Species Status Report

Dolphin and Union Caribou

Rangifer tarandus groenlandicus x pearyi

Island caribou | Arctic-island caribou | Mainland caribou
Tuktu (Kangiryuarmiutun)
Tuktu/tuktut (Sallirmiutun)
Tuttu (Uummarmiutun)
Kiilliniq caribou (Inuinnaqtun [Nunavut])

IN THE NORTHWEST TERRITORIES

NORTHWEST TERRITORIES
SPECIES AT RISK COMMITTEE

REASSESSMENT – ENDANGERED

APRIL 2023

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 Integral Ecology Group 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 Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories (2013).

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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 Dolphin and Union 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 Climate Change, Government of the Northwest Territories, provides full administrative and financial support to the Species at Risk Committee.

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REASSESSMENT OF DOLPHIN AND UNION CARIBOU

The Northwest Territories Species at Risk Committee met on April 18-21, 2023 and assessed the biological status of Dolphin and Union 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: Endangered in the Northwest Territories

Endangered – The species is facing imminent extirpation from the NWT or extinction.

Reasons for the assessment: Dolphin and Union caribou fit criteria ICK (c) and SK (A2 a) for Endangered.

Status Category	**Criterion**	
Endangered	ICK(c)	It is *generally* agreed that the species is observed *less frequently* than in the past in a large portion of its range AND is understood by knowledge holders to be *very sensitive* to natural or human-caused threats AND knowledge holders express *high* concern about *widespread threats* impacting the species.
Endangered	SK(A2 a)	Based on direct observations, the species has experienced a population size reduction ≥50% over the last 3 generations where the causes of the reduction may not have ceased and may not be reversible.

The Species at Risk Committee determined that Dolphin and Union caribou fit ICK and SK criterion for Endangered.

Main factors (ICK):

- The decline in the population of Dolphin and Union caribou is a serious concern for local communities.
- Ulukhaktok has implemented a voluntary maximum harvest of 50 Dolphin and Union caribou per year and a voluntary closure in the spring to allow pregnant cows to migrate

and calve. Strict harvesting limits for Dolphin and Union caribou have also been implemented in Nunavut. These restrictions are significantly impacting the traditional and cultural connections to the land and to Dolphin and Union caribou for all communities sharing the range of this species.

- Climate change is a high concern because of the impacts to Dolphin and Union caribou habitat as well as caribou body condition and survival.
- Important threats during migration of Dolphin and Union caribou include dangerous ice crossings, and increased ship traffic leading to increased drownings and inability to migrate across the sea ice.
- Unseasonably warm temperatures due to climate change can cause rain in the winter or freeze-thaw cycles that can create an ice crust on the snow, and delay ice formation on lakes, rivers and the sea. This makes migration and foraging difficult for Dolphin and Union caribou.
- Communities are very concerned about potential increased shipping traffic and impacts on ice conditions and migration across the sea ice.
- Access to forage is reduced by icing on snow and vegetation events, heavy precipitation, and changes in vegetation. These threatening events are linked to climate change and are predicted to increase in the future.

Main factors (SK):

- There has been an 89% decline in the total population of Dolphin and Union caribou over a 23-year period from 1997 to 2020 (approximately 3 generations [24-27 years]).
- The Dolphin and Union caribou population is currently estimated at about 3,815 caribou and has experienced a continued decline since the late 1990s. If the population continues to decline, at some point there may be potential for a genetic bottleneck.
- The decline is due to a combination of factors including some that can be managed (e.g., predation, harvest). However, threats related to climate change are extremely difficult to manage or reverse (e.g., changes to sea ice, icing events, snow cover, and extreme weather events).

Additional factors:

- Interactions with predators and increases in goose populations are also threats to Dolphin and Union caribou. Community members are very concerned about grizzly bears as a new predator establishing itself on Victoria Island. An overabundance of geese is leading to the elimination of vegetation in some areas important to Dolphin and Union caribou.

- Community members have expressed concerns regarding the impacts of future mining projects and possible expansion of current mining activities on caribou migration routes and winter-feeding grounds.

Positive influences to Dolphin and Union caribou and their habitat:

- The Olokhaktomiut Community Conservation Plan identifies a calving area for Dolphin and Union caribou in the Colville Mountains as a Wildlife Area of Special Interest.
- Recommendations from an icebreaking workshop in Cambridge Bay in October 2019 developed solutions to proactively mitigate the risks of icebreaking activities. In 2020 a Notice to Mariners (NOTMAR) for Vessels Intending to Navigate the Kitikmeot Region in Canada's Northern Waters was developed to mitigate the risks of icebreaking to wildlife and people traveling on ice.
- The draft Nunavut Land Use Plan recommends protection measures for sea ice crossings and calving areas for Dolphin and Union caribou.
- In 2020/21, restrictions were implemented on harvest of Dolphin and Union caribou by the OHTC (voluntary annual harvest of 50 and spring harvesting closure) and Nunavut (total allowable harvest of 105).
- Proposed implementation of mandatory sampling and reporting will reduce uncertainty in harvest levels and provide information on the impact of harvest on Dolphin and Union caribou population dynamics.
- WMAC (NWT) and GNWT implemented a program in 2021 to increase financial incentives for wolf harvesting in the Inuvialuit Settlement Region.
- Harvesters continue to advocate for prioritization of harvester education, covering topics from proper harvesting techniques, etiquette around meat sharing, and specialized predator knowledge, and focusing on hands-on activities that connect harvesters who want to learn with harvesters who want to teach.
- Increased plant productivity resulting from climate change may increase the availability of quality forage during the growing season.

Assessment History:

- The NWT Species at Risk Committee met in December 2013 and assessed Dolphin and Union caribou as Special Concern in the NWT.
- In 2015, Dolphin and Union caribou were listed Special Concern in the NWT under the *Species at Risk (NWT) Act.*
- The Government of the Northwest Territories, Government of Nunavut, in cooperation with co-management partners developed a management plan for Dolphin and Union caribou in 2018.

Recommendations:

- Implement and enforce protection measures for calving areas.
- Enforce ice breaking restrictions during migration periods.
- Improve communications on ship traffic and shipping management amongst data providers, NWT communities and organizations.
- Encourage and support communities to continue harvest education based on cultural teachings of Elders.
- Implement harvest sampling, monitoring, and reporting. Improve sharing of information between jurisdictions.
- Support monitoring and financial incentives for predator harvesting.
- 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	
Description Dolphin and Union caribou (tuktu/tuttu or *Rangifer tarandus groenlandicus x pearyi)* are intermediate in size and colour compared to the smaller, lighter-coloured Peary caribou and the larger, darker-coloured mainland barren-ground caribou. Similar to Peary caribou they have pale gray antler velvet, but their legs remain brown throughout the year. The caribou are named after the Dolphin and Union Strait, which the caribou historically crossed twice a year during their northward spring migration and southward fall migration. The caribou are generally distinguished from Peary and Mainland caribou based on morphological differences and migratory behaviour from Victoria Island to mainland Northwest Territories and Nunavut; however, Dolphin and Union caribou are now often found year-round on the island and mainland. Caribou and caribou cycles are inherently linked to the Inuvialuit and Inuit people in Canada's Arctic. Caribou are highly valued for subsistence, economic, and cultural purposes and are an integral part of Inuvialuit and Inuit identity and wellbeing. **Biology and Behaviour** Unlike barren-ground caribou, Dolphin and Union caribou do not aggregate to calve, so they do not have clearly delineated calving	**Description** Dolphin and Union caribou (*Rangifer tarandus groenlandicus* x *pearyi*) are larger and darker in colour than Peary caribou (*Rangifer tarandus pearyi*) and smaller and lighter in colour than barren-ground caribou (*Rangifer tarandus groenlandicus*). The early winter coat is distinctive in being white with a pale brown back and legs that are lighter in colour than barren-ground caribou, but darker than Peary caribou. In summer, the coat is light to darker brown on the back and does not have the pronounced flank stripe typical of barren-ground caribou. The pale gray antler velvet is a distinguishing characteristic compared to the brown velvet of barren-ground or woodland caribou. Dolphin and Union caribou are genetically distinct from barren-ground and Peary caribou. **Life Cycle and Reproduction** Information on biology of Dolphin and Union caribou is limited although much can be inferred from information from other northern caribou. Caribou usually first calve at three years of age and give birth to a single calf. Calves typically remain with their mothers until they are one year old. Pregnancy rates vary annually and may be affected by forage availability as well as levels of oestrid (warble) fly and intestinal worm parasites. Dolphin and Union caribou can live

grounds. Dolphin and Union caribou are migratory and move across the sea ice to reach their summer ranges on Victoria Island and their winter ranges on the mainland. In the spring, cows usually migrate onto Victoria Island and past Prince Albert Sound before the bulls, but the fall migration takes place with bulls and cows together. Migration, rut, and calving are energetically expensive activities that can result in poor body condition. Body condition, particularly the amount of body fat, and taste indicate whether an individual caribou is healthy or not. Other factors that affect body condition during migration include changes in food, changes in migration distances (e.g., when caribou have to migrate farther), and extreme temperatures, rough snow conditions, and rain during snow seasons. Decreases in body condition (back fat) have been encountered in correlation with caribou population declines.

Traditional knowledge suggests that caribou adapt their distribution and group size in response to low abundance. Dolphin and Union caribou may stop migrating during population lows and may remain on Victoria Island during the winter.

Caribou eat many different types of plants and mushrooms, but depend heavily on lichens.

Wolves prey on Dolphin and Union caribou and wolf populations cycle with caribou populations. Ulukhaktok residents (interviewed in 2011-2013) along with communities from Nunavut have reported increases in wolf numbers through the range of Dolphin and Union caribou and expressed

up to 14 years. Limited information is available on the relative importance of causes of mortality, which include drowning (breaking through sea ice), predation, hunting and starvation (due to adverse weather affecting availability of forage in winter). Their main predator is likely arctic wolf (*Canis lupus arctos*), although grizzly bear (*Ursus arctos*) abundance has recently been increasing on the mainland as well as Victoria Island. An indicator of Arctic wolf abundance (number of wolves seen during surveys) suggests that wolf numbers have likely increased since the late 1990s.

Exposure to several pathogens has been documented in Dolphin and Union caribou, with *Brucella suis* Biovar 4 and *Erysipelothrix rhusiopathiae* of most concern.

Harvesting Dolphin and Union caribou is a part of Indigenous culture. Lack of consistently collected harvest information makes it difficult to assess the level of harvest and the role of harvest in Dolphin and Union caribou population dynamics. However, recent initiatives for community-based harvest reporting along with harvest limits will help to better manage harvest and understand populations.

