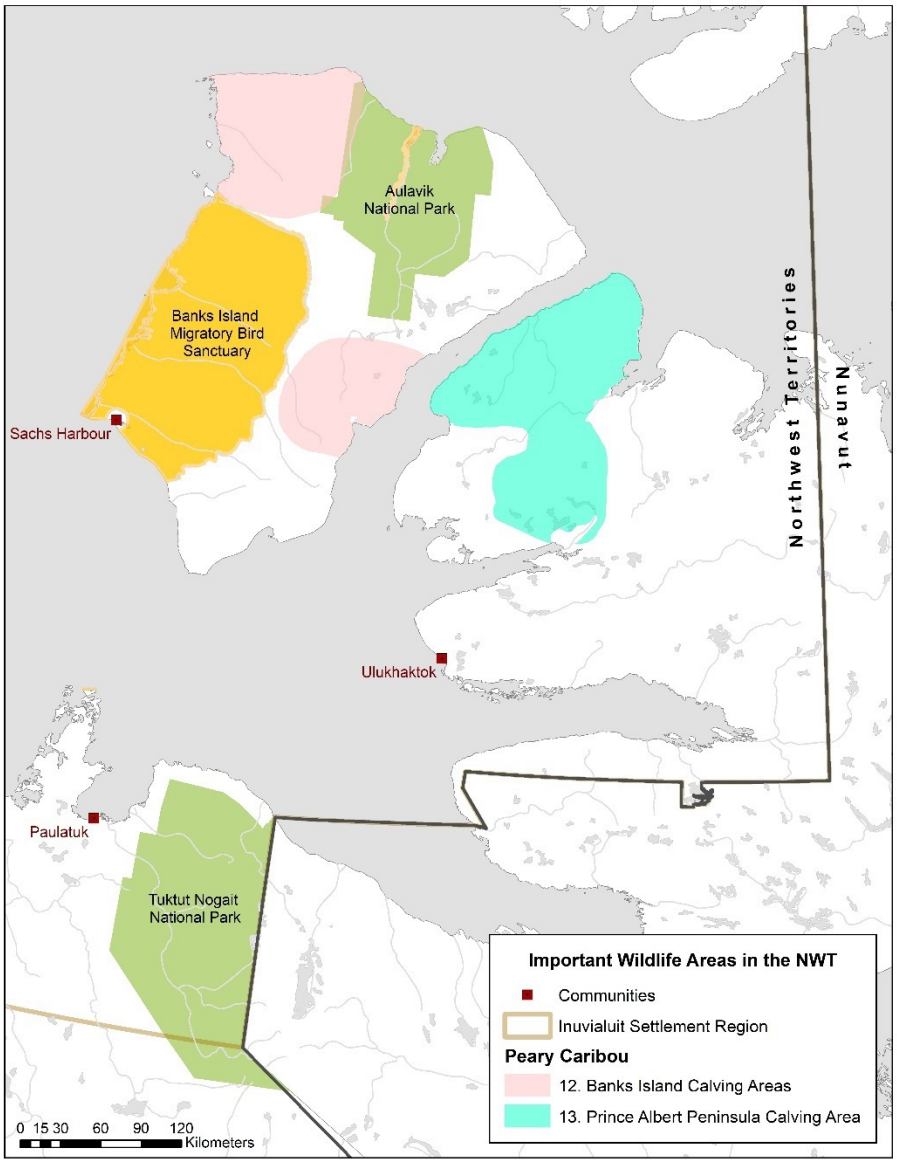

Figure 26. Important Wildlife Areas identified for Peary caribou in the Northwest Territories (reproduced from Wilson and Haas 2012 with permission). Map courtesy of M. Routh, ENR.

Habitat availability for 8-9 months of the year is strongly influenced by snow conditions. Larter and Nagy (2001a) describe annual variations in snow conditions from 1993 to 1998. Larter and Nagy (2000b) used urine metabolites collected at three times during the winter to assess the nutritional status of Peary caribou from 1993 to 1998, and suggested that conditions during the five years of the study were likely not severe enough to create nutritional stress. The influence of snow and ice conditions on habitat availability is discussed in *Threats*. Influence of caribou or muskoxen numbers is covered in the section on *Interactions*. Because there is a complete lack of locational information from satellite or GPS collared caribou, occupied and unoccupied habitats cannot be quantified; it is only practical to map the distribution of habitats. Parks

Canada and Environment and Climate Change Canada recently mapped land cover classes in Aulavik National Park, which were used in developing Resource Selection Functions for Peary Caribou winter and summer habitat; the pilot project is currently being expanded to all of Banks Island (Frandsen and Leblond 2021).

Based on aerial surveys conducted since the 1960s, Peary caribou have been found to occupy all of the Arctic Islands in the NWT. On Victoria Island, based on technical information, Peary caribou occupy the northwestern portion of the island. However, distribution information from radio-collared Peary caribou and population surveys is limited, and therefore Peary caribou could potentially occupy habitats beyond the currently defined distribution.

Habitat Trends

Changes in habitat are expected to occur as a result of climate change. In the western continental Arctic, there are measured trends for increasing plant productivity based on satellite imagery and changes in vegetation such as an increase in shrub growth (Callaghan *et al.* 2005; Hudson and Henry 2009). Changes in the timing of snow melt for eastern Banks and western Victoria islands have been noted. The mean date of snow melt on Banks Island was 7.5 days earlier for 1987-2004 compared to 1967-86 although melt has actually occurred later in the 2000s than in the 1990s (Foster *et al.* 2008). Climate change will also result in changes to sea-ice conditions. More information relating to habitat trends and a warmer climate is included in *Threats*.

Habitat Fragmentation

Activities that can potentially fragment habitat such as ice roads and seismic lines were more frequent in the early 1970s during exploration for oil and gas on Banks and the NWT WQEI. Limited information on Peary caribou behavioural responses indicates activities associated with oil and gas exploration were not at a scale to fragment habitat at that time (Urquhart 1973).

Loss of sea ice could affect the ability of Peary caribou to move between islands during seasonal migrations, and to disperse to other islands during episodes of unfavourable environmental conditions. Loss of sea ice could effectively result in fragmentation of the overall range if caribou become isolated on individual islands. Some shorter-distance movements could potentially occur during ice-free periods, but it is not known how far caribou are able to swim beyond about 2.5 km between islands (Miller 1995). However, swimming may not be an option if caribou need to disperse due to adverse environmental conditions during winter.

POPULATION

Abundance

Based on the most recent population surveys, there are approximately 8,700 Peary caribou in the NWT, which includes about 7,800 adults (Table 10). The estimates for Banks Island and Northwest Victoria are the most recent (2019), while the estimates for the Melville Group are from 2012 and are eight years old. For the Melville Group, all of Melville Island, which lies partially in Nunavut, and Byam Martin Island, which lies entirely within Nunavut, are included in the estimate based on known caribou movements between the islands in the group (see NWT Distribution). Population estimates for the Northwestern Queen Elizabeth Islands in the NWT are over 20 years old and likely do not represent current numbers.

Table 10. Current estimates of Peary caribou in the Northwest Territories.

Island	Survey Year	Total	Adult (≥1 year old)[1]		Reference
		Estimate	Estimate	95% CI	
Subpopulation: Western Queen Elizabeth Islands (NWT portion)					
Northwestern Queen Elizabeth Islands (NWT)					
Mackenzie King	1997	45[2]	36	0-79	Gunn and Dragon 2002
Brock	1997	0	0	-	Gunn and Dragon 2002
Borden	1973	16	-	-	Miller *et al.* 1977a
Southwestern Queen Elizabeth Islands (Melville Group)					
Melville[3]	2012	3029[2]	2712	2225-3199	Davison and Williams 2016
Prince Patrick	2012	3099[2]	2635	1774-3496	Davison and Williams 2016
Eglinton	2012	183[2]	183	49-317	Davison and Williams 2016
Emerald	2012	54[2]	46	0-124	Davison and Williams 2016
Byam Martin (NU)[3]	2012	150[2]	119	49-192	Davison and Williams 2016
Total Melville Group	2012	6515	5695		
Total Subpopulation (Western QEI – NWT portion)		6576	5731		
Subpopulation: Banks/Northwest Victoria Islands					
Banks	2019	2108[2]	1913	1507-2319	Davison and Baryluk 2021
NW Victoria Island	2019	NA	176	-	Davison and Williams in prep.
Total Subpopulation (Banks/Northwest Victoria)		2108+	2089		
Total: NWT					
Total NWT		8684+	7820		

[1] Adult includes individuals ≥1 year old.
[2] Total number of caribou estimated using % calves to calculate number of calves and adding them to the number of adults.
[3] Byam Martin Island and a portion of Melville Island are in Nunavut, but all caribou counted in the Melville Group are included here.

The number of caribou ≥ 1 year old is used here to approximate the number of mature (reproducing) individuals. However, because cows may mature at 2, 3, or >3 years of age depending on condition (see Life cycle and reproduction), the number of caribou ≥ 1 year old is likely an overestimate of the number of mature individuals.

Population estimates are based on the number of Peary caribou observed along strip transects during aerial surveys. Transect surveys are conducted because Peary caribou ranges are vast and remote, which makes it difficult to survey the entire range, and Peary caribou do not reliably aggregate like barren ground or Dolphin and Union caribou. The area covered during a survey depends on the number and width of transects, and spacing between transects (Appendix B). The density of caribou counted in the strip transects is then extrapolated to the portion of the survey area outside the strip transects, to estimate the number of caribou in the total survey area. Portions of the survey area may be stratified, with increased survey effort in areas with higher expected densities. The method of extrapolation from the numbers counted has varied slightly. The variance around estimates from earlier surveys was not always provided in original reports, which means the precision is unknown. In some recent surveys, variance (standard error, confidence limits, coefficient of variation) around the mean estimate was relatively wide, partly because of low overall densities, patchy distribution, and standardised stratification. Even with these uncertainties in estimating abundance, it has been possible to detect significant declines (see *Trends and fluctuations*).

The aerial survey methods used to estimate abundance are relatively well standardized, which increases the validity of trend estimates. The speed, altitude and strip width are typical for caribou surveys and this should contribute to standardizing bias (i.e. the probability of detecting caribou within the strip transect and of counting them accurately). Although methods to quantify bias such as double counting exist, they have not been applied to Peary caribou. McLean (1992) commented that reducing survey altitude from 180 to 150 m above ground level and reducing strip width from 2 to 1 km in July 1987 improved sightability of caribou.

COSEWIC (2015) estimated a global population of approximately 13,200 Peary caribou. However, using more recent survey data from 2016 and 2019 SARC estimates the global population of Peary caribou at 10,400 adult (≥1 year old) Peary caribou (Table 11). Recent survey data includes estimates for Lougheed Island (Nunavut portion of Western Queen Victoria Islands; Anderson 2016b) in 2016, as well as from Banks (ENR unpubl. data 2020) and Axel Heiberg Island (Eastern Queen Victoria Islands in Nunavut; Mallory *et al.* 2020a) in 2019; these new estimates were lower than previous estimates used in COSEWIC's assessment and status report on the Peary caribou (COSEWIC 2015).

The NWT Peary caribou population (~7,800 adults) represents approximately 75% of the global population (Table 11). All of Melville Island, which straddles the NWT/Nunavut border, was

included in the calculation because caribou move between all of the islands in the Melville Group (Miller *et al.* 1977b).

Table 11. Current estimates of Peary caribou in Canada.

Subpopulation	Territory	Island	Year	Estimated Adult (≥1 year old)	Reference
Banks/Northwest Victoria Islands	NWT	Banks	2019	1913	ENR unpubl. data 2020
		NW Victoria	2019	176	Davison and Williams in prep.
Western Queen Elizabeth Islands	NWT	Mackenzie King	1997	36	Gunn and Dragon 2002
		Brock	1997	0	Gunn and Dragon 2002
		Borden	1973	16[1]	Miller *et al.* 1977a
		Prince Patrick	2012	2635	Davison and Williams 2016
		Eglinton	2012	183	Davison and Williams 2016
		Emerald	2012	46	Davison and Williams 2016
	NWT/NU	Melville	2012	2712	Davison and Williams 2016
	NU	Byam Martin	2012	119	Davison and Williams 2016
		Devon	2016	14[2,3]	Anderson 2016a
		Lougheed	2016	140[1]	Anderson 2016b
		Bathurst	2013	1482[1]	Anderson 2014
		Cornwallis	2013	2[2,3]	Anderson 2014
		Little Cornwallis	2013	1[2]	Anderson 2014
		Helena	2013	2-3[2,4]	Anderson 2014
Eastern Queen Elizabeth Islands	NU	Axel Heiberg	2019	6[2,3]	Mallory *et al.* 2020a
		Ellesmere	2015	918[1,5]	Johnson *et al.* 2016
Prince of Wales/ Somerset/Boothia	NU	Prince of Wales	2016	0	Anderson 2016c
		Somerset	2016	0[6]	Anderson 2016c
		Russell	2016	0	Anderson 2016c
		Boothia	2006	1[2]	Dumond 2006

[1] Includes calves.
[2] Minimum count.
[3] Did not specify whether there were any calves, but it is assumed all animals were adults.
[4] The map showed that a group of 2-3 Peary caribou were seen on Helena Island but no details were provided in the text.
[5] Based on a 2015 survey of southern Ellesmere Island (Anderson and Kingsley 2015), which was then extrapolated to the whole island (Johnson *et al.* 2016). Includes an area correction (Johnson *et al.* 2016). Subsequently, during a survey of central Ellesmere Island in March 2017, 14 caribou were seen resulting in a population estimate of 32 (95% confidence interval = 8-127; Fredlund *et al.* 2019).
[6] Although no Peary caribou were seen during the survey, 2 caribou were seen by harvesters on the west coast of Somerset Island.

Population Dynamics

Factors contributing to population change include calf recruitment into the breeding population, adult mortality, emigration and immigration. For Peary caribou in the NWT, information is available on calf recruitment from population and composition surveys, but there is little information on mortality, immigration or emigration rates.

Recruitment to breeding age depends on pregnancy rate and calf survival. Calf survival depends partially on the calf's body size, which reflects the cow's condition during pregnancy and lactation. The only information about pregnancy rates is from the WQEI, where rates varied between 6-7% for 1974-76 (after 1973-74 winter which had above average snowfall – Miller *et al.* 1977a; Miller and Gunn 2003) and 88% in 1977 (Thomas 1982).

Two indicators of calf survival include calves/100 cows and % calves collected during composition and population surveys respectively (Tables 12 and 13). Larter and Nagy (2000c) analysed the sex and age composition data for Banks Island collected in 1982 and during 1990-99. The months for the surveys and sample size varied, although for the period 1993-99 the composition surveys were flown in June-July (Larter and Nagy 2000c). Calf production varied but was >50 calves per 100 adult cows for 8 of 11 years. Over-winter survival of calves varied from 23-86%. Neither calf survival nor calf production were significantly related to snow hardness or snow depth. Larter and Nagy (2000c) concluded that either their data on calf production and survival had not sampled the full range of winter conditions or that snow depth or snow hardness were not solely responsible for calf production and winter survival. The lowest calf ratio (24:100 2+ year cows) followed the winter of 1993-94 with increased snow hardness and icing conditions during the previous October-November, however the overwinter survival of calves calculated for winter 1993-94 was the highest in seven years reported (Larter and Nagy 2000c). Rain falling after snowfall in early October 2003 led to ground fast ice (Rennert *et al.* 2009), and was followed by lower calf productivity in 2004 as sex and age composition surveys revealed 29 calves:100 adult cows (Nagy and Gunn 2009).