Physiology and Adaptability

Dolphin and Union caribou are adapted to extreme cold; their tolerance of heat is unknown. Dolphin and Union caribou likely adapt to varying forage availability through their foraging strategies, which include local or long-distance movements and migrations

concerns about imbalances in predator-prey dynamics.

In the past, Victoria Island would have been a refuge for Dolphin and Union caribou from grizzly bear predation. However, the distribution of grizzly bears onto the arctic islands has been increasing and community members are very concerned about grizzly bears as a new predator establishing itself on Victoria Island.

Muskoxen and Dolphin and Union caribou feeding areas have some overlap during the growing season, but they tend to feed in different areas for the rest of the year. However, a consequence of higher numbers of muskoxen is that they provide alternate prey for wolves and therefore could maintain high numbers of wolves while caribou are declining.

Since the mid-1980s, southern and northern migration routes of different caribou types have come together more frequently and some individual caribou from different caribou types were reported as migrating together in small groups before joining a larger group. Intermixing between Dolphin and Union caribou and Peary caribou or barren-ground caribou have been observed based on behavioural and morphological changes.

when winter snow and ice conditions are exceptionally restrictive. Those movements include crossing the sea ice to reach mainland winter ranges characterised by a higher amount of vegetation and more varied terrain and snow conditions.

Interactions

Limited information is available on diet of Dolphin and Union caribou. In winter they feed on upland plant communities including evergreen shrub leaves, sedges and willow along with forbs, lichen and mosses forming a small fraction of the diet. Caribou on the island (summer range) had higher proportions of *Dryas* spp, grasses and sedges compared to arctic heather (*Cassiope tetragonia*), lichen, shrub and twigs in their mainland diet.

Lesser snow geese (*Anser caerulescens caerulescens*) have been increasing in the Central Arctic since the 1970s and are currently categorized as overabundant. Although it is unclear how the increase in snow goose numbers may be affecting Dolphin and Union caribou, impacts will likely be localized near goose colonies. Muskoxen use of plant communities may result in an overlapping diet with Dolphin and Union, potentially increasing competition for forage.

Dolphin and Union caribou may also mix with other types of caribou. Dolphin and Union caribou share Victoria Island (summer range) with Peary caribou and part of their winter range on the mainland overlaps with the barren-ground caribou range.

	Arctic wolves and grizzly bears are important predators to Dolphin and Union caribou. Grizzly bears have expanded their range in the Canadian Arctic, with increasing frequency of sightings on the NWT Arctic islands. Predation rates of wolves and grizzly bears on Dolphin and Union caribou is not known. Although parasites and evidence of exposure to diseases have been documented in Dolphin and Union caribou, less is known about the effects of parasites and diseases at the population level. Dolphin and Union caribou tested during sampling from 2015 to 2019 on Victoria Island had been exposed to six of the seven pathogens tested. Of the seven pathogens tested, *Brucella suis* Biovar 4 and *Erysipelothrix rhusiopathiae* are of most concern to caribou. Climate change is expected to result in more favourable conditions for parasites and pathogens. Harvesting is part of Indigenous culture. Harvesters from Ulukhaktok and Cambridge Bay hunt Dolphin and Union caribou during their migrations nearer to those communities. In 2021, the Olokhaktomiut (Ulukhaktok) Harvesters and Trappers Committee (OHTC) initiated a voluntary annual harvest limit of 50 Dolphin and Union caribou and a spring hunting closure from April 15 to July 15, to protect caribou during spring migration and calving. In addition, the OHTC has requested implementation of a by-law for mandatory sampling and reporting of all caribou on Victoria Island to better track harvests.
Place	

Distribution Dolphin and Union caribou are a single population found on southern, central, and eastern Victoria Island, as well as sections of the mainland coast. Their range includes parts of both the Northwest Territories and Nunavut. Caribou from the Dolphin and Union population and barren-ground caribou will often migrate together. **Movement and Dispersal** Dolphin and Union caribou migrate seasonally between their characteristic summer range on Victoria Island and their winter range on the adjacent mainland approximately between Bernard Harbour to just east of Bathurst Inlet. The distribution of Dolphin and Union caribou has varied extensively over the past 50 years and the abundance and specific crossing locations have shifted over time. **Changes in Distribution** Most caribou depart from just a few locations on the coast, which are often used consistently from year to year. A large group of Dolphin and Union caribou migrated between Victoria Island and the mainland in the late 19th century and early part of the 20th century. The group was scarcely seen from the 1920s until the 1940s. By the late 1970s, Inuit hunters began to report more caribou sightings on southern and central Victoria Island. In the early 2000s, Elders in Cambridge Bay and Kugluktuk reported that Dolphin and Union winter range was extending further	**Distribution** Dolphin and Union caribou occur as a single geographic population, and globally are found only in the Northwest Territories (NWT) and Nunavut. Their range is restricted to Victoria Island (except the northwest) and the nearby mainland coast of Nunavut and the Northwest Territories. Dolphin and Union caribou calve and spend summer into fall on Victoria Island in the Northern Arctic ecozone, and winter on the mainland in the Southern Arctic ecozone. During winter, Dolphin and Union caribou distribution may overlap with barren-ground caribou, and during summer may overlap with Peary caribou on northwestern Victoria Island. Calving is dispersed across central Victoria Island. Recently, some caribou have wintered on Victoria Island, but most Dolphin and Union caribou continue to migrate to winter range on the mainland, despite a large decrease in population size. A key distinguishing characteristic of Dolphin and Union caribou is that they complete a coordinated migration across sea ice. **Habitat Requirements, Availability, Trends and Fragmentation** Dolphin and Union caribou use tundra habitats characterised by creeping dwarf-shrubs, forbs, sedges, mosses, and lichens. Plant cover is sparse throughout their range. Limited information is available on the diet of Dolphin and Union caribou. However, data suggest that the diet consisted of mostly evergreen shrub leaves, sedges and willow typically of upland plant communities.

south than in the past. Over the past few decades, some Kugluktuk hunters reported an eastern shift in the western boundary of the range of Dolphin and Union caribou, from Kugluktuk towards Cambridge Bay. The main migratory route has since shifted east; the caribou now primarily migrate across Coronation Gulf, Dease Strait, and Queen Maud Gulf.

Historically, it is known by knowledge holders that some caribou do not migrate and remain on the Island – this behaviour may be attributed to low population densities. Long delays may cause some caribou to abandon migrating behaviour altogether and remain on the island. Changes in migration are also influenced by changes to freeze up, spring melt, ice thickness, and water levels.

Changes to vegetation that result from climate change may also cause a shift in migration patterns; however, further investigation is needed.

Search Effort

Inuvialuit and Inuit hunters from the NWT communities of Ulukhaktok and Paulatuk, and from the Nunavut communities of Cambridge Bay, Kugluktuk, Umingmaktok and Kingauk (formerly Bay Chimo and Bathurst Inlet respectively) harvest Dolphin and Union caribou. There is seasonal variation in harvesting intensity due to the seasonal movement of Dolphin and Union caribou. The season that Dolphin and Union caribou is accessible varies by community based on its

Dolphin and Union caribou migrate between seasonal ranges, including pre-calving migration to more northern and central parts of Victoria Island for calving. Caribou migrate south during fall to their winter range on the mainland, which is in the mid-Arctic vegetation zone. During fall, Dolphin and Union caribou stage along the south coast of Victoria Island before crossing the sea ice to winter ranges on the mainland. Snow cover influences habitat selection as key habitat requirements are terrain and vegetation features that offer choices as caribou adjust their foraging to snow conditions.

Unlike barren-ground caribou, Dolphin and Union caribou calving is less gregarious; cows disperse over a relatively large area to calve. This calving behaviour may be related to a relatively low density of predators and/or a low vegetation biomass. Two calving areas were identified as Important Wildlife Areas for Dolphin and Union caribou in the NWT based on information from studies and community conservation plans: the Nigiyok Naghak and Kugaluk River Calving Areas.

Information on habitat trends specifically within the Dolphin and Union caribou range is limited. Currently there are no major industrial projects on Victoria Island that could result in habitat loss. Hope Bay Mine on the east side of Bathurst Inlet on the Nunavut mainland is the only mine operating within the Dolphin and Union caribou range, although mineral exploration activities are occurring in other areas. In the Arctic, climate change is already affecting habitat through

migration. Hunting often takes place in the fall, winter, and spring months.

Today, Dolphin and Union caribou is harvested exclusively by Indigenous groups of the Northwest Territories and Nunavut. Resident and guided harvest for Dolphin and Union caribou is currently closed.

Key Habitats

Habitat/harvesting areas are located south of Wynniatt Bay, and a large habitat area is found east of Prince Albert Sound that extends north to Tahiryuak Lake on the Kuuk River. Dolphin and Union caribou habitat is also found on Wollaston Peninsula; the Colville Mountains Wildlife Area of Special Interest is an important calving area for Dolphin and Union caribou. Dolphin and Union caribou generally seek areas where high quality forage is available, and which provide relief from the elements, predation, difficult terrain, and insects. Islands, shorelines, snow patches, low valleys, high hills/eskers and damp or shared areas are often preferred. Dolphin and Union caribou travel across the sea ice to access other areas of their range for calving and foraging.

Habitat Trends and Fragmentation

Climate warming since the 1970s has changed plant growth on the tundra and on Victoria Island. Temperatures are also warmer overall. Sea ice and ice crossings may have changed: leads in the sea ice open earlier, ice is thinner overall due to warmer temperatures and changes in vegetation productivity and shrub growth, and impacts on sea ice extent, thickness, and duration.

Habitat fragmentation caused by human activities has not been documented within Dolphin and Union caribou range. However, increased ice-breaking activity could lead to fragmentation of sea ice habitat required for migrations, resulting in disrupted migrations and potentially to mortalities due to drowning.

shorter winters, and summer water levels are lower. Several information gaps have been noted regarding the condition of seasonal ranges for caribou including changes to winter conditions and availability of ranges and whether caribou and muskox compete for forage.	
Population	
Abundance, Population Dynamics, and Changes in Population Size Population surveys conducted in 1997, 2007, 2015, and 2018 suggest a decline in Dolphin and Union caribou abundance. The population estimate from the 2018 survey was 4,105 caribou and the estimate from the 2020 survey was 3,815 caribou. Although the 2020 population estimate is not significantly different from the 2018 estimate, it represents a decline in numbers from the surveys conducted in 1997 (34,558), 2007 (27,787), and 2015 (18,413), respectively. Community members from Ekaluktutiak HTO, Kugluktuk HTO, and Olokhaktomiut HTC provided input on the survey strata and participated in the 2020 survey. The 2020 survey reported a low number of caribou aggregating on the coastline to prepare for the fall migration, signalling a shift in migratory behaviour as more caribou overwinter on Victoria Island. A large group of Dolphin and Union caribou was noted to migrate between Victoria Island and the mainland in the late 19th century and early part of the 20th century. Some	**Abundance** The Dolphin and Union caribou population is shared between Nunavut and NWT. Abundance of the whole population in the early 20th century was high and then abruptly declined by the 1920s, associated with a halt in migration between Victoria Island and the mainland coast. Abundance remained low until the 1970s and early 1980s. Between 1980 and 1994, two systematic aerial surveys of western and central Victoria Island suggested increasing abundance. Systematic surveys of caribou staging along the south coast of Victoria Island began in 1997 with a corrected population estimate of 34,558 ± 4,283 (Standard Error [SE]). Since 1997, the population decreased by 89% to a corrected estimate 3,815 ± 514 (SE) caribou in 2020. Rate of decline was steepest between 2015 and 2018. **Population Dynamics** Factors contributing to population change include calf recruitment, adult mortality, emigration and immigration. Since 1987,

Cambridge Bay residents have stated that the migration did not cease and continued throughout the 1900s in small numbers. Caribou were scarcely seen in the 1920s and 1930s but were reported in southern Victoria Island again in the 1950s.