Table 12. Peary caribou composition data and percent calves from surveys on Melville and Banks Islands, 1972-2019.

Island	Year	Timing	Survey Type[1]	Total Counted	% Calves	Calves/ 100 cows[2]	Recruitment rate[3]	Reference
Melville	1998	July	C	46		80	17	Larter and Nagy 2003
	1999	July	C	73		45	24	Larter and Nagy 2003
	2000	July	C	57		63	25	Larter and Nagy 2003
	2001	July	C	121		37	12	Nagy and Gunn 2009
	2012	July/Aug	P	599	12			Davison and Williams 2016
Banks	1971	June	P	N/A	28			Urquhart 1973[4]
	1982	July	P	1726	19			Nagy *et al.* 1996
	1985	July	P	983	15			Nagy *et al.* 1996
	1987	June	P		21			Nagy *et al.* 1996
	1989	June	P	462	23			Nagy *et al.* 1996
	1991	June/July	P	93	3			Nagy *et al.* 1996
	1992	Aug	P	392	31			Nagy *et al.* 1996
	1994	July	P	361	8			Nagy *et al.* 2013a
	1994	July	C	47		24	26	Larter and Nagy 2003
	1995	July	C	29		-[5]	-[5]	Larter and Nagy 2003
	1996	July	C	34		67	25	Larter and Nagy 2003
	1997	July	C	52		40	21	Larter and Nagy 2003
	1998	July	C	156		74	19	Larter and Nagy 2003
	1998	July	P	280	19			Nagy *et al.* 2013b
	1999	July	C	174		71	24	Larter and Nagy 2003
	2000	July	C	80		57	27	Larter and Nagy 2003
	2001	July	P	466	26			Nagy *et al.* 2006c
	2004	July	C	112		29	7	Nagy and Gunn 2009
	2005	July	P	281	19			Nagy *et al.* 2009c
	2006	July	C	141		55		Gunn and Williams 2006
	2010	July	P	360	23			Davison *et al.* 2013
	2014	July	P	943	17			Davison *et al.* 2017
	2019		P	364	10			Davison and Baryluk 2021

[1] Survey type includes composition surveys (C) which are designed to provide information on numbers of different sex and age classes, yielding data on calf:cow and bull:cow ratios. And population surveys (P) which are aerial surveys designed to provide information on the number of animals, yielding data on percent calves.
[2] Number of calves per 100 adult females (2+ years of age) is used as the best estimate of calf production.
[3] Recruitment rate = (no. of yearlings/100 adult Females)/(100+(no. yearlings/100 adult Females)) expressed as %; Larter and Nagy (2003).
[4] Urquhart (1973) suggested that the high % calves may have been partly due to heavy mortality of bulls the previous winter; a survey conducted in June 1972 during calving to map calving habitat did not provide an adequate representation of calves (Urquhart 1973).
[5] Larter and Nagy (2003) did not calculate productivity or recruitment in 1995 because only 15 caribou were classified.

Table 13. Percent calves observed during population surveys of the main Western Queen Elizabeth Islands, 1961-2012. All surveys occurred during July and August.

Area	Year	% Calves	Reference
Mackenzie King, Brock and Borden	1961	22	Tener 1963
	1997	25	Gunn and Dragon 2002
Melville	1961	19	Tener 1963
	1972	0	Miller *et al.* 1977a
	1973	12	Miller *et al.* 1977a
	1974	1	Miller *et al.* 1977a
	1987	19	Miller 1988
	1997	0	Gunn and Dragon 2002
	2012	12	Davison and Williams 2016
Prince Patrick	1961	20	Tener 1963
	1973	11	Miller *et al.* 1977a
	1974	7	Miller *et al.* 1977a
	1986	30	Miller 1987
	1997	0	Gunn and Dragon 2002
	2012	18	Davison and Williams 2016

On Banks Island, trends in productivity (% calves) were poorly discernable, largely because of high annual variation (Figure 27). During higher and relatively stable numbers between 1972 and 1982 (see *Trends and fluctuations*), percent calves in 1972 was 28% and in 1982 was 19%. During the decline on Banks Island between 1982 and 1991, the percent calves was lower and the variance relatively large ($\bar{x}$ = 15 ± 8.9% (SD), n = 4), and during the period of comparatively low and stable abundance between 1992 and 2010 the percent calves was slightly higher and variance slightly lower ($\bar{x}$ = 21 ± 8.0%, n = 6). Percent calves did not differ significantly between these two periods (t = 1.1, 6 df, P = 0.31). Thus, the period of decline was characterized both by slightly fewer calves and greater variability in calf production and survival among years. The lowest proportion of calves was recorded in 1991, although no explanation was offered (Fraser *et al.* 1992). However, this could be due to low detectability of calves as the survey was flown in late June and early July with 10-100% snow cover over higher ground. Since 2010, percent calves on Banks Island decreased to 17% in 2014 and further to 10% in 2019 (Davison *et al.* 2017; Davison and Baryluk 2021).

The limited numbers of surveys and relatively small sample sizes prevent identifying a trend in calf production on northwest Victoria Island (Figure 28). The low value of 5% calves in 1993 was likely influenced by a low sample size (n=21 individuals counted; see Appendix B) and by the survey being conducted from June 13 to 15 before the peak of calving. Sample sizes for surveys in 1993, 1998 and 2005 were ≤ 25 individuals and only the surveys in 1987 and 2001 had sample sizes that exceeded 50 caribou.

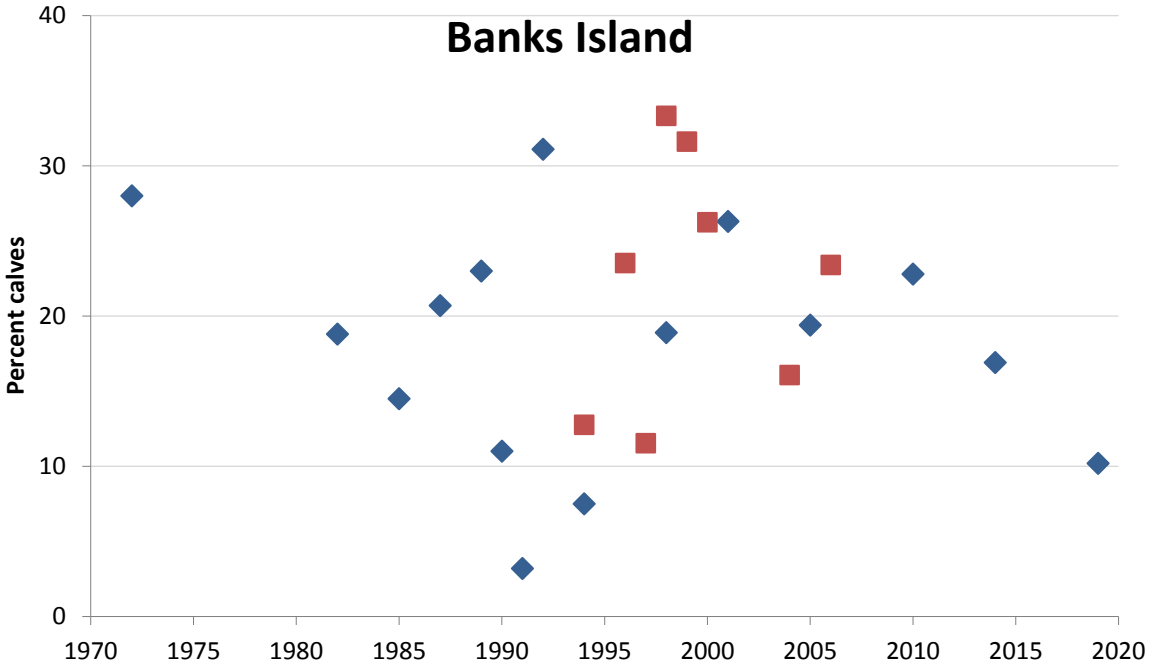

Figure 27. Percent calves observed on Banks Island, 1970-2019, during aerial surveys (blue diamonds) and composition surveys (red squares). Data are from late June to late July except for 1990 (September) and 1992 (late August). See Appendix B for data sources for surveys.

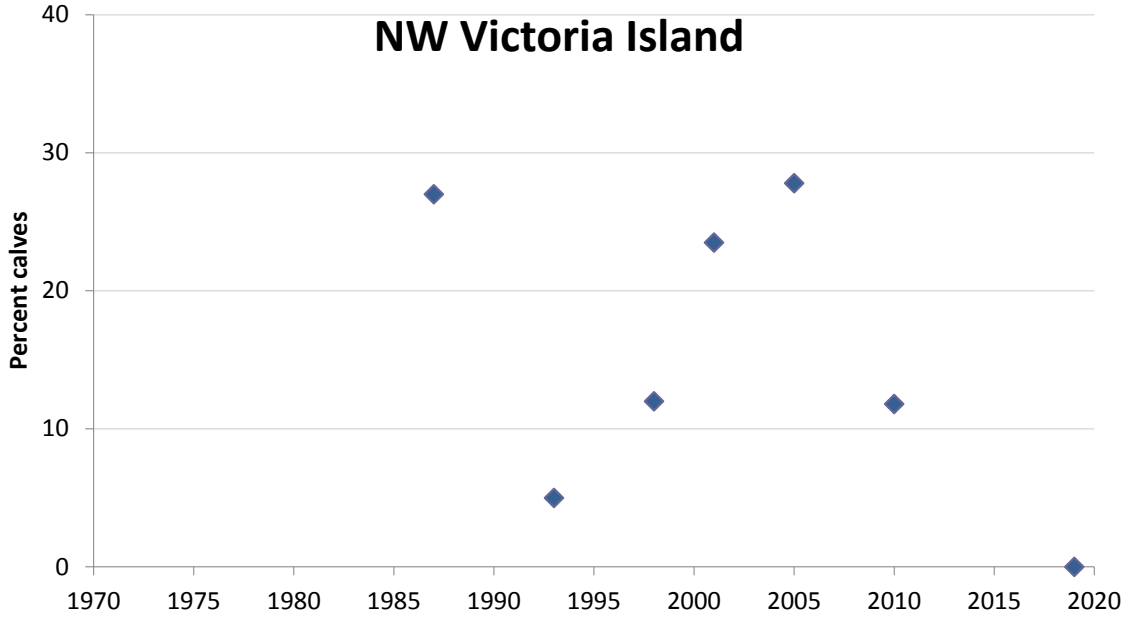

Figure 28. Percent calves observed on northwest Victoria Island, 1987-2019, during aerial surveys. All data were collected during mid-June to mid-July except for 2010 (early August). Sample sizes (total adults + calves) in 1993 and 2005 were low (20 and 66, respectively). See Appendix B for data sources for surveys.

Percent calves observed during summer surveys of the WQEI varied widely, although sample size (number of years) was small (Table 13). Very low percent calves (0-7%) were observed in some years (1972, 1974, 1986, and 1997) that followed winters with icing and above average snowfall (Miller *et al.* 1977a; Gunn and Dragon 2002). The most recent survey in 2012 indicates relatively low calf production for both Melville (12%) and Prince Patrick (18%) islands (Davison and Williams 2016).

Although there is no information about immigration or emigration rates for Peary caribou in the NWT, movements between islands and island groups suggest that immigration and emigration likely occur (Miller *et al.* 1977b). There is also limited information about adult mortality rates as there have only been a few Peary caribou radio-collared in the NWT to base mortality rates on.

Trends and Fluctuations

Aerial surveys for Peary caribou in the NWT have been conducted since the 1960s, providing an opportunity to evaluate population trend over a longer time period than the last three generations (27 years). Peary caribou undergo periodic population fluctuations, but it is unclear whether they are regular fluctuations, which are influenced by relationships among biological components of the ecosystem (e.g. caribou, forage, muskoxen), or whether fluctuations are a consequence of sporadic, unpredictable abiotic variables (Caughley and Gunn 1993; Miller and Barry 2009). Regardless, the temporal scope of these fluctuations in Peary caribou numbers in the NWT exceed the three-generation time period of about 27 years. Therefore, limiting the assessment of population trend to the past 27 years would not capture the full extent of the fluctuations. For this report, population trend is discussed for both the last three generations, and for the time period that reliable population information is available for, to aid in the understanding of population trends of Peary Caribou in the NWT.

Due to the long period of time between surveys for some island groups, available data may not be sufficient to determine whether the documented high numbers of Peary caribou followed by a decline and prolonged low numbers are part of regular fluctuations, or whether they represent a period of relative stability within an unusually prolonged decline, or whether the peak high numbers were atypical.

Trends in the NWT

Both subpopulations in the NWT display similar trends prior to 2010, which include relatively high abundance in the 1970s-80s (Banks/Northwest Victoria islands; Figures 29 and 30,) or the early 1960s (WQEI; Figure 31), followed by steep declines (averaging >90%) and then a period of relatively stable numbers at a lower population level. Since 2010, numbers have slightly increased on Banks Island, remained relatively stable on Northwest Victoria Island, and increased on the WQEI. The trends in abundance are based on aerial surveys of adequate

coverage, and comparable and relatively standard methodology, especially since the early 1990s. The weakest trend data are for the WQEI as surveys were infrequent, averaging less than one subpopulation estimate per 12 years (Figure 31). Details on surveys for the two subpopulations are summarized below.

Banks/Northwest Victoria Islands

Inuvialuit harvesters report that there were few caribou on Banks Island in the early 1950s, then in the late 1950s caribou numbers increased (Nagy *et al.* 1998). The increase was shortly after wolf numbers on Banks Island were greatly reduced during the 1955 to 1959 poisoning program. People did not start seeing wolves again until the early to mid-1970s. On northwest Victoria Island, elders reported that there were also few caribou in the 1950s with reports that caribou have gone through three cycles over the past 90 years (RWED 1998). Harvesters reported that caribou numbers were increasing during the 1960s and 1970s and then declined during the 1980s (RWED 1998).

Aerial surveys over Banks Island have tracked the trend in Peary caribou numbers since the early 1970s (Figures 29; Appendix B). Caribou numbers appeared stable between 1972 and 1982 (average exponential rate of change (Caughley 1977) of 0.013), then declined from an estimated 9,036 caribou (1+years old) in 1982 to 897 caribou (1+years old) in 1991 (Nagy *et al.* 1996), an average exponential rate of change of –0.257 (a halving rate of 2.7 years). The overall trend between 1991 and 2010 showed no evidence for recovery (average exponential rate of change 0.007). Instead, the trend was relatively stable at a low density, with an initial declining trend until 1998, then relative stability at slightly higher densities since 2001 (Nagy *et al.* 2006c, 2009c; Davison *et al.* 2013; Figure 29). Between 2010 and 2014, the population increased at a rate of 4.9% per year then between 2014 and 2019 decreased at an average annual rate of 3.1%, although the 2019 population estimate was not significantly different from the 2014 estimate (Davison *et al.* 2017; Davison and Baryluk 2021). Over the last three generations (1992 to 2019), Peary caribou on Banks Island have increased from an estimated 1015 caribou to 1913 caribou at an average annual rate of 3.3%. However, the relative recovery over the last 27 years is eclipsed by the overall population decline since 1972, with the current population at only 17% of the population size in 1972.