In the mid-2000s, Cambridge Bay residents reported fewer observations of calves and yearlings compared to the 1990s. Residents have also reported an increase in caribou deaths attributed to predation.

In the late 1990s and early 2000s, Inuit expressed different understandings of whether caribou numbers were increasing or decreasing. Studies with residents of Kugluktuk and Cambridge Bay suggest Dolphin and Union caribou, near their respective communities, reached a peak in the mid- to late-1980s and progressively declined until the mid-2010s. By 2014, residents of Cambridge Bay regularly observed fewer caribou in small, scattered groups ranging between 3 to 40 individuals.

Health

Dolphin and Union caribou body condition is known to fluctuate according to the seasons, as reported by residents of Ulukhaktok, Ekaluktutiak, and Kugluktuk. Caribou are typically fat during the summer and fall, moderate during the winter, and skinny during the spring. Migration and rut are the life stages with the greatest impact on body condition.

Changes in body condition might be due to changes in food or because they are migrating farther than in the past. Kugluktuk harvesters

pregnancy rates have generally been high except from 2001 to 2003, when they ranged from 43% to 71%. The most recent pregnancy rates (2015-2021) ranged from 87% to 94%. The only late winter calf recruitment data available was from March 2017 (11 calves/100 cows), which indicated low calf recruitment. Recent (2016-2018) annual adult female survival rates were also low ranging from 58% to 61%.

Limited information on harvests rates suggests that estimated annual harvests of 2,000-3,000 caribou prior to 2011, represented 7-11% of the population size estimated in 2007. The current allowable harvests in the NWT (50) and Nunavut (105) represent 4.1% of the 2020 population estimate but does not include potential harvest by Paulatuk community members. With recent low adult female survival and calf recruitment rates and a declining population trend, it is uncertain for if or for how long the current allowable harvest will be sustainable.

Trends and Fluctuations

The first estimates of abundance for Dolphin and Union caribou ranged from 100,000 and 200,000 animals. These were based on estimates of the number of caribou crossing the Dolphin and Union Strait early in the 20th century. The population estimate from the 2018 survey was 4,105 caribou and the estimate from the 2020 survey was 3,815 caribou. Although the 2020 population estimate is not significantly different from the 2018 estimate, it represents a decline in

interviewed in 2003 said that they encountered caribou with rashes, green meat, spleen abnormalities and other indications of disease while Ekaluktutiak interviewees described sick caribou with big stomachs, green meat, irritated spleens, and hoof problems. Harvesters from Kugluktuk and Cambridge Bay have also reported observations consistent with brucellosis, *Taenia* cysts and/or *Besnoitia tarandus* infection. The potential impacts of these diseases and infections to caribou populations is concerning for residents. **Rescue Effects** Dolphin and Union caribou are only found in the Northwest Territories and Nunavut. There is no possibility of rescue due to low populations across the entire range.	numbers from the surveys conducted in 1997 (34,558), 2007 (27,787), and 2015 (18,413), respectively. **Possibility of Rescue** The Dolphin and Union caribou population is genetically distinct and consists of only one subpopulation; consequently, rescue by genetically similar caribou may not be possible.
Threats and Limiting Factors	
Dolphin and Union caribou are threatened by drownings during ice crossings, and local communities have observed an increase in drowning events in both the spring and fall. If caribou encounter thin ice, they may fall through and drown or abandon attempts to migrate for the year. However, the population level impact of drownings is not known. Caribou require at least 10 cm of sea ice to cross from the mainland to Victoria Island. An increase in shipping traffic in the Northwest Passage is a concern for caribou as well as harvester safety because it may prevent or significantly delay the formation of ice. Community representatives are very concerned about the potential impacts of	The most important threats to Dolphin and Union caribou are likely climate change, health, predation, harvesting, disturbance, and habitat alteration due to human activities. It is uncertain how limiting factors interact. For Dolphin and Union caribou, the two primary threats of climate change are impacts on distribution and migrations due to changes in sea ice extent, thickness and duration, and decreased forage accessibility in winter due to increased intensity and frequency of severe weather events. Between Victoria Island and the mainland, total sea ice decreased at a rate of 6-10% per decade while there was no significant change

shipping traffic to Dolphin and Union caribou and highlight the importance of strong enforcement against icebreaking in the area. Icing on snow and vegetation causes problems for Dolphin and Union caribou. Caribou cannot 'dig' through ice crusts to forage, and ice crusts pose challenges for caribou to walk across. Freezing temperatures during calving may also result in the death of calves. Reports from knowledge holders indicate that freezing rain is happening more frequently now than in the past. Warm and dry weather promotes a longer and more intense insect season. An increase in insect harassment for caribou has been seen since the 1970s. Insect avoidance behaviour wastes energy and prevents feeding, which impacts body condition and thus their ability to survive migration and winter. Extremely hot weather can also cause caribou to lose body condition. Hot temperatures combined with windy conditions can limit sea ice formation and may influence caribou migratory behaviour and routes. Industrial development and other human activities may cause caribou to shift their annual migration routes, and noise pollution from machinery and low-flying aircraft may disturb caribou, particularly during calving season. Residents have expressed concerns regarding the impacts of future mining projects and possible expansion of current mining activities to caribou migration routes and winter-feeding grounds.	in multi-year ice. Sea ice is forming later in the fall and melting earlier in the spring (2004 and 2018). Later sea ice formation not only affects sea ice habitat for fall migration, but it extends the duration of staging along the south coast as the caribou wait for sea ice to form, which could have impacts on coastal plant communities resulting from increased foraging by caribou. Both rain-on-snow and icing events tripled in the Canadian Arctic Islands from 1979-1995 to 1996-2011. These events are linked to caribou mortalities through limiting access to forage. The extent and availability of snow cover indirectly influences plant communities and productivity and in turn caribou access to vegetation. Although technical information on causes of natural mortalities is limited, predation by Arctic wolves is likely a significant mortality factor. Grizzly bear abundance appears to be increasing on Victoria Island, which may result in increased predation on Dolphin and Union caribou. More information is needed to understand the impacts of grizzly bear predation on Dolphin and Union caribou. Restrictions on harvest were implemented in 2020 and 2021. The current allowable harvests in the NWT (50) and Nunavut (105) represent 4.1% of the 2020 population estimate. For Dolphin and Union caribou, human activities that result in disturbance and habitat alteration are primarily associated with mineral development and shipping.

Harvest levels and the overall harvest rate for Dolphin and Union caribou were unknown until very recently making it difficult to determine the degree of threat posed by harvesting activities. However, in 2018 The Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study was launched – providing annual information on the caribou harvest of Inuvialuit communities and reports harvest data specifically for Dolphin and Union caribou. Poorer hunting practices by less experienced Inuit and non-Inuit hunters were noted as an important issue facing Dolphin and Union caribou. Participants in the program expressed a desire for more educational opportunities for hunters. A range of diseases and parasites have been identified as impacting the Dolphin and Union caribou health, with local communities reporting more observations of diseased caribou since the 1980s. Wolves, wolverines, and grizzly bears are known predators within the range of Dolphin and Union caribou. Concerns about increasing wolf and grizzly bear abundance have increased since the 1970s and continue to be expressed by knowledge holders into 2020. Increases in populations of geese are also identified as a concern for Dolphin and Union caribou. An overabundance of geese is leading to the elimination of vegetation in some areas important to Dolphin and Union caribou.	Mining activity on the Nunavut mainland within the Dolphin and Union caribou range include the Doris Mine (Hope Bay) east of Bathurst Inlet and several mineral exploration sites both east and west of Bathurst Inlet. Two roads have been proposed to connect mineral properties to proposed ports on the coast and that could also connect to the Yellowknife-Contwoyto Winter Road. Increased human activity at exploration sites or mines and on associated roads have the potential to increase disturbance to Dolphin and Union caribou during winter, and to their winter range. Shipping in the Canadian Arctic has increased since the 1980s. Traffic through the Northwest Passage in 2013 and 2019 exclusively used the southern route through the Coronation Gulf and Dolphin and Union Strait, with a 44% increase in the number of unique ships and a 107% increase in the distance travelled by all ships combined from 2013 to 2019. It is unclear what influence increasing shipping will have on Dolphin and Union caribou, but any transit that results in open leads may delay or impede caribou movement between Victoria Island and the mainland, or increase the risk of drowning if caribou attempt to cross thin ice. Concerns have been raised about the potential for increased pressure to extend duration of vessel access in the areas, such as for supporting industrial activities. Intra-specific competition between Dolphin and Union caribou and other types of caribou as well as muskox and overabundant geese

	has potential to impact access to forage and other resources. Small population sizes and continued declines may contribute to potential genetic bottlenecks in the future.
Positive Influences	
Dolphin and Union caribou were listed as Special Concern in the NWT under the *Species at Risk (NWT) Act* in 2015. The COSEWIC assessment in 2017 led to the proposed federal listing of Dolphin and Union caribou as 'Endangered'. In 2018, the Dolphin and Union Management Plan was published by the Governments of Nunavut and Northwest Territories. Conservation measures to protect Dolphin and Union caribou habitat (such as calving grounds) are conferred through the Olokhaktomiut Community Conservation Plan. This plan recommended certain parts of the Dolphin and Union caribou range on Victoria Island for special land management including the Colville Mountain Wildlife Area of Special Interest. The quality and amount of forage is increasing on Victoria Island due to climate change. These changes in vegetation relate to warming temperatures which is promoting plant growth on the tundra. In 2020 a *Notice to Mariners (*NOTMAR*) for Vessels Intending to Navigate the Kitikmeot Region in Canada's Northern Waters* was developed to mitigate the risks of icebreaking to wildlife and people traveling on ice. The	Dolphin and Union caribou were added to Schedule 1 of the federal *Species at Risk Act* in 2011 as a species of Special Concern. And in 2015, Dolphin and Union caribou were listed as Special Concern under the *Species at Risk (NWT) Act*. As a result of listing, the Government of the Northwest Territories, Government of Nunavut, in cooperation with co-management partners developed a management plan for Dolphin and Union caribou. The management plan was then adopted by Environment and Climate Change Canada. In 2017, COSEWIC reassessed Dolphin and Union caribou as Endangered. If Dolphin and Union caribou are listed as Endangered, then a recovery strategy will be required along with the identification of critical habitat. The draft Nunavut Land Use Plan recommends protection measures for sea ice crossings and calving areas for Dolphin and Union caribou. However, special land use management has not been recommended for the winter, calving or other seasonal ranges on central Victoria Island or fall staging areas along the south coast of Victoria Island. The Nunavut Land Use Plan calls for no icebreaking between Victoria Island and the Mainland

NOTMAR provides information to mariners about the time (seasonal) and area (location of caribou and people on the ice) considerations that operators traveling through the region should be made aware of. In the NOTMAR, from October 15 to June 30 the vessels are required to provide one week's notice over the phone and/or email to the hamlet of Cambridge Bay and Ekaluktutiak Hunters and Trappers Organization (EHTO) and to follow-up in advance of their passage. WMAC (NWT) and ENR implemented a program in 2021 to increase financial incentives for wolf harvesting in the Inuvialuit Settlement Region. This action was done in tandem with activities led by the OHTC, including: increased public education, a recommendation for mandatory caribou harvest sampling and reporting for all caribou harvested on Victoria Island, a voluntary maximum harvest of 50 caribou per year with a closure of Dolphin and Union caribou hunting in the spring season in order to allow pregnant cows to migrate and calve. Harvesters continue to advocate for prioritization of harvester education, covering topics from proper harvesting techniques, etiquette around meat sharing, and specialized predator knowledge, and focusing on hands-on activities that connect harvesters who want to learn with harvesters who want to teach.	from October 15 to November 30, and April 1 to May 31, however exceptions are made for vessels engaged in activities related to public safety or health including community resupply or emergency response. Positive influences for Dolphin and Union caribou include community involvement, limits on harvest, completion of the Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study in 2018, listing under the federal and territorial species at risk acts, recent land use and caribou management planning, shipping guidelines, potential increased availability of forage due to climate change, and to a lesser extent, protected areas. Community involvement in designing the 2020 population survey improved the survey design and successful completion of the survey. The 2020/21 restrictions on harvest of Dolphin and Union caribou by the OHTC (voluntary annual harvest of 50) and Nunavut (total allowable harvest of 105) are positive influences. Further, the proposed implementation of mandatory sampling and reporting of harvest will reduce uncertainty in harvest levels and provide information on the impact of harvest on Dolphin and Union caribou population dynamics. The Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study, also documents harvest specific to Dolphin and Union caribou in NWT.

	In response to concerns about wolf predation, WMAC (NWT) and ENR implemented a program in 2021 to increase financial incentives for wolf harvesting in the Inuvialuit Settlement Region. Recommendations from an icebreaking workshop in Cambridge Bay in October 2019 developed solutions to proactively mitigate the risks of icebreaking activities. The NOTMAR has been in place since 2020. The NOTMAR provides information to mariners about the time (seasonal) and area (location of caribou and people on the ice) considerations that operators traveling through the region should be made aware of. In the NOTMAR, from October 15 to June 30 the vessels are required to provide one week's notice over the phone and/or email to the hamlet of Cambridge Bay and Ekaluktutiak Hunters and Trappers Organization (EHTO) and to follow-up in advance of their passage. The Olokhaktomiut Community Conservation Plan identifies a calving area for Dolphin and Union caribou in the Colville Mountains as a Wildlife Area of Special Interest. Increased plant productivity resulting from climate change could increase the availability of quality forage during the growing season. This may result in improved condition of animals prior to the winter, which may have a positive impact on calf and adult survival.

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.	Dolphin and Union caribou are named after the Dolphin and Union Strait, which the caribou historically crossed twice a year during their northward spring migration and southward fall migration. The caribou are generally distinguished from Peary and Mainland caribou based on morphological differences and migratory behaviour from Victoria Island to mainland Northwest Territories and Nunavut; however, Dolphin and Union caribou are now often found year-round on the island and mainland. Caribou and caribou cycles are inherently linked to the Inuvialuit and Inuit people in Canada's Arctic. Caribou are highly valued for subsistence, economic, and cultural purposes and are an integral part of Inuvialuit and Inuit identity and wellbeing. Dolphin and Union caribou do not aggregate to calve, so they do not have clearly delineated calving grounds. Caribou begin to calve when they are two or three years old and generally calve every year until they reach a certain age, after which they will not have calves. Caribou are unable to tolerate high temperatures. Icing and freezing rain events that result in the formation of ice crusts over the vegetation or snow pose difficulties for caribou, as they are unable to 'dig' through ice crusts for forage. Road development, mining, and other human disturbances are thought to cause disruptions for caribou and negatively impact caribou habitat. Dolphin and Union caribou is harvested exclusively by Indigenous groups of the Northwest Territories and Nunavut.

	Resident and guided harvest for Dolphin and Union caribou is currently closed. Inuvialuit and Inuit hunters from the NWT communities of Ulukhaktok and Paulatuk, and Nunavut communities of Cambridge Bay, Kugluktuk, Umingmaktok and Kingauk (formerly Bay Chimo and Bathurst Inlet respectively) harvest Dolphin and Union caribou. Harvest levels and the overall harvest rate for Dolphin and Union caribou were unknown until recent years. Since 2020, harvest is estimated from mandatory tags in the Nunavut portion of the range, as well as information shared in co-management meetings and the recent voluntary limits in Ulukhaktok. However, in 2020 the Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study was launched – providing annual information on the caribou harvest of Inuvialuit communities. It reports harvest data specifically for Dolphin and Union caribou. Wolves prey on Dolphin and Union caribou and wolf populations cycle with caribou populations. Ulukhaktok residents (interviewed in 2011-2013) along with communities from Nunavut have reported increases in wolf numbers through the range of Dolphin and Union caribou and expressed concerns about imbalances in predator-prey dynamics. In the past, Victoria Island would have been a refuge for Dolphin and Union caribou from grizzly bear predation. However, the distribution of grizzly bears onto the arctic islands has been increasing and community members are very concerned about grizzly bears as a new predator establishing itself on Victoria Island. Dolphin and Union caribou do not appear to compete for food or habitat with muskoxen; however, there are differing views on this among knowledge holders.
Place	
For example: amount and quality of habitat available to the species compared to the past; changes in range use by	The distribution of Dolphin and Union caribou has varied extensively over the past 50 years and the abundance and specific crossing locations have shifted over time. The main migratory route has since shifted east; the caribou now

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.	primarily migrate across Coronation Gulf, Dease Strait, and Queen Maud Gulf. In the early 2000s, Inuit hunters reported that better forage is increasingly available on Victoria Island for caribou. However, earlier spring melt, later fall freeze-up, and thinner sea ice are resulting in degradation of caribou habitat in some areas and pose challenges for caribou during migration. Historically, it is known by knowledge holders that some caribou do not migrate and remain on the Island – this behaviour may be attributed to low population densities. Long delays may cause some caribou to abandon migrating behaviour altogether and remain on the island. Changes in migration are also influenced by changes to freeze up, spring melt, ice thickness, and water levels.
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.	A large group of Dolphin and Union caribou was noted to migrate between Victoria Island and the mainland in the late 19th century and early part of the 20th century. Caribou were scarcely seen in the 1920s and 1930s but were reported in southern Victoria Island again in the 1950s. Population surveys of Dolphin and Union caribou conducted in 1997, 2007, 2015, 2018, and 2020 suggest a decline in Dolphin and Union caribou abundance. The population estimate from the 2018 survey was 4,105 caribou and the estimate from the 2020 survey was 3,815 caribou. Although the 2020 population estimate is not significantly different from the 2018 estimate, it represents a decline in numbers from the surveys conducted in 1997 (34,558), 2007 (27,787), and 2015 (18,413), respectively. The decline in the population of Dolphin and Union caribou is a serious concern for local communities.
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.	Indigenous and community knowledge sources indicate several contributing threats and limiting factors to Dolphin and Union caribou populations on Northwest Victoria Island and on the mainland. Global climate change is an important threat that impacts caribou habitat (e.g., changes to factors that influence migration and changes to forage conditions), as well as caribou body condition and survivorship. Important threats to the migratory behaviour of Dolphin and Union caribou include drownings, dangerous ice crossings and increased ship traffic. Climate change may also limit or change access to forage through increases in icing on snow and vegetation events, heavy precipitation events, and increases in temperature. Industrial activities and other human disturbances are also also potentially important threats or limiting factors. The degree of threat posed by over-harvesting in the past is difficult to determine; however, increases in harvest reporting and studies are now contributing to management decisions. Disrespectful harvesting (e.g., wounding loss) is also a concern that is being discussed and addressed through cultural teachings and educational opportunities. In recent years, much work has been done to understand that state of Dolphin and Union caribou health and the prevalence and impact of diseases and parasite on individuals and populations of caribou. Interactions with predators and increases in goose populations are also threats to Dolphin and Union caribou.
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.	Federal and territorial assessments and listings as Special Concern (NWT) and Endangered (Government of Canada) have led to the development of the Dolphin and Union Management Plan published by the Governments of Nunavut and Northwest Territories.

	Conservation measures to protect Dolphin and Union caribou and their habitat are conferred through the Olokhaktomiut Community Conservation Plan. The Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study is considered a major step towards filling the harvest information gap for Dolphin and Union caribou in the NWT. In addition, a recommendation was made by WMAC (NWT) with support from the OHTC to ENR in 2021 to implement mandatory sampling and reporting for all caribou harvested on Victoria Island through the OHTC by-laws in the *Wildlife Act*. When this is implemented, exact harvest information will be known throughout the Dolphin and Union range, with the exception of the opportunistic harvest from Paulatuk. In 2020 a *Notice to Mariners (*NOTMAR*) for Vessels Intending to Navigate the Kitikmeot Region in Canada's Northern Waters* was developed to mitigate the risks of icebreaking to wildlife and people traveling on ice. WMAC (NWT) and ENR implemented a program in 2021 to increase financial incentives for wolf harvesting in the Inuvialuit Settlement Region. This action was done in tandem with activities led by the OHTC, including: increased public education, a recommendation for mandatory caribou harvest sampling and reporting for all caribou harvested on Victoria Island, a voluntary maximum harvest of 50 caribou per year with a closure of Dolphin and Union caribou hunting in the spring season in order to allow pregnant cows to migrate and calve.