Between 1980 and 1993, Peary caribou from northwestern Victoria Island were surveyed five times. The surveys showed a rapid decline from a high of 4,512 caribou (including calves) in July-August 1980 (Jakimchuk and Carruthers 1980) to an estimated 114 ± 22 (1+years old) in March 1993 (Gunn 2005), an average exponential rate of change of –0.283, a halving time every 2.4 years (Figure 30). Only 4 caribou were observed on what was considered the range of the northwestern Victoria Island group of caribou in June 1994, too few to generate a population estimate (Nishi and Buckland 2000). A survey in April/May 2015 was also unable to generate a population estimate; only 2 caribou were observed (Davison and Williams 2019). Over the last

three generations (1992 to 2019), population estimates have fluctuated, but the overall trend has been stable at low numbers (Figure 30; Appendix B).

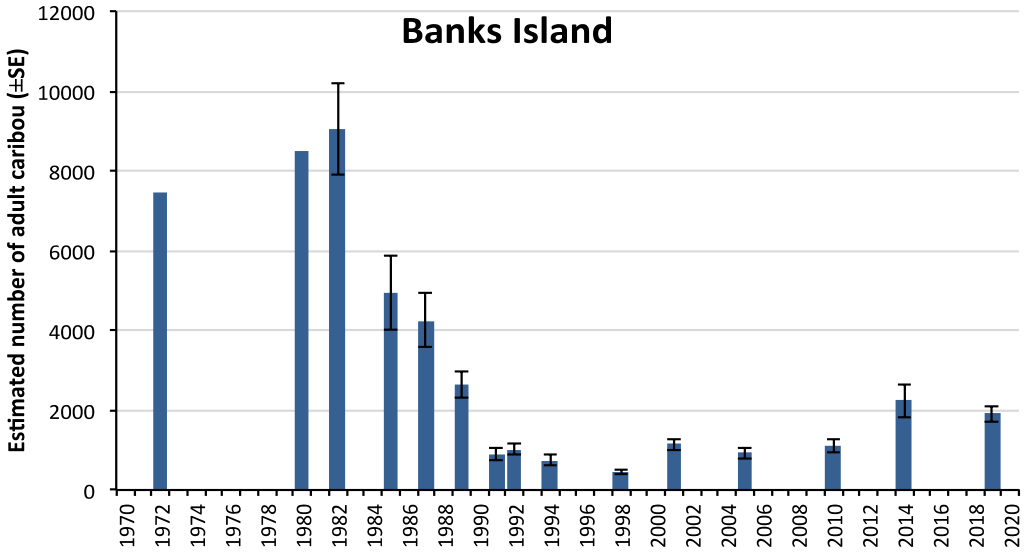

Figure 29. Estimates of Peary caribou numbers on Banks Island, 1972-2019. All estimates are for 1+ year old caribou (1972 survey estimate of 11,000 total caribou converted using percent calves). All surveys took place between late June and late August. Standard error bars are shown where available. See Appendix B for references.

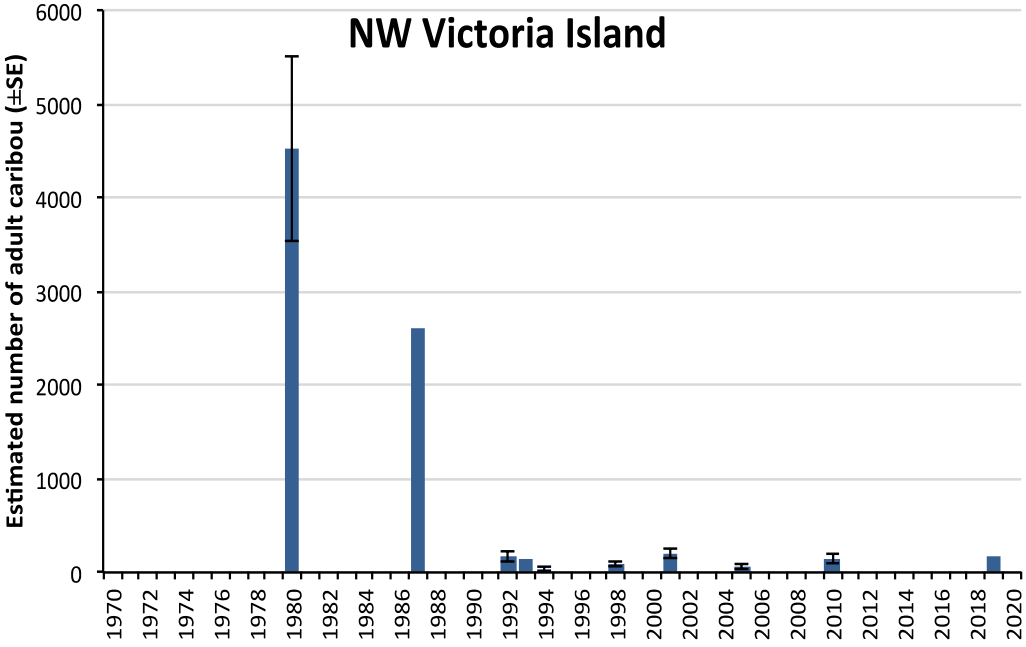

Figure 30. Estimates of Peary caribou numbers on northwest Victoria Island, 1980-2010. All estimates are for 1+ year old caribou, except for 1980, which includes calves. All surveys took place between late June and late August, except for 1992 (March), and 2019 (May). Standard error bars are shown where available. See Appendix B for references.

Western Queen Elizabeth Islands

Determining trends in Peary caribou abundance on the WQEI is complicated by the irregular timing of surveys (Figure 31; Appendix B). Also surveys have not always covered all the islands at the same time. This is potentially problematic as some caribou may seasonally migrate between Melville and Prince Patrick islands (Miller *et al.* 1977b). Between 1961 (the first range-wide aerial survey) and 1997, the overall trend was a 95% decline on Prince Patrick Island (1,797 to 84 1+ year old caribou) and a 92% decline on Melville Island (10,366 to 787 1+ year old caribou) (Tener 1963; Gunn and Dragon 2002), with average annual exponential rates of change of -0.085 and –0.072, respectively. Similar steep declines of 87-99% were detected on islands within the Mackenzie King, Borden and Brock group (Mackenzie King Island: 1, 710 1+ year old caribou in 1961 to 60 in 1974, average exponential rates of change of –0.258; Brock Island: 190 in 1961 to 24 in 1973, –0.172; Borden Island: 1,271 in 1961 to 16 in 1973, –0.365) (Tener 1963; Miller *et al.* 1977a; Gunn and Dragon 2002).

In 2012, the population estimate for the Melville Group (Melville, Prince Patrick, Byam Martin, Eglinton, Emerald) was about 5,700 1+ year old caribou (Davison and Williams 2016), which was 6.5 times higher than the 1997 estimate of 871, and 1.3 times higher than the 1973 estimate of 4,326. Because of the 15-year gap between the 1997 and 2012 surveys, it is difficult to determine the population trend during that period, which could have included periods of stability or decrease in addition to the increase. Mackenzie King, Brock and Borden Islands could not be reached because sea-ice between the islands was not solid and the required ceilings to cross open water in a single engine survey aircraft were not achieved (Davison and Williams 2016). However, in 2011, as part of fieldwork for the Ecological Classification of the NWT, crews surveyed portions of Mackenzie King, Borden and Brock islands over a one- day period and observed one Peary caribou bull on the southern end of Brock Island, but none on either Borden or Mackenzie King islands (Downing in SARC 2012: 88).

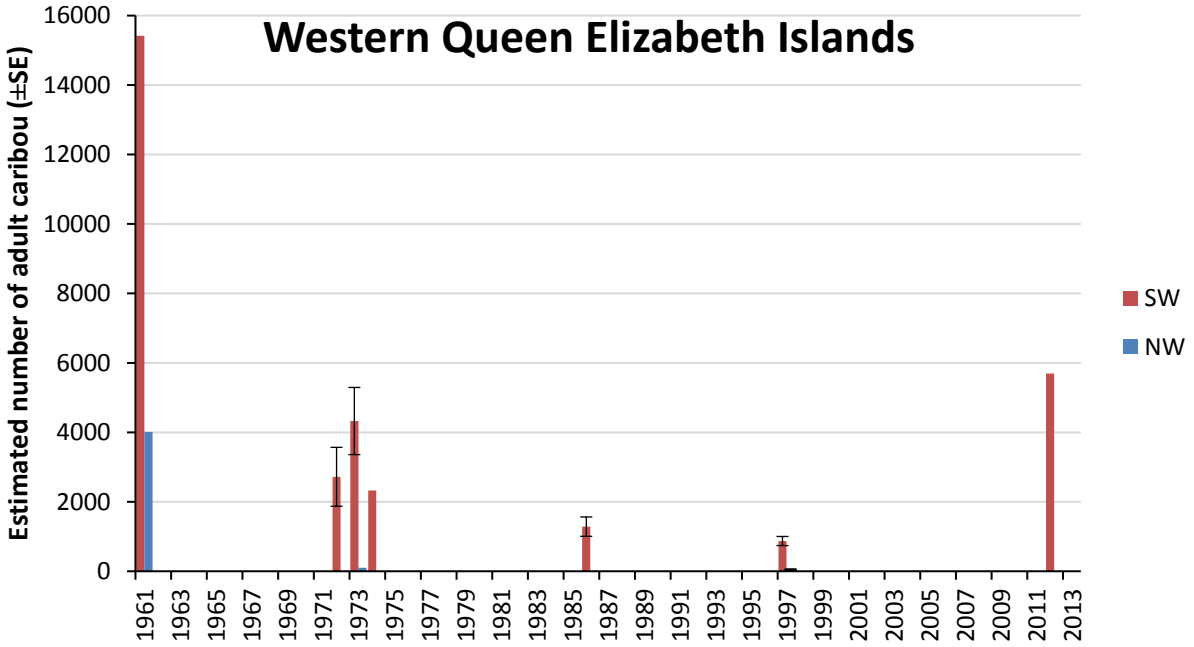

Figure 31. Estimates of adult Peary caribou numbers on the northwestern (NW QEI) and southwestern (SW QEI) Queen Elizabeth Islands, 1961-2012. The Western Queen Elizabeth Islands subpopulation is depicted in two groups because of temporally non-overlapping surveys. All surveys took place during summer, except northwest QEI in 1973 (April). Estimates for 1972-74 include calves. Standard error bars are shown where available. See Appendix B for references.

NWT Summary

The overall estimated population change for Peary caribou in the NWT, from about 36,000 Peary caribou (in 1961, 1972 and 1980) to about 7,800 (in 2012 and 2019, combining totals from different years), represents an overall decline of approximately 80% over the past 60 years. Over the last 40 years (based on population estimates from the 1970s and 1980), the population has declined 50% from about 15,600 caribou. Over the last three generations (~27 years), using 1997 and 1998 estimates when all island groups in the two subpopulations were assessed at the same time (907 for WQEI, 546 for Banks/Northwest Victoria Islands) the population has increased five-fold. Both subpopulations were at their lowest levels three generations ago, and although they have increased since then, they are still at lower levels than they were 40-60 years ago.

For Banks Island, based on five pairs of consecutive surveys since 1998, the population increased for two pairs of consecutive surveys and did not change significantly for the other three pairs (Appendix B). Although there appears to be an overall increasing trend from 1998 to 2019, the 2019 population estimate is lower (although not significantly) than the previous estimate in 2014. This recent plateau in the population level coupled with a low calf production estimate of 10% calves (see *Population dynamics*), could potentially result in a levelling off or decrease in caribou numbers, if calf production does not increase. For the WQEI

subpopulation, although a population increase was detected between the 1997 and 2012 surveys, it has now been eight years since the most recent survey was conducted; therefore, the population estimate and trend based on that survey may no longer represent the current situation.

The decreases in Peary caribou numbers on Banks Island and Northwestern Victoria Island coincided with increases in muskoxen numbers (Figure 32). Both muskoxen populations increased starting in the early 1980s, peaked around 1994-2001, and declined to current levels (Figure 32). However, although not surveyed as frequently, muskoxen numbers on the WQEI did not exhibit the same peak in the late 1990s as those on Banks and Northwestern Victoria islands, and both Peary caribou and muskoxen increased from lows in 1997 to 2012 (Figure 32).

SARC (2020) defines a "continuing decline" as "a recent, current or projected future decline, (which may be smooth, irregular or sporadic), that is liable to continue unless remedial measures are taken". Based on the most recent information suggesting at least moderate increases in caribou numbers in both subpopulations, it is unlikely that Peary caribou in the NWT are experiencing a continuing decline. However, if the recent increases are temporary, the long-term trajectory (over 40-60 years) would indicate a continuing decline.