Technical Summary – Scientific Knowledge Component

Question	Scientific Knowledge
Population Trends	
Generation time (average age of parents in the population) (indicate years, months, days, etc.).	Estimated as 8-9 years.
Number of mature individuals in the NWT (or give a range of estimates).	The total population was estimated at 3,815 ± 514 (SE) in 2020, across the whole range in the NWT and Nunavut. There is insufficient information available to determine the portion of the population that consists of mature individuals, or the portion of the population in just the NWT.
Percent change in total number of mature individuals over the **last** 10 years or 3 generations, whichever is longer.	89% decline in the total population over a 23-year period from 1997 to 2020 (approximately 3 generations [24-27 years]).
Percent change in total number of mature individuals over the **next** 10 years or 3 generations, whichever is longer.	There is insufficient information to estimate population change over the next 3 generations.
Percent change in total number of mature individuals over any 10 year or 3 generation period that includes **both the past and the future**.	89% decline in the total population over a 23-year period from 1997 to 2020 (approximately 3 generations [24-27 years)].

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 is likely due to a number of factors, of which some could be managed.
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, hunting), while others may not be (e.g., extreme weather events).
If there is a decline, are the causes of decline clearly understood?	Uncertain as causes of the decline were likely interactions between factors including hunting, predation, and accidental deaths.
If there is a decline, have the causes of the decline been removed?	Partially – total allowable harvests have been implemented in both the NWT and Nunavut.
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, there are no previous cycles to compare to in order to evaluate if this cycle is within, or outside of, natural cycles.
Are there 'extreme fluctuations' (>1 order of magnitude) in the number of mature individuals?	No. The increase between 1980 and 1997 and decrease between 1997 and 2020 are approximately one order of magnitude, but they occurred over 17 and 23 years respectively and therefore did not occur rapidly and frequently.
Distribution	
Estimated extent of occurrence in the NWT (in km^2).	NWT: 116,841km2 Entire population (both NWT and NU): 499,449 km2
Index of area of occupancy (IAO) in the NWT (in km^2; based on 2 x 2 grid).	NWT: 64,168km2 including sea ice and 54,784 km2 not including sea ice.

	Entire population (both NWT and NU): 391,292 km2 including sea ice and 286,336 km2 not including sea ice.
Number of extant locations[1] in the NWT.	One.
Is there a **continuing decline** in area, extent, and/or quality of habitat?	Uncertain due to limited information. However, sea ice has formed an average of 10 days later between 1982 and 2008, and from 2004 to 2018, sea ice formed later and melted earlier.
Is there a **continuing decline** in number of locations, number of populations, extent of occupancy, and/or IAO?	No decline in number of locations or populations. Limited information is available to assess declines in extent of occupancy, but collar data indicate that caribou continue to use their mainland winter range and their range on Victoria Island.
Are there 'extreme fluctuations' (>1 order of magnitude) in number of locations, extent of occupancy, and/or IAO?	Uncertain due to limited information; however, fluctuations may occur over many decades/long periods, and therefore do not occur rapidly and frequently.
Is the total population 'severely fragmented' (most individuals found within small and isolated populations)?	No
Immigration from Populations Elsewhere	

[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.

Does the species exist elsewhere?	No, but the population occupies range within both the NWT and Nunavut
Status of the outside population(s)?	Not Applicable
Is immigration known or possible?	No
Would immigrants be adapted to survive and reproduce in the NWT?	Not Applicable
Is there enough good habitat for immigrants in the NWT?	Not Applicable
Is the NWT population self-sustaining or does it depend on immigration for long-term survival?	The total population, which is shared with Nunavut, is the only population of Dolphin and Union caribou, and therefore, by definition is self-sustaining.
Threats and Limiting Factors	
Briefly summarize negative influences and indicate the magnitude and imminence for each.	Important threats to Dolphin and Union caribou include climate change (including changes to sea ice and icing events), predation, harvest, and disturbance and habitat alteration due to human activities. Warmer temperatures are already manifested as trends in the mean fall temperatures which delay fall sea ice crossings. Other potential threats include Intra- and inter-specific forage competition and contaminants. Predicted effects of climate change on caribou include 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. Information on predation rate of Dolphin and Union caribou is not available, however it is a likely a threat to Dolphin and Union caribou when their abundance is low.

	In the past the estimated harvest was high compared to the 1997 and 2007 population estimates. The current allowable harvests in the NWT (50) and Nunavut (105) represent 4.1% of the 2020 population estimate but does not include potential harvest by Paulatuk community members. With recent low adult female survival and calf recruitment rates and a declining population trend, it is uncertain if or for how long or the current allowable harvest will be sustainable. Human 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. For Dolphin and Union caribou, human activities that result in disturbance and habitat alteration are primarily associated with mineral development and shipping. Community concerns regarding potential impacts of a proposed gold mine (the Doris North Project) located at the north end of Doris Lake, Nunavut, approximately 160 km southwest of Cambridge Bay in the Hope Bay Belt. Roads and road construction near Bathurst Inlet impact caribou in several ways especially when caribou numbers are low. The physical presence of the road, disturbance from construction or traffic may change caribou behaviour and cause caribou to avoid the area. The area proposed for the Grays Bay Deep Water Port and Road Project is planned to go through an area that is heavily used by both caribou and harvesters. It is important that this proposed development is considered alongside the management plan objective to minimize disturbance to habitat and preserve sea ice crossings of Dolphin and Union caribou. However, data are lacking to assess the level of threats from human activities on Dolphin and Union caribou. Increased ship traffic and an increased shipping season supported by icebreaking would result in impacts on fall migration of Dolphin and Union caribou. Intra-specific competition has not been examined in detail for Dolphin and Union caribou. The shift to wintering on the mainland has been suggested as evidence for competition among Dolphin and Union caribou. If the trend is for the

	Dolphin and Union caribou to stage for a longer time while waiting for the sea ice to freeze, or to abandon migrating to winter ranges on the mainland, then intra-specific competition becomes more likely. The Dolphin and Union caribou population is currently estimated at about 3,815 caribou and has experienced a continued decline since the late 1990s. If the population continues to decline, at some point there may be potential for a genetic bottleneck.
Positive Influences	
Briefly summarize positive influences and indicate the magnitude and imminence for each.	Positive influences for Dolphin and Union caribou include community involvement, limits on harvest, species at risk listing, recent land use and caribou management planning, shipping guidelines, potential increased availability of summer forage due to climate change, and to a lesser extent, protected areas.

Glossary

Term	Dialect	Translation	Source
Tiriganniaq	Sallirmiutun; Kangiryuarmiutun	Arctic Fox	Albert Elias 2022; Helen Kitekudlak 2022
Ikaariaq	-	Banks Island	Inuit Tapitiit Kanatami 2018
Iqaluktuuttiaq, Ikaluktuuttiak	-	Cambridge Bay	Inuit Tapitiit Kanatami 2018; Thorpe *et al.* 2001
Tuktu (singular), Tuktuk (plural)	Kangiryuarmiutun	Caribou	Helen Kitekudlak 2022
Tuktu/tuktut	Sallirmiutun	Caribou	Albert Elias 2022
Tuttu	Uummarmiutun	Caribou	Inuvialuit Cultural Society 2014
Tuktu Kulavak	Sallirmiutun; Kangiryuarmiutun	Caribou; Female	Albert Elias 2022; Helen Kitekudlak 2022
Uqsutuuq	-	Gjoa Haven	Inuit Tapitiit Kanatami 2018
Akhak	Kangiryuarmiutun	Grizzly bear	Helen Kitekudlak 2022
Akhaq	Sallirmiutun	Grizzly bear	Albert Elias 2022
Akhat	Sallirmiutun; Kangiryuarmiutun	Grizzly bears	Albert Elias 2022; Helen Kitekudlak 2022
Qurluqtuq	-	Kugluktuk	Inuit Tapitiit Kanatami 2018
Aqiarungnaq	Kangiryuarmiutun	Lichen sp.	Helen Kitekudlak 2022
Tuktut niqait	Sallirmiutun	Lichen sp. (caribou food)	Albert Elias 2022
Ningnaq	Kangiryuarmiutun	Moss	Helen Kitekudlak 2022
Ningak	Sallirmiutun	Moss campion (Silene acaulis)	Albert Elias 2022
Qungiliq	Sallirmiutun; Kangiryuarmiutun	Mountain sorel (Oryria digyna)	Albert Elias 2022; Helen Kitekudlak 2022
Umingmak	Sallirmiutun; Kangiryuarmiutun	Muskox	Albert Elias 2022; Helen Kitekudlak 2022

Term	Dialect	Translation	Source
Qiviuq	Kangiryuarmiutun	Muskox's inner wool	Helen Kitekudlak 2022
Qiviut	Sallirmiutun	Muskox's inner wool	Albert Elias 2022
Qurluqtuqmiut	Kangiryuarmiutun	People of Kugluktuk	Helen Kitekudlak 2022
Qurluqturmiut	Sallirmiutun	People of Kugluktuk	Albert Elias 2022
Olokhaktomiut	Sallirmiutun	People of Ulukhaktok	Albert Elias 2022
Ulukhaqtuungmiut	Kangiryuarmiutun	People of Ulukhaktok	Helen Kitekudlak 2022
Nanuq	Sallirmiutun; Kangiryuarmiutun	Polar bear	Albert Elias 2022; Helen Kitekudlak 2022
Kinngailak	-	Prince of Wales Island	Inuit Tapitiit Kanatami 2018
Ugijulik	-	Queen Maud Gulf	Inuit Tapitiit Kanatami 2018
Ikaahuk	-	Sachs Harbour	Inuit Tapitiit Kanatami 2018
Hiku	Kangiryuarmiutun	Sea ice	Helen Kitekudlak 2022
Siku	Sallirmiutun	Sea ice	Albert Elias 2022
Nurraq (singular), Nurrait (plural)	Sallirmiutun	Small caribou	Albert Elias 2022
Tuktuinnaq	Kangiryuarmiutun	Small caribou	Helen Kitekudlak 2022
Ulukhaqtuuq	-	Ulukhaktok	Inuit Tapitiit Kanatami 2018
Kiliniq	-	Victoria Island	Inuit Tapitiit Kanatami 2018
Kiiliniq tuktungit	Sallirmiutun	Victoria Island or Island caribou	Albert Elias 2022
Killiniiq	Kangiryuarmiutun	Victoria Island or Island caribou	Helen Kitekudlak 2022
Ulauyaq	Kangiryuarmiutun	Willows	Helen Kitekudlak 2022

Term	Dialect	Translation	Source
Uqpik (singular), Uqpiit (plural)	Sallirmiutun	Willows (Salix sp.)	Albert Elias 2022
Amaruq	Sallirmiutun; Kangiryuarmiutun	Wolf	Albert Elias 2022; Helen Kitekudlak 2022
Qalvik	Sallirmiutun; Kangiryuarmiutun	Wolverine	Albert Elias 2022; Helen Kitekudlak 2022
Qalviit	Sallirmiutun; Kangiryuarmiutun	Wolverines	Albert Elias 2022; Helen Kitekudlak 2022
Amaqqut	Sallirmiutun; Kangiryuarmiutun	Wolves	Albert Elias 2022; Helen Kitekudlak 2022
Nukatugaq	Kangiryuarmiutun	Young male caribou	Helen Kitekudlak 2022

Acronyms

Acronym	Term
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EC	Environment Canada
ECC	Environment and Climate Change
ECCC	Environment and Climate Change Canada
ENR	Environment and Natural Resources
GN	Government of Nunavut
GNWT	Government of the Northwest Territories
HTC	Hunters and Trappers Committee
HTO	Hunters and Trappers Organization
ICK	Indigenous and community knowledge
ISR	Inuvialuit Settlement Region
IQ	Inuit Qaujimajatuqangit
NTS	National Topographic Series
NWT	Northwest Territories
SARA	*Species at Risk Act*
SARC	Northwest Territories (NWT) Species at Risk Committee
TAH	Total Allowable Harvest
TK	Traditional Knowledge
WMAC (NWT)	Wildlife Management Advisory Council (NWT)

Table of Contents

REASSESSMENT OF DOLPHIN AND UNION CARIBOU 3

Executive Summary 7

Technical Summary – Indigenous and Community Knowledge Component 22

Technical Summary – Scientific Knowledge Component 27

Glossary 33

Acronyms 36

Table of Contents 37

List of Tables 42

List of Figures 44

PLACE NAMES 47

INDIGENOUS AND COMMUNITY KNOWLEDGE COMPONENT 50

Preface 50

Preamble 51

ABOUT THE SPECIES 56

Names and Classification *56*

Description *57*

Relationship with People *58*

Biology and Behaviour *59*

Life cycle and reproduction 59

Physiology and adaptability 60

Adaptations to Environment 61

Diet and Feeding Behaviour 63

Relationship Within and Among Species *64*

PLACE 70
Distribution *70*
Ulukhaktok 72
Mainland 73
Cambridge Bay 74
Movement and Dispersal *78*
Fall Migration 78
Spring migration 79
Changes in Distribution *80*
Search Effort and Harvest Patterns *82*
Harvesting Rates 84
Key Habitats *87*
Habitat Requirements 87
Seasonal Habitat Requirements 89
Habitat Trends and Fragmentation *91*
POPULATION 94
Abundance, Population Dynamics, and Changes in Population Size *94*
Health *97*
Rescue Effects *101*
THREATS AND LIMITING FACTORS 101
Drowning and Dangerous Ice Crossings *101*
Increase in Shipping Traffic *103*
Icing on Snow and Vegetation/Heavy Precipitation Events *104*
Impacts of Warmer Temperatures *105*
Industrial Activities and Other Human Disturbances *106*
Disrespectful Harvesting and/or Over-harvesting *108*
Health and Diseases *110*
Predation *111*
Increase in Goose Populations *112*

POSITIVE INFLUENCES 113
ACKNOWLEDGEMENTS 117
AUTHORITIES CITED 118
AUTHORITIES CONTACTED 120
BIOGRAPHY OF PREPARER 122
SCIENTIFIC KNOWLEDGE COMPONENT 123
ABOUT THE SPECIES 123
Names and Classification *123*
Systematic/Taxonomic Clarifications 123
Description *124*
Life Cycle and Reproduction *125*
Physiology and Adaptability *126*
Interactions *127*
Forage 127
Dolphin and Union caribou 127
Interactions with other herbivores 128
Predation 130
Parasites and disease 132
Humans 134
PLACE 140
Distribution *140*
World, Continental, or Canadian Distribution 140
NWT distribution 142
Extent of Occurrence 142
Area of occupancy 143
Location(s) 143
Search effort 143

Distribution Trends *147*
Movements *150*
Habitat Requirements *152*
Habitat Availability *155*
Habitat Trends *161*
Habitat Fragmentation *162*
POPULATION 163
Abundance *163*
Population dynamics *164*
Trends and fluctuations *170*
Possibility of rescue *174*
THREATS AND LIMITING FACTORS 174
Climate change *174*
Health *177*
Predation *177*
Harvesting *178*
Human activities - disturbance and habitat alteration *178*
Intra- and inter-specific forage competition *182*
Contaminants *183*
Small population size *183*
POSITIVE INFLUENCES 184
ACKNOWLEDGEMENTS 187
AUTHORITIES CONTACTED 188
BIOGRAPHY OF PREPARER 190
STATUS AND RANKS 191
INFORMATION SOURCES 192
Indigenous and Community Knowledge Component 192

Scientific Knowledge Component 201

APPENDIX A – ADDITIONAL INFORMATION 220

Threats Assessment *220*

Overall Level of Concern 221

Detailed Threats Assessment 222

List of Tables

Table 1. Dolphin and Union caribou range and hunting range summarized by decade from 1980-2020, as mapped by traditional knowledge keepers in 2018-2020. The values reflect absolute areas and do not consider overlapping areas. Percent of total indicates the percent of the related 1980-2020 interval range (maximum) represented in the specific year interval. Percent change indicates the percent change in area from the previous decade (reproduced from Hanke and Kutz 2020 with permission). 77

Table 2. Documented Inuit knowledge of climate change in the Kitikmeot region (reproduced from Golder 2003 with permission)..... 93

Table 3. Group interviews: participants' perceptions on diseases (lesions/syndromes), expressed as relative prevalence (%), and observations of disease occurrence (provided by groups that reported the specific disease), in the hunted and observed caribou in the Iqaluktutiaq (Cambridge Bay) area, Victoria Island, Nunavut, during the decline period of the mid-2000s to the end of 2014, (reproduced from Tomaselli *et al.* 2018b with permission). 99

Table 4. Community comments related to caribou and mineral activity (reproduced from Golder 2003 with permission). 107

Table 5. Group size of Dolphin and Union caribou during fixed-wing aerial surveys. 128

Table 6. Summary of wolf observations during aerial surveys for caribou and muskoxen, Victoria Island, 1959-2020..... 131

Table 7. Seroprevalence of pathogens in adult female Dolphin and Union caribou (adapted from Carlsson *et al.* 2019, and Aguilar and Kutz 2020). 133

Table 8. Available harvest information for Dolphin and Union caribou 1982/83 to 2020/21. . 137

Table 9. Area of Occupancy and Index of Area of Occupancy for Dolphin and Union caribou. 143

Table 10. Years and survey coverage for Dolphin and Union caribou aerial surveys on Victoria Island, 1980-2020. Muskox surveys with caribou sightings recorded are also included. 145

Table 11. Mean temperature and precipitation of dominant Ecoregions within the Dolphin and Union caribou range (from EWSG 1995). 154

Table 12. Pregnancy rates for Dolphin and Union caribou collected (1987-2003) or captured and collared (2015-2021)..... 164

Table 13. Calf composition during surveys conducted for the Dolphin and Union caribou population..... 166

Table 14. Calves/100 cow ratios for Dolphin and Union caribou. 167

Table 15. Dolphin and Union annual adult female caribou survival rates based on adult female collared caribou. 168

Table 16. Mortality timing, type and location for caribou collared in April 2015 and April 2016 (primarily adult females), grouped by location of summer range on Victoria Island (VI) (adapted from Leclerc and Boulanger 2020)..... 169

Table 17. Population estimates for the Dolphin and Union caribou population based on fall aerial surveys conducted when caribou congregate along the south coast of Victoria Island (VI) prior to crossing the sea ice to the mainland. 172

List of Figures

Figure 1. Map of the Northwest Territories and Nunavut showing features mentioned in the report, communities, protected areas, and the range of Dolphin and Union caribou (place names from Kuptana 2022). Map courtesy M. Routh and N. Wilson, ECC-GNWT. 47

Figure 2. Regional map of southern Victoria Island and mainland Nunavut (place names from Kuptana 2022). Map courtesy M. Routh and N. Wilson, ECC-GNWT. 48

Figure 3. Regional map of northern Victoria Island and Banks Island (placenames Kuptana 2022). Map courtesy M. Routh, ECC-GNWT. 49

Figure 4. Dolphin and Union caribou. Photo courtesy M. Dumond. 57

Figure 5. Current and extended range of Dolphin and Union caribou based on Indigenous and Community knowledge from Ulukhaktok and Kugluktuk. Map includes range extension on the Northwestern Prince Albert Peninsula provided by Kuptana 2022 (hatching), southern extent reproduced with permission from Hanke and Kutz 2020 based on observations by Kugluktukmiut knowledge keepers in 2018-2020 (cross-hatching) and the scientific range by Environment and Natural Resources, unpubl. data 2012 (pink shaded area). See also Figure 6 for additional information on observations in the southern range on the mainland. 70

Figure 6. Maps of Dolphin and Union caribou range (a) and hunting range (b) as reported by Kugluktukmiut knowledge keepers in 2018-2020. Colour gradient is based on the density of observations (Hanke and Kutz 2020). 73

Figure 7. Graphs depicting participants' observations of relative abundance (%) of muskoxen (A) and caribou (B) between 1960 and 2014 in the Cambridge Bay area. The number of participant groups providing observations is specified in parenthesis under each year (Tomaselli *et al.* 2018b). 75

Figure 8. Areas identified as no longer completely freezing due to currents as a result of climate change, which prevent caribou from safely crossing (Kuptana 2023). 81

Figure 9. Caribou harvest locations (red dots) based on the Nunavut Wildlife Harvest Study (1996-2001). The blue dots are the collar locations of the Bluenose-East barren-ground caribou herd (1996-2006) and the green dots are the collar locations for the Dolphin and Union caribou (2002-2004) (Dumond 2007, with permission). A = Wellington Bay. B = Tree River. 86

Figure 10. Map of Colville Mountains Wildlife Area of Special Interest, Wollaston Peninsula, Victoria Island, Nunavut. This region was identified as a Dolphin and Union caribou calving area (reproduced from OHTC *et al.* 2016). 89

Figure 11. Map depicting caribou (green dots), wolf (red dots), muskox (black dots), and moose (brown dots) observations recorded during the Dolphin and Union fall 2020 abundance survey in the NWT and Nunavut (Campbell *et al.* 2021)..... 95

Figure 12. Graph illustrating the collective Dolphin and Union caribou abundance trend between 1960 and 2020, based on Kugluktukmiut knowledge. The list of participant IDs represents each focus group that participated in a proportional piling exercise. The blue line represents a smoothed quadratic linear model that was reviewed and accepted during feedback sessions in 2020 with Kugluktukmiut as representing the Dolphin and Union caribou abundance trend from a Kugluktukmiut perspective (Hanke and Kutz 2020). 96