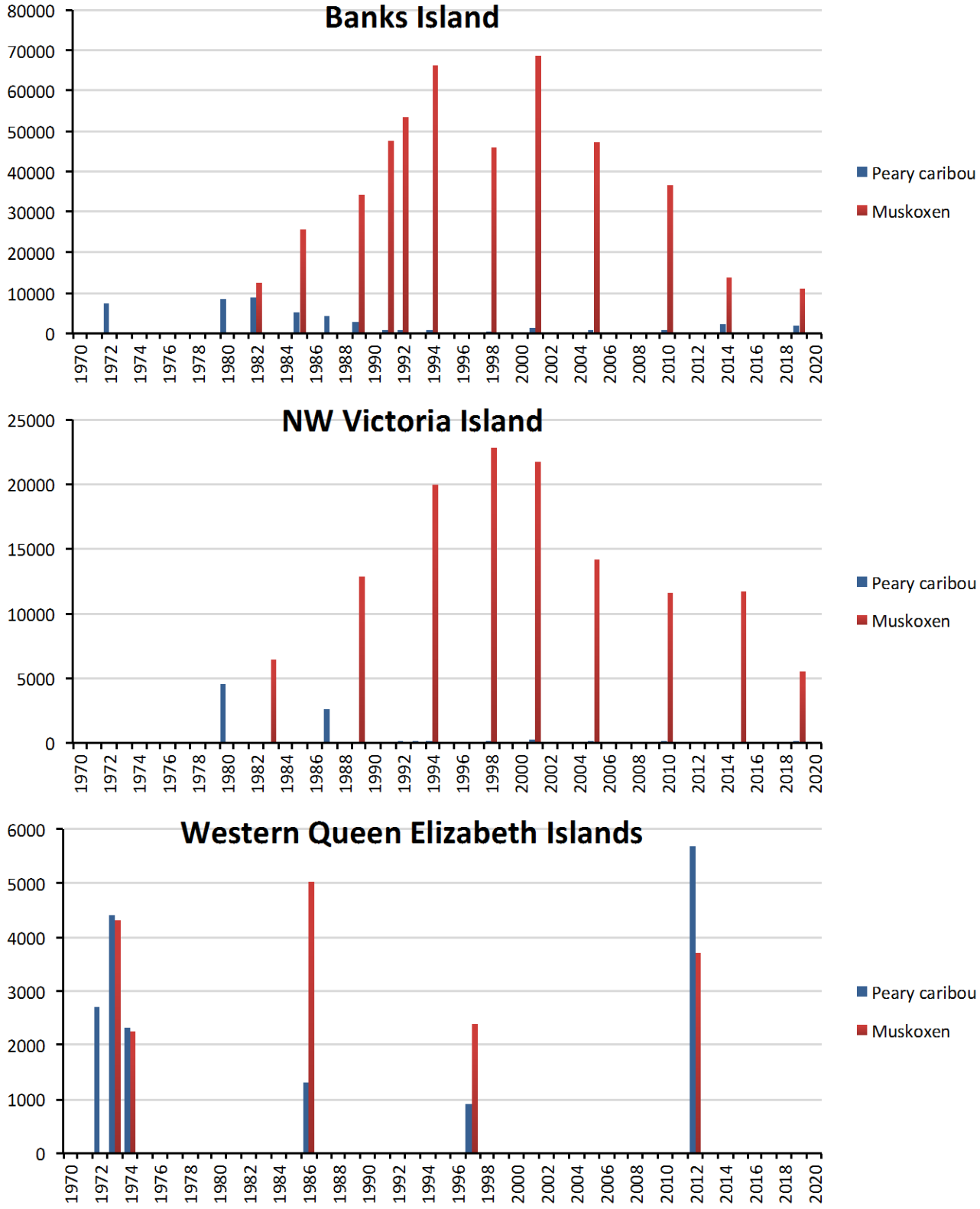

Figure 32. Estimated number of Peary caribou and Muskoxen on Banks, Northwest (NW) Victoria and Western Queen Elizabeth Islands in the NWT, 1970-2020. See Appendix B for Peary caribou references.

Global Trends

Johnson *et al.* (2016) assessed long-term (30-year) and short-term (10-year) population trends for the four Peary caribou subpopulations. Long-term trend was assessed as decreasing for the Banks/Northwest Victoria Islands and Prince of Wales/Somerset/Boothia subpopulations, increasing for the WQEI, and uncertain for the Eastern Queen Elizabeth Islands. Short-term trend was assessed as increasing for the Banks/Northwest Victoria Islands, and uncertain for the Eastern and WQEI. No short-term trend was provided for the Prince of Wales/Somerset/Boothia subpopulation since the most recent population estimate is one caribou, based on a minimum count during surveys in 2004 and 2006.

The two Peary caribou subpopulations in the NWT have experienced recent increases (see *NWT trends*). In Nunavut, only the WQEI subpopulation (Bathurst Island Group) is stable or increasing (Johnson *et al.* 2016). The Prince of Wales/Somerset/Boothia subpopulation collapsed in the mid-2000s, and a survey of Alex Heiberg Island in the Eastern Queen Elizabeth Islands in 2019 suggests that caribou numbers on that island have also collapsed (Mallory *et al.* 2020a). Mallory *et al.* (2020a) suggest that it is not possible to determine if the population declined (or the cause of the decline) or if caribou dispersed from the island; however, no increases in caribou were seen on central and southern Ellesmere Island in 2015 and 2016.

Possibility of Rescue

The nearest source of neighbouring caribou is from the Bathurst Island Group in Nunavut and from the other islands to the east and north of Borden and Prince Patrick islands, known as the Ringnes Island Group, in Nunavut. These areas are connected to the NWT by multi-year sea-ice. There are no conspicuous geographical barriers to immigration; however, changes to sea-ice due to climate warming could make sea-ice crossings difficult or even impassable. Peary caribou are capable of moving long distances and movements between island groups in Nunavut and the NWT have been recorded, suggesting that immigration to/from Nunavut is likely to occur.

Peary caribou from Nunavut are likely to be able to survive and reproduce within the NWT as habitat and climate are similar. However, Peary caribou on the high Arctic Islands are genetically distinct from and genetically less diverse than Peary caribou on the low Arctic Islands (McFarlane *et al.* 2014; Klütsch *et al.* 2017; Jenkins *et al.* 2018). Therefore, if natural dispersal and immigration are not likely to occur and recovery tools such as translocation are considered, only genetically similar caribou should be translocated to ensure that genetic distinctiveness is preserved.

Currently, there are more Peary caribou in the NWT than outside the NWT, and two of the subpopulations in Nunavut have undergone significant recent declines (see *Abundance* and *Trends and fluctuations*). Given the higher abundance and short-term increasing trends of

Peary caribou in the NWT, it is more likely that Peary caribou from the NWT would be required to support recovery of Peary caribou in Nunavut than vice versa.

Breeding Peary caribou in captivity would likely be successful since reindeer, which are the same species as caribou, have been successfully domesticated. Peary caribou have been raised in captivity on the Alberta Game Farm in the early 1970s but little recorded information is available. The idea of releasing captive-raised animals into the wild was extensively discussed in the 1990s (Government of the Northwest Territories, unpubl. files) and while possible, would depend on both the conditions in which the caribou were held, how they were released, resources, community support, social licence and likelihood of survival once reintroduced.

THREATS AND LIMITING FACTORS

Figure 33 summarizes potential threats to Peary caribou and how they affect Peary caribou population dynamics, habitat use and migration (Johnson *et al.* 2016). Key threats include: natural variation in climate/weather and the added impacts of climate change; human activities; and interactions with other species. However, limited information is available on adult survival (predation rates, accidents, diseases) and about how limiting factors interact. For example, mortality as a consequence of wolf predation and harvesting acts on populations against the background of annual variations in environmental conditions (chiefly the effects of weather on forage availability and plant growth). When the depth, density, layer structure, and hardness of the snowpack limit forage availability, Peary caribou are more vulnerable to other causes of low survival, although it can be difficult to partition the effects of the individual factors. For example, the decline in Peary caribou on Banks and northwest Victoria islands during the 1980s and early 1990s was likely caused by the cumulative effects of human harvest, winters with deeper than average snow depths, icing events and wolf predation. Inter-island movements and competition from the expanding muskoxen population have also been proposed as contributing factors, although, without supporting evidence those factors are difficult to evaluate (Nagy *et al.* 1996).

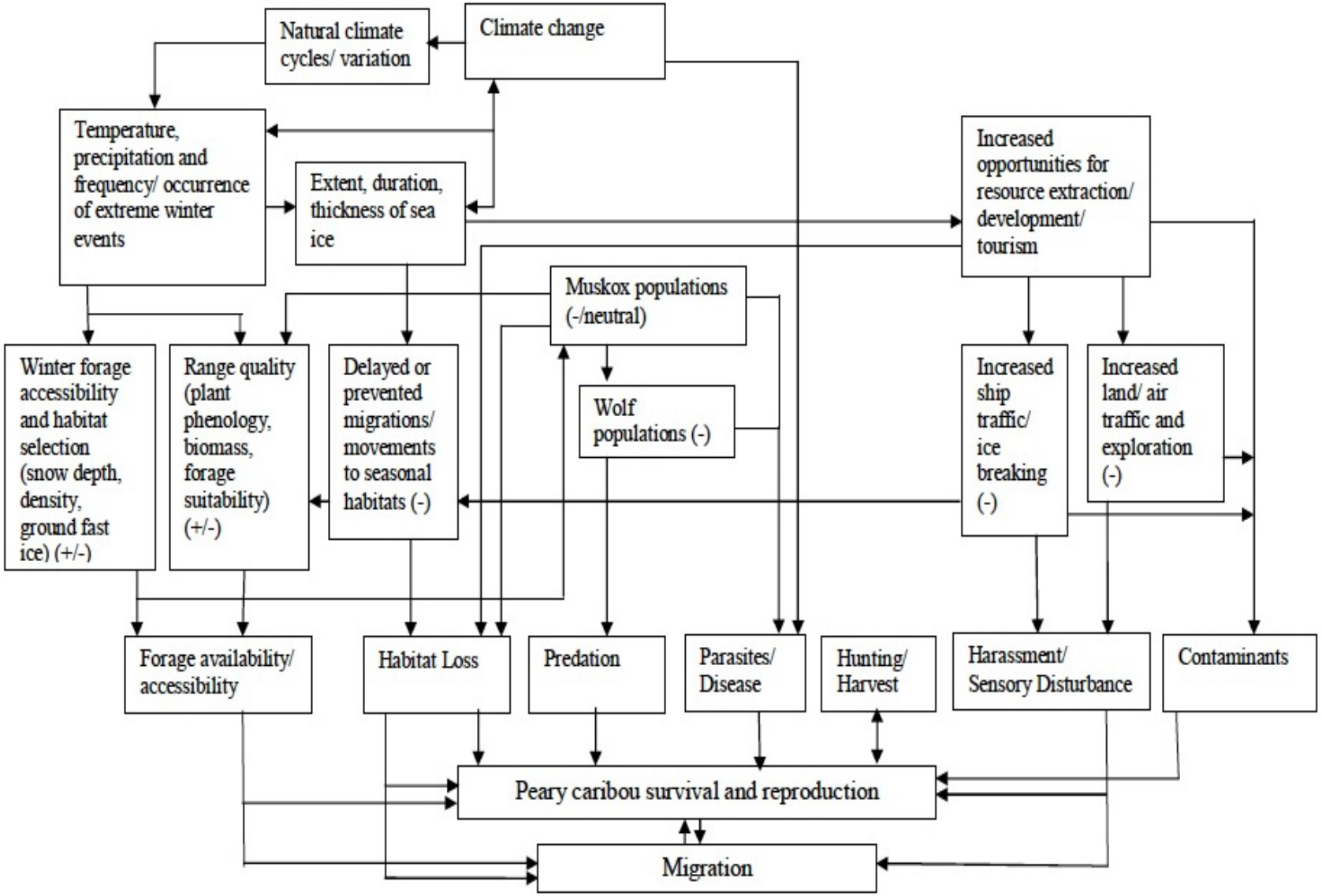

Figure 33. Threats and associated mechanisms affecting Peary caribou population fluctuations and habitat use (from Johnson *et al.* 2016).

Climate/Weather Variability

Climate variability plays a large role in the population dynamics of Peary caribou through weather influencing forage availability directly as effects on plant growth and flowering, and as relative availability, which is mediated by the depth, density, layer structure, and hardness of the snow pack (Tyler 2010). The effects of weather on forage availability are complex and limited information contributes uncertainty to describing climate variability as a threat. There are only three long-term (>10 years) weather data sets (with some gaps in records) and they are from weather stations restricted to coastal locations (Sachs Harbour, Mould Bay and Ulukhaktok), which inadequately represent inland weather conditions. More recently, fewer weather data have been collected at some of the stations. For example, snowfall data for Mould Bay has not been consistently available since about 1997.

Climate over the Peary caribou range in the NWT is regionalized (Maxwell 1981), and some limited generalizations can be made about climate effects. For example, there is a north-south continuum in climate across the geographic range of Peary caribou. On average, over the long-term, mean daily temperatures are above 5°C only 4.1% of the year at Mould Bay (Prince Patrick Island) but 10.2% of the year at Sachs Harbour (Banks Island) (Environment Canada 2011a). The regional nature of the climate is a consequence of low pressure weather systems (cyclonic activity), the sea-ice seasonal melting pattern, large-scale landscape features, and net radiation (Maxwell 1981).

The timing of snowmelt and freeze-up is annually variable and fall incursions of moister warmer Pacific air masses periodically cause rain-on-snow events (rain falling and freezing as ice within or on snow-covered ground), which restrict access to forage (Rennert *et al.* 2009). Restrictions in availability of winter forage because of rain-on-snow events are infrequent but can influence Peary caribou abundance at unpredictable intervals. The effect of the warmer temperatures in the fall and winter that can cause either rain or melting within the snowpack is moderated by snow depths. For example, more is known from Svalbard where winter weather is characterized by relatively frequent periods of warmer weather >0°C which can be associated with icing (Kohler and Aanes 2004). The effect of the above zero temperatures melting within the snowpack is complicated as it depends on snow depth. In shallow snow, the warmer temperatures will improve forage availability as the snow disappears, but in deeper snow the melting causes ground fast ice reducing forage availability (Tyler *et al.* 2008). However, not all winters with deeper snow are detrimental to forage availability as temperatures and wind strength affect the snowpack characteristics (Miller and Gunn 2003).

Given the complexities of the relationships between snow depth, temperature and then wind packing, effects of winter weather on forage availability are difficult to monitor from just a few scattered weather stations. Larter and Nagy (2000 d) measured snow depth, density, and

resistance in four habitats on southern Banks Island from 1993 to 1998. Over the same time period snow characteristics were measured adjacent to feeding craters of Peary caribou and muskoxen. The snow and ice conditions can make foraging energetically costly or make it impossible. The degree of the effect and its geographical extent influences how severely caribou are affected, whether they can find alternate foraging and the proportion of the population affected. Ground measurements of snow hardness and ice conditions offer valuable information on how environmental conditions are affecting wildlife, however, most often this information is lacking (Tyler 2010). Recent advances in measuring snow and ice properties (i.e. remote sensing) and detecting or modelling rain on snow or other extreme weather events could provide information on how dynamics in snow and ice impact wildlife behaviour (Langlois *et al.* 2017; Ouellet *et al.* 2017; Boelman *et al.* 2019).

Since the 1950s, a number of icing events and their impact on Peary caribou have been observed in the Banks/Northwest Victoria Island subpopulation range.

McEwan (1952) reported deaths from starvation and Peary caribou moving out onto the sea-ice in November 1951, with at least 20 reaching the mainland (McEwan 1952, Nagy *et al.* 1998). However, McEwan (1952) did not report the causes of the starvation.

Urquhart (1973) reported unusually heavy snowfall in mid-October 1970 and estimated 1,000-2,000 caribou had died during winter 1970-71. In November 1970, trappers reported caribou out on the sea-ice and many dead caribou on the land, mostly calves and bulls, and in February 1971, trappers from Sachs Harbour reported seeing dead caribou, mostly bulls and calves (Urquhart 1973).

In late November 1977, the weather station meteorologist at Sachs Harbour reported a widespread intense freezing rainstorm which left up to 5 mm of ice on the ground. In December 1977, harvesters from Sachs Harbour were reporting caribou carcasses widespread across the landscape and seeing fewer live caribou than expected (Morrison 1978). Morrison (1978) reported finding 36 caribou carcasses during a snow machine survey over about 166 km^2 on southern Banks Island in May 1978. The appearance of the marrow fat for most (n = 30) of the carcasses was typical of starvation. The population-wide effect of the freezing rain and icing in 1978 is unknown although it would have been largely additive to the harvest.