Figure 13. Dolphin and Union caribou. Photo courtesy K. Poole. 125

Figure 14. Government of the Northwest Territories Wildlife Management Areas for Dolphin and Union caribou (ENR 2021b). 135

Figure 15. Current range of Dolphin and Union caribou based on Scientific knowledge (Environment and Natural Resources, unpubl. data 2012). 141

Figure 16. Collared cow locations for Dolphin and Union caribou in late October (1987-2019) based on Nunavut's fall telemetry data, and Nunavut's 2018 abundance fall survey strata (Campbell et al. 2021, with permission). 146

Figure 17. Distribution of wintering Dolphin and Union caribou during the late 1980s (dashed black line 90% fixed kernel polygons) and the mid-1990s to mid-2000s (dark grey polygon). Data from Poole *et al.* (2010). 149

Figure 18. Dolphin and Union caribou seasonal ranges in the Northwest Territories and Nunavut 1987-2020. (a) annual range and spring migration seasonal range, (b) annual range and calving seasonal range, (c) annual range and post-calving seasonal range, (d) annual range and summer seasonal range, (e) annual range and late summer seasonal range, (f) annual range and fall migration, pre-breeding seasonal range, (g) annual range and rut/breeding seasonal range, (h) annual range and fall migration, post-breeding seasonal range, and (i) annual range and winter seasonal range. (Maps reproduced with permission from Campbell *et al.* 2021. Data from collared female caribou Telemetry points were collected from three telemetry programs, the first deployed between 1987 and 1989 maintaining a mean of 6 collars annually, the second between 1996 and 2006 maintaining a mean of 11 collars annually, and the third between 2015 and 2020, maintaining a mean of 27 collars annually. Annual range is a 95% utilization distribution.) 160

Figure 19. Important Wildlife Areas identified for Dolphin and Union caribou in the Northwest Territories (reproduced from Wilson and Haas 2012 with permission). Map courtesy of M. Routh, ECC-GNWT. 161

Figure 20. Strata used and wildlife observations recorded during the Dolphin and Union population survey, October 22 to November 2, 2020 (Campbell *et al.* 2021). 163

Figure 21. Dolphin and Union caribou abundance estimates, 1997 to 2020 with the 2020 Victoria Island + mainland estimate (Campbell *et al.* 2021). Error bars show the 95% Confidence Interval. 173

Figure 22. Map of the mineral tenure (active, leased or suspended), prospecting permits and the proposed Grays Bay Road in Nunavut. Data from Open Government Licence – Canada, Mineral Tenure in Nunavut: Mining Leases and Prospecting Permits (CIRNAC 2023a, b). Map courtesy N. Wilson, ECC-GNWT. 179

Figure 23. Vessel transit through the Beaufort Sea by type of ship and month from ENR 2022. Data derived from NORDREG 2015. 182

PLACE NAMES

Figures 1, 2 and 3 display the geographic features (e.g., mountains, river, lakes) and place names referred to in this status report.

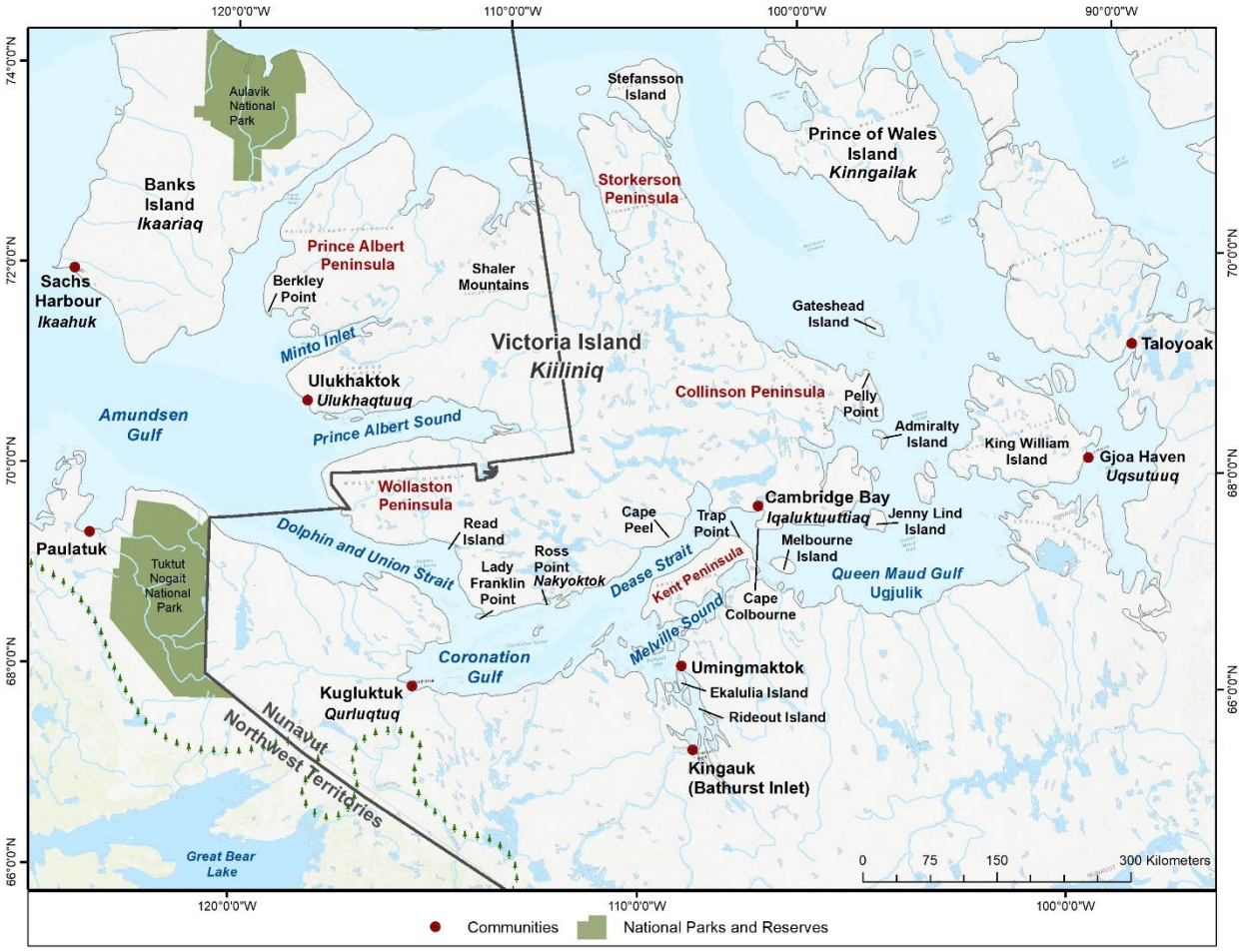

Figure 1. Map of the Northwest Territories and Nunavut showing features mentioned in the report, communities, protected areas, and the range of Dolphin and Union caribou (place names from Kuptana 2022). Map courtesy M. Routh and N. Wilson, ECC-GNWT.

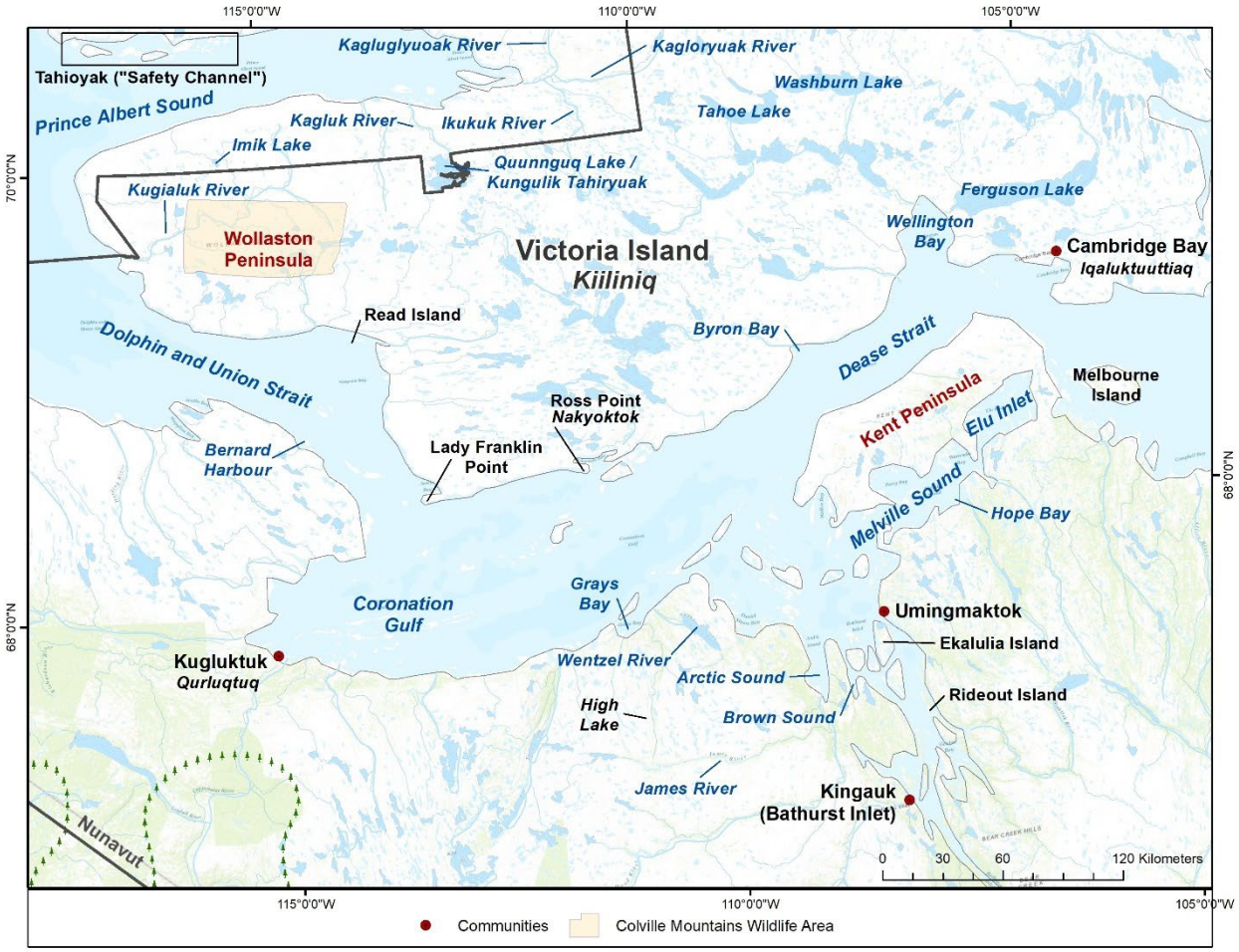

Figure 2. Regional map of southern Victoria Island and mainland Nunavut (place names from Kuptana 2022). Map courtesy M. Routh and N. Wilson, ECC-GNWT.