During the 1982-92 caribou decline on Banks Island, there was no relationship between calf production or overwinter survival and snow depth or hardness (Larter and Nagy 2000c). In fall 1993, widespread icing (Larter and Nagy 1994) coincided with reduced condition of Peary caribou (Larter and Nagy 1996) although not to the point of known deaths. The productivity rate of 24 calves/100 cows in 1994 was lower than the 1992-2006 mean of 52 calves/100 cows (see Table 12); however, overwinter survival of calves for winter 1993-94 was higher than in any of the other 7 years recorded (Larter and Nagy 2000c).

In fall 2003, icing occurred after rainfall following snowstorms. Composition surveys on Banks and Melville Islands the following summer found almost 500 muskoxen carcasses, but only 5 caribou carcasses, indicating no caribou die-off as a result of the October icing (Nagy and Gunn 2009). The surveys recorded 29 and 37 calves per 100 adult females on Banks and Melville Islands, respectively (Nagy and Gunn 2009).

Winters with reduced forage availability probably caused die-offs on the WQEI, when up to 46% (1973-74) and 30% (1996-97) of the caribou died during a single winter with deep snow and icing apparent in the snow pack (Miller *et al.* 1977a; Gunn and Dragon 2002). On Prince Patrick Island, high winds and a 14.0 cm snowfall were recorded at the Mould Bay weather station on 13 September 1996 with >0°C a few days later and 0.2 mm freezing rain. The snowfall in September totaled 46.6 cm (1950-89 mean is 14.9 ± 10.3 [SD]). An incomplete snowfall record exists for the remainder of this winter. However, snowfall of 69.5 cm was recorded, compared to a long-term average of 65 cm, with data missing for four months, December 1996, and April, May and June, 1997 (Gunn and Dragon 2002). Gunn and Dragon (2002) counted 31 caribou carcasses and live caribou but no calves on Prince Patrick Island in July 1997. The four antlered carcasses from prime bulls indicate that their deaths occurred in early winter during late rut or shortly after the rut.

An aspect of summer weather that should be considered is the influence of low rainfall. Typically, Peary caribou forage in the drier plant communities (polar desert communities) and elsewhere in the Arctic (Svalbard), Tyler (1987) reported that summer moisture can limit plant growth for the upland plant communities which caribou tend to use in winter. On Banks Island, Larter and Nagy (2001b) reported that crude protein levels in a sedge was higher in winters that followed summers with higher precipitation.

In Sachs Harbour, from 1956 to 2021, there was an average rise in June temperature of about 1.9°C, and a 4.4°C rise in October (Figure 34; Environment and Climate Change Canada 2021). At Mould Bay, snowfall in September and October on average doubled between 1949 and 1996 (Environment Canada 2011a). Between 1949 and 1996, the highest snowfall recorded in September and October combined was 91 cm in October 1985 (Environment Canada 2011a), which may have also included heavy snowfall on northern and central Banks Island. Snowfall recorded at Sachs Harbour was above average in May 1986 and the melt was unusually late (Gunn *et al.* 1991). Nagy *et al.* (1996) reported that severe winter weather events (based on freezing rains) occurred during the winters of 1987–88, 1988–89, and 1990–91 on Banks Island, where between 60 and 300 caribou deaths were recorded in each of those years.

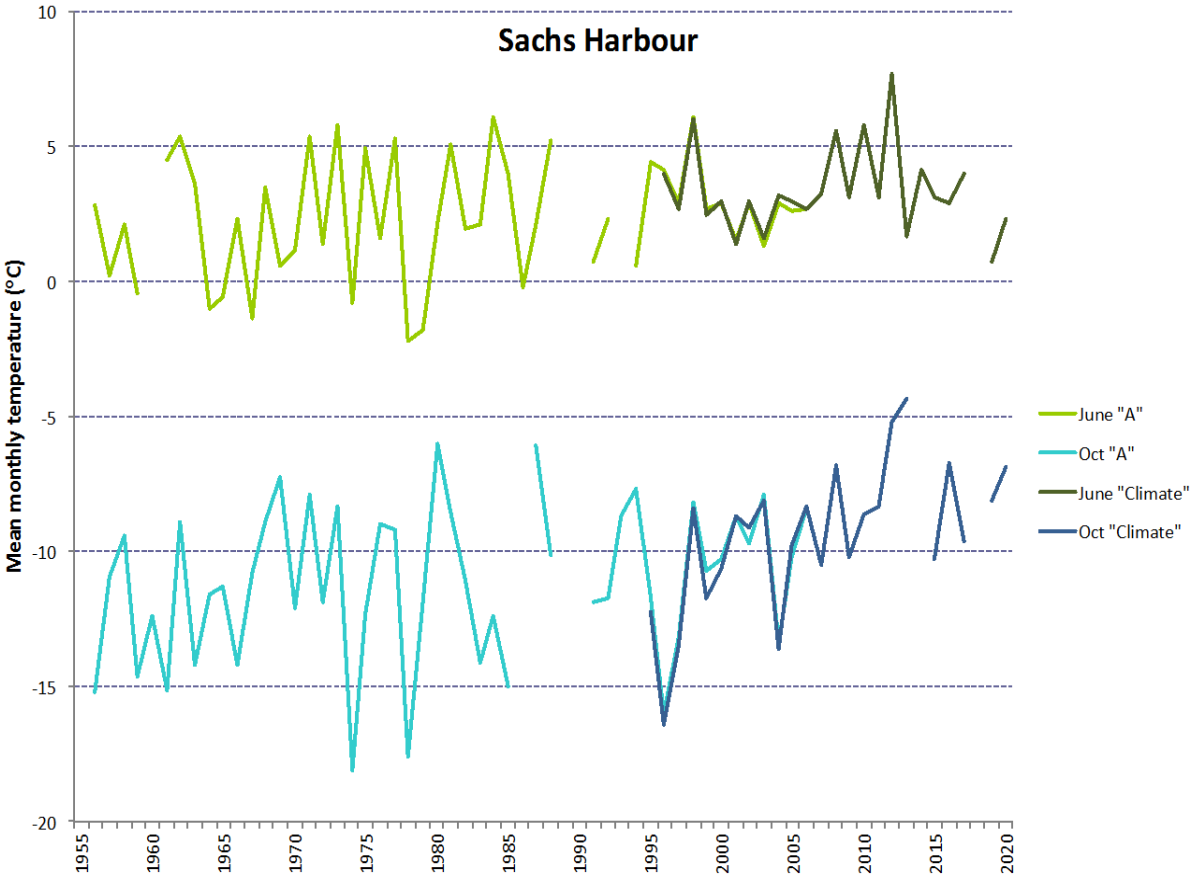

Figure 34. Mean monthly temperature data from Sachs Harbour "A" (1956-2006) and Sachs Harbour "Climate" (1995-2020) weather stations (Environment and Climate Change Canada 2021a). Weather station data overlapped from 1995 to 2006, with mean monthly temperatures for June and October almost equivalent for the two datasets during those years.

Climate Change

Climate change has already resulted in a 2.3 °C increase in average annual temperature and a 54% and 42% increase in winter and spring precipitation, respectively, in northern Canada between 1948 and 2016, and further increases are predicted (Zhang *et al.* 2019).

Predicted effects of climate change on caribou (all ecotypes) include: increased wildfire on winter ranges, increased summer insect harassment, changing forage quality and quantity in summer and winter, increased icing events in winter, changing spring phenology, and changes to distributions and migration (Mallory and Boyce 2018).

For Peary caribou specifically, two primary threats of climate change are suggested: 1) decreased forage accessibility in winter due to increased intensity and frequency of severe weather events, and 2) decreased migration and movement caused by decreased extent and thickness of sea ice (Johnson *et al.* 2016). However, a potential positive effect may be increased summer forage availability and quantity (Johnson *et al.* 2016).

Both rain-on-snow and icing events tripled in the Canadian Arctic Islands from 1979-1995 to 1996-2011 (Langlois *et al.* 2017). Banks Island and Northwest Victoria Island were two of five areas with the most combined occurrences of these two types of events. Caribou numbers were found to be lower when 1 to 2 icing events, or 3-4 rain-on-snow events were detected in one winter (Langlois *et al.* 2017).

Both extent and thickness of sea ice decreased in the Canadian Arctic from 1968 to 2016 (Derksen *et al.* 2019). Total sea ice in the waters surrounding the WQEI and north of Banks and Victoria islands decreased at a rate of <5% per decade while the waters between Banks Island and the mainland, and Victoria Island and the mainland decreased at rates of 11-15% and 6-10% per decade respectively (Derksen *et al.* 2019). Multi-year ice around the Prime Minister Group in the WQEI and around and between and south of the Melville Group decreased by <5% and 6-10% per decade respectively, while there was no significant change in multi-year ice between Banks and Victoria islands and the mainland (Derksen *et al.* 2019). Waters that historically froze annually north of King William Island and around Prince of Wales and Boothia Peninsula are now remaining ice-free all winter (CWS 2013; ECCC 2021). Overall, ice thickness has also decreased.

Sea ice is important for maintaining and facilitating connectivity between and within subpopulations to fulfill ecological needs (Paquette 2020), especially for the smaller Arctic Islands (Jenkins *et al.* 2016; Mallory and Boyce 2019). Predicted earlier spring break-up and delays in fall sea-ice formation could potentially disrupt the timing of seasonal migrations and may result in accidental drowning deaths or starvation while waiting for the ice to be thick enough to cross (Jenkins *et al.* 2016; ECCC 2021). Bathurst Island plays a critical role in facilitating connectivity among Peary caribou subpopulations, but other islands in the WQEI including Melville and Prince Patrick islands, are also important (Mallory and Boyce 2019). Larger islands such as Banks Island and Victoria Island play a limited role in Peary caribou connectivity.

Earlier spring snowmelt has resulted in an earlier start to the growing season on Banks and Victoria Islands, but not in the High Arctic Islands (Jia *et al.* 2009). On Banks Island, over a 30-year period (1984-2014), vegetation productivity has increased across about 80% of the Banks Island Migratory Bird Sanctuary on the west side of the island, with a stronger response in upland habitats (Campbell *et al.* 2020). Increased forage productivity and extended periods of greenness would increase the availability of quality forage during the growing season. Such a scenario may promote increased fattening and improved condition of animals prior to the winter, all of which may have a positive impact on calf survival and possibly adult survival (Larter *in* SARC 2012: 99). An earlier start to the growing season could result in a trophic mismatch where timing of migration and calving/peak lactation may no longer coincide with peak plant nutrition and digestibility (Post and Forchhammer 2008). However, Mallory *et al.*

(2020b) found no evidence of a trophic mismatch in barren-ground caribou since both migration and peak of calving in barren-ground caribou also occurred earlier. Increases in shrub cover and extent have also been detected in Arctic ecosystems (Stow *et al.* 2004), which is also likely a result of an extended growing season.

Climate change could also influence conditions for parasites and diseases not currently prevalent in the Arctic Archipelago (Kutz *et al.* 2014; ECCC 2021b). The effects of parasites and disease will be complex (Kutz *et al.* 2009; Davidson *et al.* 2011).

Intra- and Inter-specific Forage Competition

The magnitude of intra- and inter-specific forage competition for Peary caribou is not known. Inter-specific competition for forage between other herbivores and Peary caribou is possible given that there is some evidence for overlap in diet between Peary caribou and muskoxen (Larter and Nagy 2004), although the consequences of the overlap are not known (Figure 35 and 36). At high muskoxen numbers, inter-specific competition may have included intra-specific competition among muskoxen for forage and possibly more use of caribou forage (Larter and Nagy 2001d). This may have changed since the decline in muskoxen abundance after 2001. See *Interactions with Other Herbivores.*

The effects of weather on inter- and intra-specific competition are not known. For example, icing or deep snow could cause muskoxen to forage on upper slopes and ridges where Peary caribou typically forage. Hyperabundant snow geese numbers may have localized effects on habitat, with a reduction in the availability of sedge meadow habitat as influence by geese increases (Fleming *et al.* 2019). Intensive use by snow geese has been found to further exacerbate the reduction of pond surface water associated with climate change (Campbell *et al.* 2018).

Intra-specific competition among Peary caribou may be less likely at low densities (see *Interactions with Other Predators*). However, the effects of annual variations in forage productivity or the trend toward increased forage productivity (see *Climate change*) could potentially change intra-specific competition for forage.

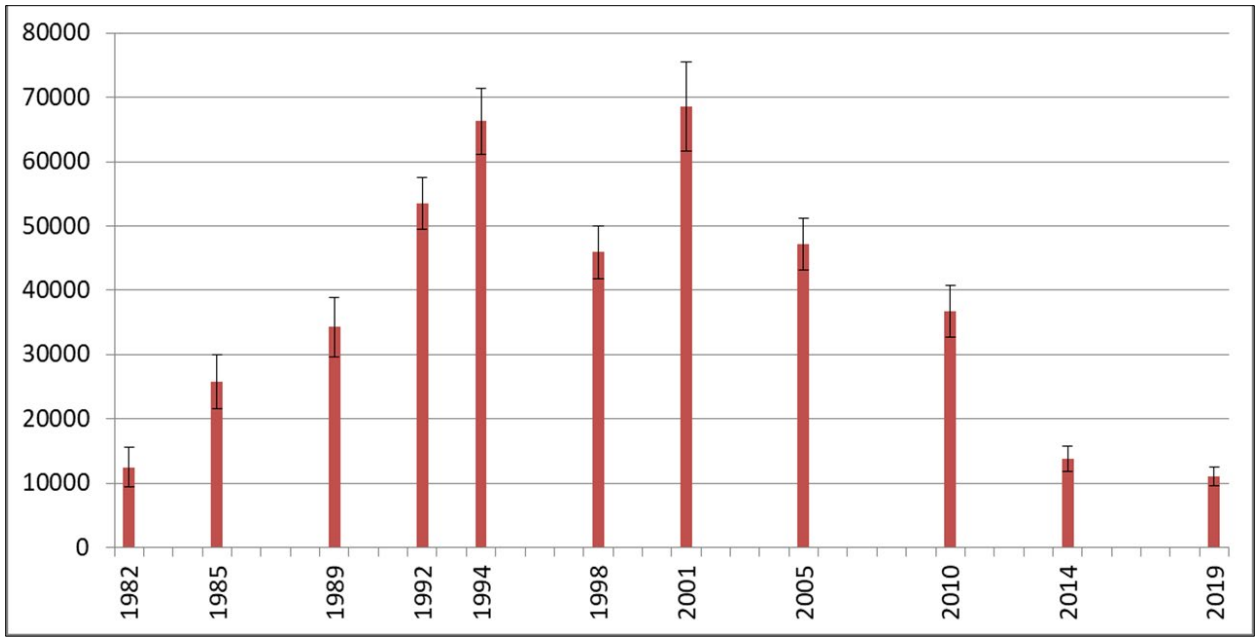

Figure 35. Population estimates for muskoxen on Banks Island from 1982 to 2019. (Davison and Baryluk 2021 in prep.)

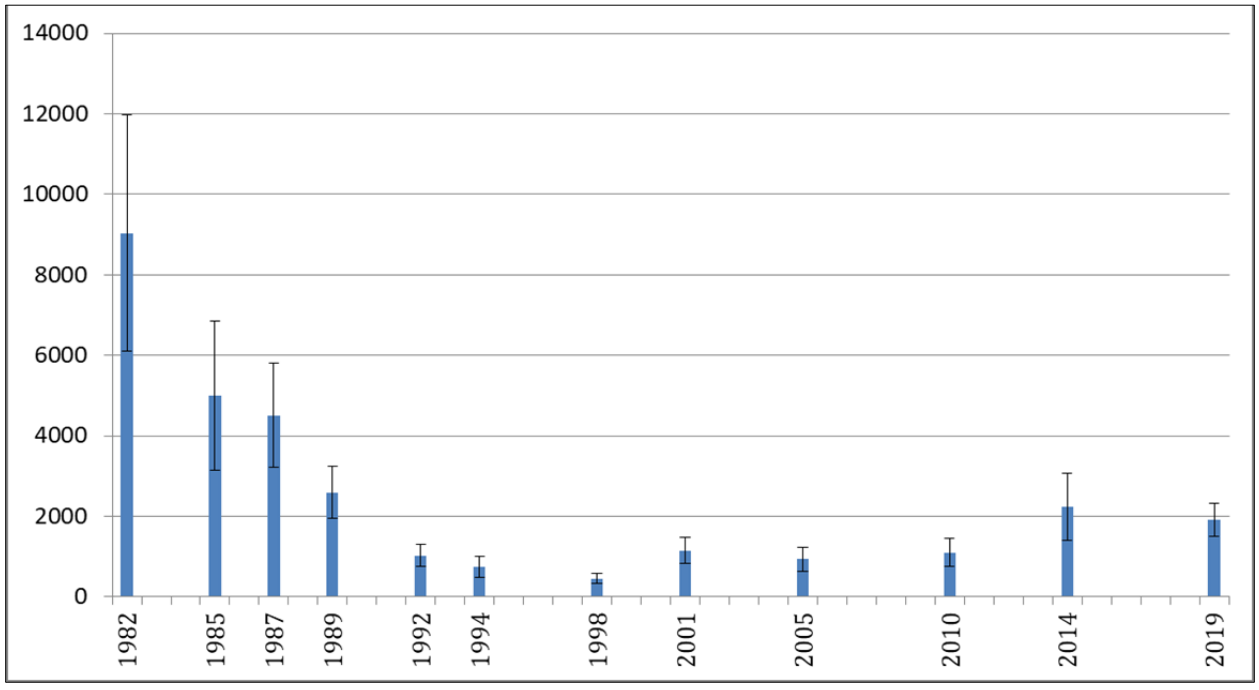

Figure 36. Population estimates for Peary Caribou on Banks Island from 1982 to 2019. (Davison and Baryluk 2021 in prep.)

Predation

Little information is available on arctic wolves. Poisoning programs conducted in the 1950s resulted in reduced wolf numbers on Banks Island (Zoltai *et al.* 1980 in Nagy *et al.* 1996). Although wolf sightings during aerial surveys on Banks Island increased from the 1990s until the 2000s (Table 6), coinciding with an increase in muskoxen abundance, there have been no studies assessing the effects of wolf predation on Peary caribou populations. Peary caribou comprised a small portion of the wolf diet on Banks Island in the 1990s while muskoxen numbers were high (Larter 2013). However, the predation that did occur could have had a significant impact on caribou numbers, especially when Peary caribou numbers were low. Muskoxen abundance has declined since the early 2000s (Davison *et al.* 2017), which may have resulted in increased predation risk for Peary caribou as the primary food source for wolves declined. Although the relative contribution of wolf predation to Peary caribou mortality is not known, it is a likely threat to Peary caribou populations especially when Peary caribou abundance is low and when muskoxen numbers are declining.

While Peary caribou and muskoxen may not necessarily compete directly for forage (see previous section), muskoxen could affect Peary caribou numbers through 'apparent competition', which is an indirect interaction between species that share a common predator (Holt 1977). When muskoxen are the primary prey species of wolves and Peary caribou are a secondary prey species, increasing muskoxen numbers could result in increased wolf numbers, which in turn could exert greater predation pressure on Peary caribou (Nagy *et al.* 1996).

Recent range expansion of grizzly bears on Arctic islands suggests that grizzly bear numbers may be increasing within Peary caribou range (see *Interactions – Predation*); however, there is no information yet on whether grizzly bear predation is emerging as a threat to Peary caribou (see *Interactions – Predation*).

Human Activities – Disturbance and Habitat Alteration

The magnitude and immediacy of human activities as a measurable threat to Peary caribou are low but uncertain given the lack of information. Disturbance is included as a potential threat because concerns are often expressed about effects of industry, which if increased, would influence behaviour and local distribution. Based on experience elsewhere, disturbances such as low-level aircraft flights, people on foot and vehicles can increase caribou energetic costs if those human activities interrupt caribou foraging or cause the caribou to move away in response (Weladji and Forbes 2002). Human activity on the Canadian Arctic Islands has not yet reached a scale at which habitat loss through displacement of Peary caribou can be identified (Hodson in SARC 2012: 97). However, the low densities of caribou mean that the displacement would have to have a large effect to be measurable.

Petroleum exploration activities on the Canadian Arctic Islands in the NWT were widespread and conducted primarily in the early 1970s (Urquhart 1973; Miller *et al.* 1977a; Thomas *et al.* 1999; Figure 20 in the Indigenous and Community Knowledge component). Currently there is no seismic exploration, but there is potential for it in the future (Hodson in SARC 2012: 97). Although there is limited information on the effects of seismic lines on vegetation in the High Arctic, studies in the Low Arctic showed changes that lasted up to at least two decades including: change in vegetation cover composition, decrease in mosses and lichens, increase in grasses and shrubs, and subsidence due to thawing of ground ice, (Kemper *et al.* 2009; Jorgenson *et al.* 2010; Dabros *et al.* 2018). Vegetation in upland tundra was less resistant than wetland vegetation (Kemper and Macdonald 2009).

The potential for mineral exploration and development appears moderate (Dewing *et al.* 2007). Mineral exploration occurred in the Shaler Mountains of northwest Victoria Island in the 1990s. The concerns about the effects on caribou led to studies (CEAA 2010), but so far the exploration has not led to development. Although the level of industrial activities in NWT Peary caribou ranges has been low, in Nunavut, communities have indicated that mineral exploration and development may have contributed to Peary caribou population declines (Johnson *et al.* 2016).

Disruption to sea ice along movement corridors between and among islands by marine traffic is expected to increase in the Arctic as access and the length of the open water season increases (ECCC 2021b). Shipping in the Canadian Arctic has increased from four transits per year in the 1980s to an average of around 23 transits per year between 2015 and 2020 and a record number (35) of transits in 2017 (NORDREG *in* ENR 2022), including an increase in traffic through the southern route of the Northwest Passage (Dawson *et al.* 2018). General cargo vessels and government icebreakers have made up the greatest proportion of ship traffic in the Canadian Arctic from 1990 to 2015 (Dawson *et al.* 2018). Traffic from tankers, general cargo ships, fishing vessels and pleasure crafts have increased steadily from 2000 to 2015, while passenger ship activity was greatest in 2006-2010 (Dawson *et al.* 2018). The greatest increase in traffic has been by pleasure craft, with the greatest use along the southern route of the Northwest Passage, although use has also increased along the northern routes and around Banks Island (Dawson *et al.* 2018). Marine traffic in the fall could prevent sea ice from forming and icebreaking may cause ice shelfs and ice-block rubble along edges of shipping channels preventing caribou from exiting the water, resulting in drowning (Miller *et al.* 2005; ECCC 2021b). It is unclear what influence increasing shipping will have on Peary caribou in the NWT, but shifting freeze-up and break-up timing may intensify interactions between sea ice and ship transit creating challenges for caribou movement (Paquette 2020) and any transit that results in open leads may delay or impede caribou movement between islands or increase the risk of drowning if caribou attempt to cross thin ice (Dumond *et al.* 2013).

Additional concerns related to ship traffic include the introduction of water pollutants through the illegal dumping of grey water, changing ballast water, and potential oil or waste spills (OHTC 2016; ECCC 2021b).

The levels of access on these islands are generally very low. Increased pleasure craft and passenger ship traffic (Dawson *et al.* 2018) could lead to increased recreational use on islands; however, land-based activities would likely be limited by how far people would venture inland. In the Ulukhaktok area, concerns have been raised about helicopters (possibly from cruise ships) disturbing caribou calving areas (Inuvialuit Game Council 2019). Concerns about use of drones and effects on wildlife were also raised (Inuvialuit Game Council 2019).

The number of people visiting Aulavik National Park was less than 50 during most years since 2004 (Figure 37). There does not appear to be a consistent trend in use by any of the user groups, with the predominant types of users varying among years. The majority of paid visitors participate in guided river trips on the Thomsen River (Blyth pers. comm. 2021). Due to Covid, there were no visitors in the park in 2020 and a similar situation is expected in 2021 (Blyth pers. comm. 2021).

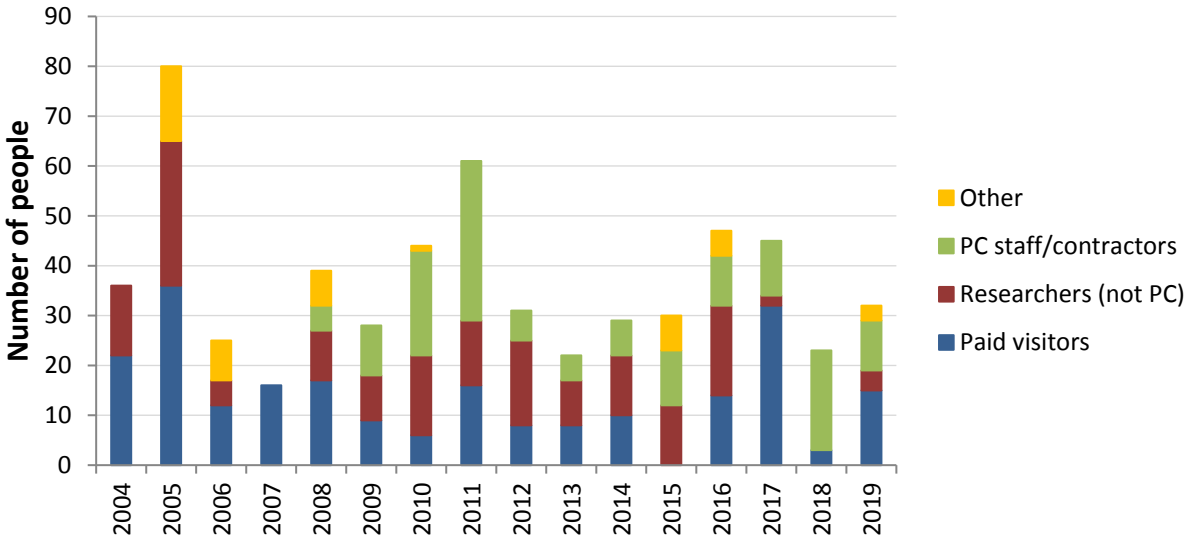

Figure 37. Visitor use in Aulavik National Park, 2004-2019.

Contaminants

Based on sampling Peary caribou on Banks Island in the 1990s, contaminants do not appear to be a current threat to caribou health. Levels of metals in Banks Island caribou are the lowest reported in the study of 15 Canadian caribou subpopulations and are similar to background levels found in humans (Larter and Nagy 1996; MacDonald *et al.* 1996; Larter and Nagy 2000e). Levels of radionuclides including $_{137}$Cesium (from the fallout after the Chernobyl reactor meltdown) were not detectable in muscle or liver tissues and were very low in kidneys (MacDonald *et al.* 1996). Dolphin and Union caribou sampled on Victoria Island in 2015 had contaminant levels that were similar to other Arctic caribou (Gamberg 2019).

Despite these findings, contaminants were included among potential threats because over time the types of contaminants change as new chemicals come into common use.

Harvesting

Nagy *et al.* (1996) suggested that the Peary caribou population decline on Banks Island was likely due to a combination of severe winters, harvest, wolf predation, inter-island movement and possibly competition from the increasing muskoxen population. Peary caribou harvest is limited to Inuvialuit and Inuit respecting the preferential rights in their respective land claim agreements (*Inuvialuit Final Agreement* and *Nunavut Agreement*). There are quotas for Peary caribou on Banks Island and Northwest Victoria Island, with harvests averaging below quotas> Harvesting on the WQEI is likely low due to their remoteness (see *Interactions – Humans*).

At this time, Peary caribou harvest is likely not a significant enough mortality factor to be considered a threat to the two NWT subpopulations.

POSITIVE INFLUENCES

A key positive influence that likely halted the decline of Peary caribou in the 1990s was that Sachs Harbour and Ulukhaktok harvesters voluntarily restricted their harvesting of Peary caribou in 1993 (Nagy *et al.* 1998; RWED 1998). These steps were outlined in community conservation plans, which summarized the status of Peary caribou on Banks and northwest Victoria islands, and produced co-management goals (Nagy *et al.* 1998; RWED 1998). Peary caribou population levels would have likely been much lower had quotas on Banks Island and a voluntary cessation of Peary caribou harvesting on Northwest Victoria Island not been implemented (Kaluskar *et al.* 2020). There is less harvest pressure on Melville/Prince Patrick Islands, since people rarely travel there anymore (Nathoo pers. comm. 2021).

The Sachs Harbour Community Conservation Plan, a community-based planning document, was initiated in 1992, updated in 2000, 2008 and 2016 (SHHTC *et al.* 2016), and is a working document with scheduled reviews and updates. The document guides land use planning on Banks Island through identifying important habitats and a community-based approach for the

use of those habitats. Some known Peary caribou calving grounds are identified and recommended for the highest degree of protection under the Community Conservation Plan. The *Olokhaktomiu*t Community Conservation Plan (OHTC *et al.* 2016) identifies important areas for Peary caribou on southern Melville and northwestern Victoria Island.

A limited amount of Peary caribou range is protected within Aulavik National Park (Parks Canada 2010) and The Banks Island No. 1 Migratory Bird Sanctuary. For the latter, the surface lands are protected for migratory birds and are administered by Environment and Climate Change Canada under the *Migratory Birds Convention Act.* Peary caribou likely receive some conservation benefit from this Migratory Bird Sanctuary because of the limitations on disturbance to migratory birds, their nests, and their associated habitat. With Peary caribou listed as "Endangered" in Canada since 2011 (www.sararegistry.gc.ca), the federal *Species at Risk Act* provides Peary Caribou some protection within the National Park and the Migratory Bird Sanctuary because they are federal lands. Environment and Climate Change Canada's protected areas policy document states that Environment and Climate Canada will consider species at risk and their associated critical habitat before issuing permits for any proposed activity (Environment Canada 2011b:3). These protected areas may have long-term implications for Peary caribou through habitat protection.

Some steps have been taken to clean up industrial exploration sites. Indigenous Relations and Northern Affairs Canada initiated a clean-up of the Johnson Point staging area and camp on eastern Banks Island in 2005. Contaminants have now been removed and monitoring is being conducted (Government of Canada 2021). Environment and Climate Change Canada is also in the process of cleaning up the Mould Bay (HAWS) site on Prince Patrick Island (Government of Canada 2021).

Warmer temperatures and changes to the emergence of vegetation for forage as a result of climate change may benefit Peary caribou as summer forage availability and quantity could increase (Johnson *et al.* 2016; ECCC 2021b). However, considering these changes as positive should be done cautiously as the effects of climate change on Arctic ecosystems is complex and it is not clear how these changes will impact Peary caribou overall. In response to challenges associated with changing climate, the GNWT is developing a Climate Change Adaptation Strategy for Wildlife in the NWT (GNWT 2022; ECCC 2021b).

Draft guidelines have been developed for passenger/cruise vessels in the Canadian Arctic, which include a summary of federal and territorial permit requirements, and guidelines for use of helicopters and unmanned aerial vehicles (Transport Canada 2017). In addition, the *Inuvialuit Settlement Region – Cruise Ship Management Plan 2022-2025* proactively sets standards to manages cruise ships in a way that respects Inuvialuit lands, water and people, and includes reducing icebreaking in important habitats (Inuvialuit Regional Corporation 2022).

Peary caribou have been the focus of national status assessments and recovery planning since 1979 (COSEWIC 2004) although no plans were finalized. Efforts included an IUCN workshop for Peary caribou held in Yellowknife, February 1998, which brought together stakeholders and interested people. The 2004 NWT Species at Risk Recovery and Management Team (SARRAMT 2004) drafted technical options for recovery (S. Carrière, J. Nagy and A. Gunn) which listed potential management options for recovery planning; however, these were never implemented. Peary caribou were added to Schedule 1 of the *Species at Risk Act* in February 2011, which required a national Recovery Strategy to be completed by 2014 (Bigelow in SARC 2012: 101). A proposed *Recovery Strategy for Peary Caribou in Canada* was posted for public comment in 2021. In the proposed recovery strategy for Peary caribou, sea-ice areas providing connectivity between different local populations or key islands with important habitat are identified as candidate critical habitat for Peary caribou (ECCC 2021b). A schedule of studies within the recovery strategy are also listed to provide the necessary information to complete the identification of critical habitat needed to meet the population and distribution objectives (ECCC 2021b). Once identified, critical habitat must be protected from destruction and should inform land use planning, environmental assessment and/or permitting (ECCC 2021b).

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STATUS AND RANKS

Region	Coarse Filter (Ranks)[15] To prioritize	Fine Filter (Status) To provide advice	Legal Listings (Status) To protect under species at risk legislation
Global	G5T1 – Species Secure [Species], Critically Imperiled [Subspecies] (NatureServe 2016[16])	A2a – Vulnerable (IUCN 2016[17])	Not Applicable
Canada	N1 – Critically Imperiled (NatureServe 2016)	Threatened (COSEWIC – 2015)	Endangered (*Species at Risk Act* – 2011)
Northwest Territories	At Risk (NWT General Status Ranking Program – 2020)	Threatened (Species at Risk Committee – 2012)	Threatened (*Species at Risk [NWT] Act* – 2014)
Adjacent Jurisdictions			
Nunavut	Sensitive (NU General Status – 2010)		

[15] All NatureServe codes are as defined in Definitions of NatureServe Conservation Status Ranks: http://help.natureserve.org/biotics/Content/Record_Management/Element_Files/Element_Tracking/ETRACK_Definitions_of_Heritage_Conservation_Status_Ranks.htm#NatureSe

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APPENDIX A – ADDITIONAL INFORMATION

Threats Assessment[18]

Threats have been classified for Peary caribou as a whole, insofar as those threats may be relevant to the status of the population in the NWT. The threats assessment is based on whether threats are considered to be of concern for the sustainability of the species over approximately the next 10 years.

This threats assessment was completed collaboratively by members of the NWT Species at Risk Committee, at a meeting on June 23, 2021. The threats assessment will be reviewed and revised as required when the status report is reviewed, in 10 years or at the request of a Management Authority or the Conference of Management Authorities. Parameters used to assess threats are listed in Table A1.

Table A1. Parameters used in threats assessment.

Parameter	Description	Categories
LIKELIHOOD		
Timing (i.e., immediacy)	Indicates if the threat is presently happening, expected in the short term (<10 years), expected in the long term (>10 years), or not expected to happen.	Happening now Short-term future Long-term future Not expected
Probability of event within 10 years	Indicates the likelihood of the threat to occur over the next 10 years.	High Medium Low
CAUSAL CERTAINTY		
Certainty	Indicates the confidence that the threat will have an impact on the population.	High Medium Low
MAGNITUDE		

[18] This approach to threats assessment represents a modification of the International Union for the Conservation of Nature's (IUCN) traditional threats calculator. It was originally modified for use in the Inuvialuit Settlement Region Polar Bear Joint Management Plan (Joint Secretariat 2017). This modified threats assessment approach was adopted as the standard threats assessment method by the Species at Risk Committee and Conference of Management Authorities in 2019.

Extent (scope)	Indicates the spatial extent of the threat (based on percentage of population area affected)	Widespread (>50%) Localized (<50%)
Severity of population-level effect	Indicates how severe the impact of the threat would be at a population level if it occurred.	High Medium Low Unknown
Temporality	Indicates the frequency with which the threat occurs.	Seasonal Continuous
Overall level of concern	**Indicates the overall threat to the population (considering the above).**	**High** **Medium** **Low**

Overall Level of Concern

The overall level of concern for threats to Peary caribou are noted below. Please note that combinations of individual threats could result in cumulative impacts to Peary caribou in the NWT. Details be found in the *Detailed Threats Assessment*.

Overall level of concern:

- **Threat 1 – Climate change** **Low-Medium**
- **Threat 2 – Marine traffic** **Low-Medium**
- **Threat 3 – Competition** **Low**
- **Threat 4 – Harvesting** **Low**
- **Threat 5 – Predation** **Low**
- **Threat 6 – Human activities – disturbance and habitat alteration** **Low**
- **Threat 7 – Contaminants** **Low**

Detailed Threats Assessment

Threat #1. Climate change	
Specific threat	Climate variability plays a large role in the population dynamics of Peary caribou through forage availability influenced by weather and relative availability, which is mediated by the depth, density, layer structure, and hardness of the snow pack. Climate change is linked to a number of proximate threats and limiting factors. Wolf predation, harvesting, and availability of forage as mediated by weather, are the main proximate threats and limiting factors for Peary caribou. However, less is known about the relative contribution of each of these threats, and there is no information available on adult survival or causes of mortality to evaluate relative contributions. Many changing characteristics of weather and climate in the Arctic islands pose challenges to Peary caribou including severe weather events. Increased temperatures and increased moisture and rain may be resulting in an earlier green-up of vegetation and changes to the diversity and abundance of lichen as well as other vegetation. However, it has also been suggested that an earlier onset of green-up can lead to a reduction in important nutrients for calves and a decrease in their rate of survival. A longer growing season however would increase the availability of quality forage during the growing season. Peary caribou rely on movements over land and sea ice for survival at different stages of their lifecycle. Changing sea ice conditions are a concern as receding or changing ice conditions (less land fast, annual and multi-year ice, fewer ice floes, and more open water in winter and spring) may inhibit caribou from moving between islands. Severe or unseasonal weather events (e.g. rain-on-snow events or freezing rain) are becoming increasingly common on Banks Island in terms of changes in the frequency, timing, and severity. Such changes are most noticeable in the transitional seasons of autumn and spring. These severe weather events affect the ability of Peary caribou to access forage. The effects of weather on forage availability are complex and limited information contributes uncertainty to describing climate variability as a threat. However, severe winter weather is correlated with major population declines in Peary caribou as a result of starvation. On Victoria Island there was no Indigenous knowledge to indicate that die-offs occurred during unusual winters or that deaths occurred from starvation or malnutrition. However, caribou are known to disappear, move away, or starve when there have been freezing rains on the ground.
Stress	The effects of weather and climate can be both positive and negative for caribou and may be difficult to gauge because of compounding factors like natural population cycles, inter-species interactions, harvesting and predation. Climate change could have significant implications for the survival of Peary caribou

	including increased incidence of rain-on-snow and icing events, and sea-ice loss, as well as periodic and unpredictable lack of forage availability (primarily weather-related, which is climate-related). A warming climate and changing winds, and less stable sea-ice conditions could impede the ability of Peary caribou to travel between islands, which is one way they cope with severe weather conditions. While temperatures and precipitation can be variable, it is not understood how this variability influences forage growth and productivity relative to winter forage availability, or parasite or disease prevalence. Severe or unseasonal weather events affect the ability of Peary caribou to access forage. This can occur through harsh winters, during which deep hard snow cover forces animals to forage in more raised wind-blown areas where snow cover has been reduced, or when rain falls on top of the snow, freezing it into a layer that is difficult to penetrate. Most freezing rains occur in the autumn, which affects bulls and young calves most significantly; rains are particularly harmful in the spring for newborn caribou. Freezing rain may also drive caribou to search for other islands, explaining carcasses found out on open ice.
Extent	Widespread (>50%)
Severity	Unknown-Medium (knowledge of vegetation response to climate change is lacking)
Temporality	Seasonal Continuous
Timing	Happening now
Probability	High
Causal certainty	Low
Overall level of concern	**Low-Medium**

Threat #2. Marine traffic	
Specific threat	Climate change is extending the open water season in the Arctic and decreasing sea ice (annual and multi-year); combined this allows for increased ship traffic in the Northwest Passage. Increased ship traffic is identified as a threat for Peary caribou particularly if ship traffic along migration/movement corridors results in open leads. Increased marine traffic may also increase the potential for spills or contamination from illegal dumping of grey water, changing ballast water or waste spills. Communities have stressed the

	importance of identifying Peary caribou migration/movement routes and working with governments and management authorities to mitigate shipping impacts and international use of the Northwest Passage.
Stress	Marine traffic in the fall could prevent sea ice from forming and icebreaking may cause ice shelfs and ice-block rubble along edges of shipping channels preventing caribou from exiting the water, resulting in drowning. Open leads or open water may delay or impede caribou migration/movement increasing the potential for accidental drowning deaths or starvation while waiting for the ice to be thick enough to cross Sea ice is critical for maintaining and facilitating connectivity between and within subpopulations to fulfill the ecological needs of Peary caribou.
Extent	Localized (<50%)
Severity	Low
Temporality	Seasonal
Timing	Happening now
Probability	Medium
Causal certainty	Medium
Overall level of concern	**Low-Medium**

Threat #3. Competition	
Specific threat	Inuvialuit have identified competition with muskoxen as a major threat to Peary caribou. Substantial Inuvialuit knowledge relates to the interspecific interactions between muskoxen and Peary caribou, Peary caribou avoidance of muskoxen and displacement of Peary caribou when muskoxen populations are high. Many Inuvialuit Elders have seen a correlation between high muskoxen populations and low caribou populations, suggesting that muskox and caribou naturally cycle opposite to each other. Commercial harvest programs and quotas for muskox have been managed in order to promote caribou populations. Inter-specific competition for forage between other herbivores and Peary caribou is possible given that there is some evidence for overlap in diet between Peary caribou and muskoxen, although the consequences of the overlap are not known. The effects of weather on inter- and intra-specific

	competition are not known. For example, icing or deep snow could cause muskoxen to forage on upper slopes and ridges where Peary caribou typically forage.
Stress	Increased numbers of muskoxen have a detrimental effect on Peary caribou on Banks Island, either due to competition for food, trampling of caribou forage, or avoidance of the muskoxen's strong odor. High muskoxen populations may also attract and maintain high numbers of wolves. Hyperabundant snow geese compete with Peary caribou for forage and change sedge meadow habitat by damaging whole plants and further reducing surface water of ponds associated with climate change
Extent	Widespread (>50%)
Severity	Low
Temporality	Continuous
Timing	Happening now
Probability	High
Causal certainty	Low
Overall level of concern	**Low**

Threat #4. Harvesting	
Specific threat	Several hunters report that general overharvesting contributed to Peary caribou declines on Northwest Victoria Island, and some harvesters from Banks and Northwest Victoria Islands suggest that harvesting females may be detrimental to Peary caribou populations. New technologies such as snowmobiles and rifles, in addition to the growth of the community itself, were reported to have facilitated overharvesting and wastage of caribou on Northwest Victoria Island On Northwest Victoria Island, harvesting by humans has often been implicated in local perspectives of past caribou declines. However, more recently Inuvialuit harvesters have preferential rights to Peary caribou harvest and community-imposed harvest quotas have kept harvest rates nil—to-minimal since 1993. Peary caribou harvest quotas on Northwest Victoria Island (10) and Banks Island (72) for have been in place since 2015/16, with annual harvesting level below quota most years. And Peary caribou are rarely hunted on the WQEI because there are no communities on those islands and their remoteness makes them difficult to reach.

Stress	In the early 1970s, it was reported that an average of six caribou were taken per family during the early winter, or 200-225 caribou in total per year. Prior to 1987-88, harvest numbers for Peary caribou were recorded only sporadically. Although overharvesting has been an important factor in past declines on Northwest Victoria Island, the current harvest of Peary caribou is now much lower than in the past. Since 1987, the reported harvest of Peary caribou (the 'Minto Inlet Herd') on Northwest Victoria Island has declined to virtually nothing. This is in part on account of an NWT-wide harvest quota being introduced in 1990, and a zero-harvest policy initiated by the Olokhaktomiut Hunters and Trappers Committee in 1993 for Northwest Victoria Island. In 2015/16, an annual quota of 10 animals from the Minto Inlet management area was established. There are quotas for Peary caribou on Banks Island and Northwest Victoria Island, with recent harvests averaging below the quotas, and harvesting on the WQEI is likely low due to their remoteness. Currently, harvest of Peary caribou is likely not a significant enough mortality factor to be considered a threat to the two NWT subpopulations.
Extent	Widespread (>50%)
Severity	Low
Temporality	Continuous
Timing	Not expected (Harvest is occurring but under strict quota)
Probability	Low
Causal certainty	Low
Overall level of concern	**Low**

Threat #5. Predation	
Specific threat	Little information is available on Arctic wolf population size/trends, the seasonal diets of wolves in the area and the effect of wolf predation on the Peary caribou population. However, harvesters have cited predation by wolves as a significant factor in caribou declines, particularly on Banks Island. On Northwest Victoria Island, hunters report that wolves feed primarily on caribou. Wolf populations have fluctuated over the years and were reported to be increasing on both Banks Island and Northwest Victoria Island in the 1990s. Between 2014/15 and 2018/19, a 5-year cumulative total of wolf samples and hides submitted by subsistence harvesters (as a proxy for individual animals

	harvested) were 57 from Sachs Harbour and 149 from Ulukhaktok. In many communities wolves are considered a problem for caribou and they are hunted to minimize the effect of predation on Peary caribou. In addition to the number of wolves, some communities are seeing changes to wolf pack structure (bigger packs, healthier, braver wolves). From 1955 to 1959 a wolf poisoning program reduced the number of wolves drastically. The decline of wolves coincided with the growth of the muskox population on Banks Island. The inter-relationships between wolves, muskoxen, and Peary caribou are clearly complex on Banks Island. Across the Inuvialuit and Kitikmeot range many Elders and communities interviewed believe that wolves are a part of the natural system and are not responsible for the major declines in Peary caribou and may have positive effects on population fitness.
Stress	Increasing wolf populations impact caribou especially when the numbers are low or declining, and when muskoxen numbers are declining. Wolf predation near caribou calving grounds in the north of Banks Island is considered a particularly serious risk. While Peary caribou and muskoxen may not necessarily compete directly for forage, muskoxen could affect Peary caribou numbers through 'apparent competition', which is an indirect interaction between species that share a common predator. When muskoxen are the primary prey species of wolves and Peary caribou are a secondary prey species, increasing muskoxen numbers could result in increased wolf numbers, which in turn could exert greater predation pressure on Peary caribou.
Extent	Widespread (>50%)
Severity	Unknown (Information on predation is considered a knowledge gap)
Temporality	Continuous
Timing	Happening now
Probability	High
Causal certainty	Low
Overall level of concern	**Low**

Threat #6. Human activities – disturbance and habitat alteration

Specific threat	The magnitude and immediacy of human activities as a measurable threat to Peary caribou are low but uncertain given the lack of information. There are concerns about the negative effects of resource development on Peary caribou and development in sensitive caribou habitat. Specific concerns pertain to low-flying helicopters, increasing interest in coal exploration, future potential in oil and gas resource extraction and mobilization (e.g. the proposed Melville Island deposit and gas pipeline), offshore oil and gas exploration, and increased offshore marine traffic. Resource extraction activities are of concern in critical areas on Banks and Melville Islands.
Stress	Communities have raised concerns regarding the disruption of migration routes, stress on caribou from low-flying helicopters and direct or functional habitat loss associated with resource extraction activities. Other potential direct negative impacts of industrial activities on Peary caribou include consumption of vegetation from contaminated sites, and sensory disturbance from noise and smell of explosions for seismic exploration or mining which may cause the caribou to move away from seismic sites. Sensory disturbance from exploration, seismic activity and low-level flying and land vehicles could negatively affect species, habitats, and body condition. Resource extraction activities may also result in the functional loss of habitat which may cause Peary caribou to abandon ranges or movement routes.
Extent	Localized (<50%)
Severity	Unknown (Lack of information on disturbance impacts)
Temporality	Continuous
Timing	Long-term future
Probability	Low
Causal certainty	Low
Overall level of concern	**Low**

Threat #7. Contaminants	
Specific threat	Contaminants do not appear to be significant threat to Peary caribou health. Contaminant levels were measured in Peary caribou on Banks Island in the 1990s. Levels of metals in Banks Island caribou are the lowest reported in the study of 15 Canadian caribou subpopulations and are similar to background levels found in humans. Levels of radionuclides including $_{137}$Cesium (from the fallout after the Chernobyl reactor meltdown) were not detectable in muscle

	or liver tissues and were very low in kidneys.
Stress	Contaminants were included among potential threats because over time the types of contaminants change as new chemicals come into common use. The risk from current and emerging airborne contaminants (including smoke and dust from forest fires in the NWT or surrounding areas) and contaminated sites to the health of Peary caribou has been identified by communities as a priority for further investigation and monitoring.
Extent	Widespread (>50%)
Severity	Low
Temporality	Continuous
Timing	Happening now
Probability	High
Causal certainty	Low
Overall level of concern	**Low**

APPENDIX B: PEARY CARIBOU SURVEY DATA (NORTHWEST TERRITORIES)

Modified from Jenkins *et al.* (2011) and updated with data from new surveys.

Survey Year	Season	Survey Coverage (%)	Estimate incl. calves	SE or 95% CI	Estimate 1+ year	SE or 95% CI	% Calves or Not Observed	Carcass counts (estimates)	Comments	Reference
Western Queen Elizabeth Subpopulation										
Northwestern Queen Elizabeth Islands										
Mackenzie King Island										
1961	17-Aug	4	2,192		(1710)		22			Tener 1963
1973	15-Apr	~25-50	NA				N			Miller *et al.* 1977a
1974	11-Apr	~25-50	60				N			Miller *et al.* 1977a
1997	18-Jul	20			36	22	25	(24+/-14)	1 cow-calf pair	Gunn and Dragon 2002
Brock Island										
1961	17-Aug	4	190				unk		Partial survey due to fog	Tener 1963
1973	15-Apr	~25-50	24				N			Miller *et al.* 1977a
1997	18-Jul	20	0		0		0	0		Gunn and Dragon 2002
Borden Island										
1961	17-Aug	4	1,630		(1271)		22			Tener 1963
1973	14-15 Apr	~25-50	16				N			Miller *et al.* 1977a
Southwestern Queen Elizabeth Islands (Melville Group)										
Melville Island (Half in Nunavut)										
1961	8-22 Jul	4	12,799				19			Tener 1963
1972	20 Mar-6 Apr	~25-50	705	159			N			Miller *et al.* 1977a

Survey Year	Season	Survey Coverage (%)	Estimate incl. calves	SE or 95% CI	Estimate 1+ year	SE or 95% CI	% Calves or Not Observed	Carcass counts (estimates)	Comments	Reference
1972	13-24 Aug	~25-50	2,551	724	2,551	724	0		Only strata I-VI	Miller *et al.* 1977a
1973	19 Mar-7 Apr	~25-50	1,648	181			N			Miller *et al.* 1977a
1973	5 Jul-2 Aug	~25-50	3,425	618			12			Miller *et al.* 1977a
1974	4-21 Aug	~25-50	1,679	NA			1		Extrapolated for 3 missed strata	Miller *et al.* 1977a
1987	1-22 Jul	27	943	126	729	104	19			Miller 1988
1997	2-20 Jul	20	787	97	787	97	0	(150+/-48)		Gunn and Dragon 2002
2012	31 Jul-20 Aug	20			2712	2225-3199	11.7	0	70 calves observed	Davison and Williams 2016
Byam Martin Island (Nunavut)										
1972	22-23 Mar	~25-50	4	3			N			Miller *et al.* 1977a
1972	07-Aug	~25-50	86	65			0			Miller *et al.* 1977a
1973	27-Mar	~25-50	34	13			N			Miller *et al.* 1977a
1973	15-Jul	~25-50	43	36			11			Miller *et al.* 1977a
1974	01-Apr	~25-50	6	2			N			Miller *et al.* 1977a
1974	20-Aug	~25-50	6	4			0			Miller *et al.* 1977a
1987	08-Jul	27	98	37	70	26	19			Miller 1988
1997	20-Jul	20	0		0		0	(26+/-11)		Gunn and Dragon 2002
2012	8 Aug	19			119	46-192	25.8		8 calves observed	Davison and Williams 2016
Prince Patrick Island										
1961	23-24 Jul	4	2,254				20			Tener 1963
1973	8-15 Apr	~25-50	1,381	269			N			Miller *et al.* 1977a
1973	28 Jul-21 Aug	~25-50	807	259			11			Miller *et al.* 1977a
1974	10-16 Apr	~25-50	1,049	212			N			Miller *et al.* 1977a
1974	18-25 Jul	~25-50	621	177			7			Miller *et al.* 1977a
1986	4-13 Jul	27	151	12-182	106	11-114	30			Miller 1987

Survey Year	Season	Survey Coverage (%)	Estimate incl. calves	SE or 95% CI	Estimate 1+ year	SE or 95% CI	% Calves or Not Observed	Carcass counts (estimates)	Comments	Reference
1997	29 Jun-1 Jul	20	84	34	84	34	0	(178+/-37)		Gunn and Dragon 2002
2012	21-26 Aug	21			2635	1774-3496	17.6	0	119 calves observed	Davison and Williams 2016
Eglinton Island										
1961	24-Jul	4	204				31		4 calves observed	Tener 1963
1972	04-Apr	~25-50	574	122			N			Miller *et al.* 1977a
1972	10-Aug	~25-50	83	59	83	59	0			Miller *et al.* 1977a
1973	08-Apr	~25-50	90	15			N			Miller *et al.* 1977a
1973	08-Aug	~25-50	12	9	12	9	0			Miller *et al.* 1977a
1974	Apr	~25-50	301	60			N			Miller *et al.* 1977a
1974	25-Jul	~25-50	18	10			4		1 calf observed	Miller *et al.* 1977a
1986	04-Jul	27	79	0-229	65	0-183	18			Miller 1987
1997	02-Jul	20	0		0		0	0		Gunn and Dragon 2002
2012	20 Aug	19			183	49-317	0		No calves observed	Davison and Williams 2016
Emerald Island										
1961	24-Jul	4	161				3			Tener 1963
1973	15-Apr	~25-50	0				N			Miller *et al.* 1977a
1973	30-Jul	~25-50	39				N			Miller *et al.* 1977a
1974	17-Apr	~25-50	12				N			Miller *et al.* 1977a
1986	04-Jul	27	14	0-49	11	0-37	25			Miller 1987
1997	19-Jul	20	0		0		0	(17+/-16)		Gunn and Dragon 2002
2012	19 Aug	20			46	0-124	18.2		2 calves observed	Davison and Williams 2016
Melville Group amalgamated (including NU sectors)										
1961	Jul	4	15,418						Byam Martin (NU) not done	Tener 1963
1972	Apr	~25-50	1,283						Prince Patrick,	Miller *et al.* 1977a

Survey Year	Season	Survey Coverage (%)	Estimate incl. calves	SE or 95% CI	Estimate 1+ year	SE or 95% CI	% Calves or Not Observed	Carcass counts (estimates)	Comments	Reference
									Emerald not done	
1972	Aug	~25-50	2,720						Prince Patrick, Emerald not done	Miller *et al.* 1977a
1973	Mar-Apr	~25-50	3,153							Miller *et al.* 1977a
1973	Jul-Aug	~25-50	4,326							Miller *et al.* 1977a
1974	Apr	~25-50	1,368						Melville not done	Miller *et al.* 1977a
1974	Jul-Aug	~25-50	2,324						Emerald not done	Miller *et al.* 1977a
1986-87	Jul	27	1,285							Miller 1988
1997	Jul	20	871							Gunn and Dragon 2002
2012	31-Jul-26 Aug		>5,500						Mack-King, Brock, Borden not done	Davison and Williams 2016
Banks/Northwest Victoria Islands Subpopulation										
Banks Island										
1970	23-28 Jun	Unk	5,300						Northern Banks only	Kevan 1974
1970	23-28 Jun	Unk	5,300-8000		4,298		18.9		Northern Banks only	Kevan 1974
1971	Mar	N/A	11398		10,099		11.4			Urquhart 1973
1971	Jun	N/A	10327		7,446		27.9			Urquhart 1973
1971	Sept	N/A	11150		8,541		23.4			Urquhart 1973
1972	Sept	6-25	12098		10,005		17.3			Urquhart 1973 Updated from Jenkins et al 2011
1979-80		25-26			8,000-9,000					Vincent 1990 in Latour 1985

Survey Year	Season	Survey Coverage (%)	Estimate incl. calves	SE or 95% CI	Estimate 1+ year	SE or 95% CI	% Calves or Not Observed	Carcass counts (estimates)	Comments	Reference
1982	4-10 Jul	15			7,233	998			Calves not recorded	Latour 1985
1982	4-10 Jul	15			6,970	1,133	19		Area verification	Nagy *et al.* 1996
1982	4-10 Jul	15			9,036	6,110-11,370			Retrospective	Nagy *et al.* 2009a
1985	6-14 Jul	9-24			5,000	910	15		Calves likely minimum est.	McLean *et al.* 1986
1985	6-14 Jul	9-24			4,931	914	15		Area verification	Nagy *et al.* 1996
1987	27-30 Jun	5-15			4,500	660	23			McLean 1992
1987	27-30 Jun	5-15			4,251	663	21		Area verification	Nagy *et al.* 1996
1989	22-28 Jun	10-20			2,600	340	26	(300)	29 carcasses observed	McLean and Fraser 1992
1989	22-28 Jun	10-20			2,641	334	23		Area verification	Nagy *et al.* 1996
1990	14-19 Sep	5			526	302	11			McLean *et al.* 1992
1991	27 Jun-3 Jul	10			888	151	5	(60)	6 carcasses observed	Fraser *et al.* 1992
1991	27 Jun-3 Jul	10			897	151	3		Area verification	Nagy *et al.* 1996
1992	21-30 Aug	20-40			1,018	133 (748-1288)	29	2		Nagy *et al.* 2009b
1992	21-30 Aug	20-40			1,005	133	31		Area verification	Nagy *et al.* 1996
1994	Jul	20-40	812	313?	742	132 (269)	8 (7.5)	7		Nagy *et al.* 2006a 2013
1994	Jul	20-40	812		742	473-1011	7.5		SE = 137	Nagy *et al.* 2013; MR 223
1998	Jul	20-40			451	60	19	0		Nagy *et al.* 2006b

Survey Year	Season	Survey Coverage (%)	Estimate incl. calves	SE or 95% CI	Estimate 1+ year	SE or 95% CI	% Calves or Not Observed	Carcass counts (estimates)	Comments	Reference
1998	Jul	20-40	566		451	328-574	18.9		SE = 63	Nagy *et al.* 2013; MR224
2001	7-15 Jul	20			1,142	155 (818-1466)	26	0		Nagy *et al.* 2006c
2005	24 Jul-1 Aug	20			929	143 (640-1218)	19	0		Nagy *et al.* 2009c
2010	17-26 Jul	20			1,097	754-1440	22.8		SE = 175	Davison *et al.* 2013
2014	8-18 Jul	20			2234	1404-3064	17.8		SE = 423	Davison et al 2017
2019	??	17			1913	1507-2319	10.2		SE = 207	GWNT unpubl. data
Northwest Victoria Island										
1980	Aug 5-20		4,512	988						Jakimchuk and Carruthers 1980
1987	21 Jun	6	3500		(643) 2600	(172)	27			Gunn and Fournier 2000a 3500 and 2600 and 27 from Gunn 2005
1992	24-26 Mar	10-31			170	54 (116-224)				Heard 1992a
1993	18-20 Mar	5-10			114	22				Gunn 2005
1993	13-15 Jun	10			20	-	5		Total observed; 1 calf	Gunn 2005
1994	5-17 June	10-30			39	28			Stratum IV of western Victoria	Nishi and Buckland 2000

Survey Year	Season	Survey Coverage (%)	Estimate incl. calves	SE or 95% CI	Estimate 1+ year	SE or 95% CI	% Calves or Not Observed	Carcass counts (estimates)	Comments	Reference
1998	early Jul	20			95	29 (35-155)	12	0		Nagy *et al.* 2009d
2001	16-21 Jul	20			204	50 (101-307)	24	0		Nagy *et al.* 2009e
2005	6-8 Jul	10-20			66	30 (5-127)	28	0		Nagy *et al.* 2009f
2010	28 Jul-15 Aug	20			150	46-254	12			Davison and Williams 2013
2015	14 Apr-6 May	19							Only 2 caribou were observed	Davison and Williams 2019
2019	8-24 May	17			176	N/A	0			Davison and Williams in prep.