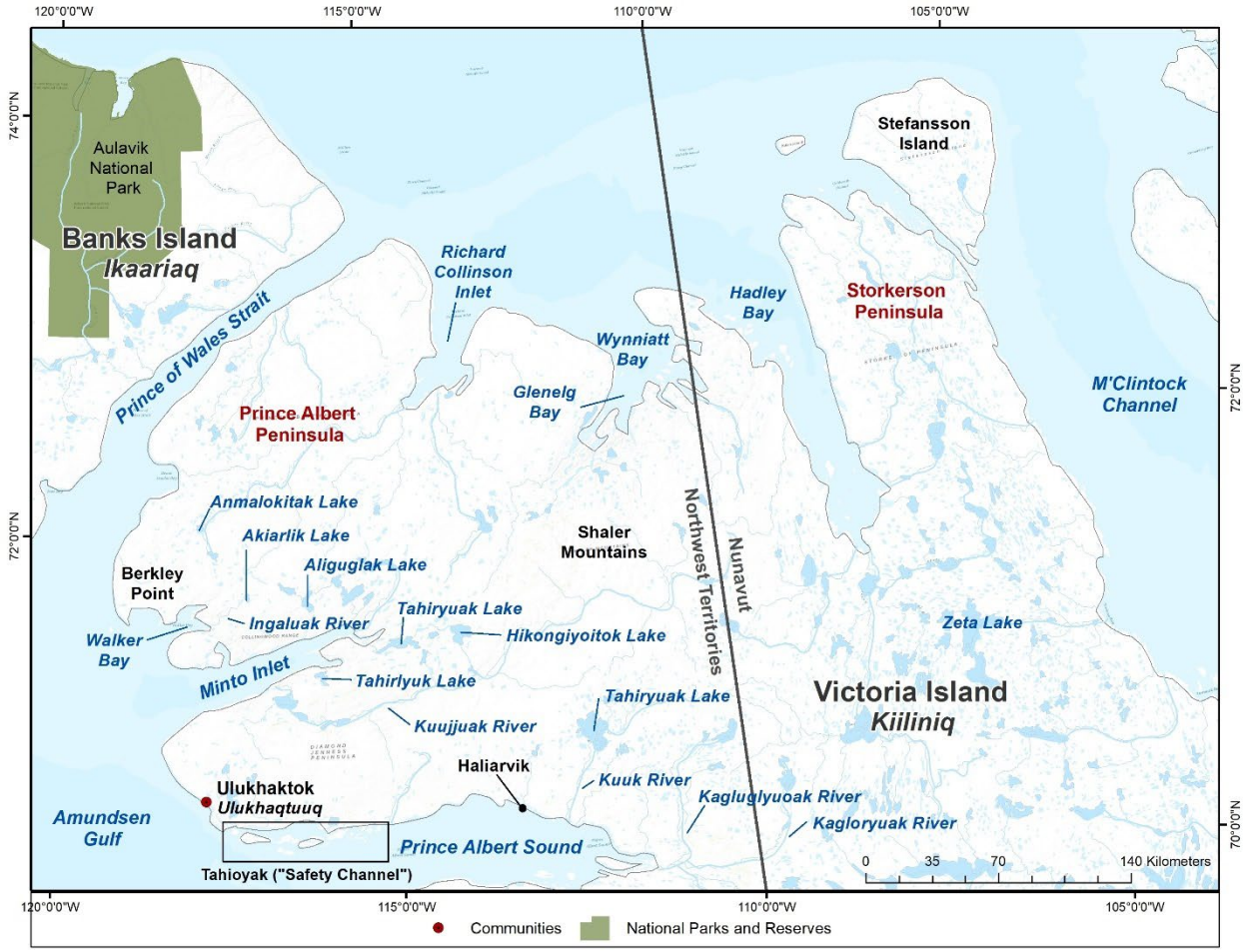

Figure 3. Regional map of northern Victoria Island and Banks Island (placenames Kuptana 2022). Map courtesy M. Routh, ECC-GNWT.

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 to recognize that the Indigenous knowledge transcribed and 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.* 2017a). As noted by Polfus *et al.* (2017a: 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

Inuvialuit traditional and local 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). Inuit Qaujimajatuqangit (IQ) is an Inuktitut (Nunavut) term that "encompasses all aspects of traditional Inuit culture including values, world-view, language, social organization, knowledge, life skills, perceptions, and expectations" (Anonymous 1998:1 *in* Wenzel 2004). 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 Inuit and through generations of accumulated experiences and place-based observations, holds wisdom, insight, and perspective into the complex Arctic environment (Slavik 2013, Thorpe *et al.* 2001). 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 an accumulation of adaptive responses that evolve over time (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 (Slavik 2013, Usher 2000, Wray 2010). Communities and wildlife biologists within the Dolphin and Union caribou region have a history of collaboration. For example, 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).

The 2013 Species Status Report for Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories (SARC 2013) acknowledged that there has been limited documentation of Indigenous and community knowledge of Dolphin and Union caribou in the NWT, although there remains extensive (though undocumented) knowledge of Dolphin and Union caribou within the living memory of Elders and harvesters in Ulukhaktok and Paulatuk (Thorpe *et al.* 2001; GWNT and GN 2018; WMAC (NWT) 2019; Thorpe Consulting Services 2019). To date, information from Indigenous and community sources from the NWT and Nunavut focuses on Victoria Island and the mainland (SARC 2013).

Dolphin and Union caribou were first assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1979 as part of Peary caribou (COSEWIC 2017). This designatable unit was divided into three discrete populations in 1991. In 2004, the population designations were deactivated and separated between Peary caribou and Dolphin and Union caribou. Dolphin and Union Caribou is composed of a portion of the former "Low Arctic population". In 2004, this sub-species was assessed as "Special Concern" by COSEWIC. In 2011, the species was added to Schedule 1 with the status "Special Concern" under the federal *Species at Risk Act* (SARA). In 2017, COSEWIC re-assessed Dolphin and Union caribou as 'Endangered' (COSEWIC 2017). In 2018, the Dolphin and Union Management Plan was published by the Governments of Nunavut and Northwest Territories with goals to increase use of ICK and promote collaboration across the NWT and NU boundary. The COSEWIC re-assessment and proposed change in status as 'Endangered' under the federal *Species at Risk Act* (SARA) in 2017, as well as the implementation of the Dolphin and Union Management Plan, led to prioritizing additional research and synthesis across the range, including an increased effort to collect and synthesize Indigenous and community knowledge in research. The majority of published research since 2012 reflects the Inuit Qaujimajatuqangit (IQ) of Nunavut communities within the Dolphin and Union caribou range – Cambridge Bay *(Iqaluktuuttiaq/Ikaluktuuttiak)*, Kugluktuk (*Qurluqtuq)*, Umingmaktok (*Omingmaktok/*Bay Chimo), and Kingauk/Qinqaut (formerly Bathurst Inlet). Publications of these studies were reviewed for this status report update, recognizing the transboundary nature of Dolphin and Union caribou and importance of Indigenous knowledge and local observations across the species range in the central and western Arctic. Information shared by Ulukhaktok community members in meetings, consultations, and workshops since the signing of the Dolphin and Union caribou Joint Management Plan was also reviewed for informing the status report update.

In 2013, the NWT Species at Risk Committee assessed Dolphin and Union Caribou as a species of Special Concern in the NWT because of population decline and concerns about threats. In 2015,

Dolphin and Union Caribou were listed as Special Concern in the NWT under the territorial *Species at Risk (NWT) Act*. This update to the Species Status Report for Dolphin and Union caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories (SARC 2013) draws on recent studies, publications, and community and co-management 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 a report resulting from a 2019 workshop focused on mitigating the impacts of ice breaking to hunters and caribou led by the Ekaluktutiak Hunters and Trappers Organization, the 2020 Dolphin and Union population survey led by the Government of Nunavut with participation from members of local Hunters and Trappers Organizations (HTOs) and Hunters and Trappers Committees (HTCs), and a number of community consultations and co-management meetings which took place as part of implementation of the *Dolphin and Union Management Plan (2017)*.

The 2021 SARC assessment update gathered information from the following sources:

- The 2016 updates to the Olokhaktomiut Community Conservation Plan (CCP) (OHTC *et al.* 2016).
- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2017. COSEWIC assessment and status report on the Dolphin and Union caribou (*Rangifer tarandus groenlandicus x pearyi*) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON, 63 pp.
- Environment and Natural Resources (ENR). 2021. Summary of harvest data for species in the Inuvialuit Settlement Region: July 2016 to June 2021. November 2021. Prepared for WMAC (NWT), IGC and WMAC (NS) by the Department of Environment and Natural Resources, Inuvik Region, Government of the Northwest Territories, Inuvik, NT.
- Government of the Northwest Territories (GNWT) and Government of Nunavut (GN). 2018. Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut. Prepared in cooperation with the Government of Canada, the Nunavut Wildlife Management Board, Kitikmeot Regional Wildlife Board, Nunavut Tunngavik Inc., Kitikmeot Inuit Association, Kugluktuk Hunters and Trappers Organization (HTO), Ekaluktutiak HTO, Omingmaktok HTO, Burnside (Bathurst Inlet/Qinqaut) HTO, Wildlife Management Advisory Council (NWT), Inuvialuit Game Council, Olokhaktomiut Hunters and Trappers Committee (HTC), and the Paulatuk HTC. 228 pp.
- Hanke, A., M. Angohiatok, L.-M. Leclerc, C. Adams and S. Kutz. 2021. A Caribou Decline Foreshadowed by Inuit in the Central Canadian Arctic: A Retrospective Analysis. Arctic 74(4): 437-455.

- Hanke, A., and S. Kutz. 2020. Kitikmeot traditional knowledge studies on Dolphin and Union caribou, 2003 and 2018-2020: Research update. 46 pp.
- Olokhaktomiut Hunters and Trappers Committee (OHTC). 2021. Meeting minutes from Olokhaktomiut Hunters and Trappers Committee Special Members Meeting on Dolphin and Union caribou management actions: March 2021. Olokhaktomiut Hunters and Trappers Committee, Ulukhaktok, NT.
- Dolphin and Union Caribou User-to-User Group. 2022. Unpublished notes from Dolphin and Union caribou User-to-User Group minutes with Ulukhaktok: 2019-2022. Dolphin and Union Caribou User-to-User Group. Inuvik, NT.
- Thorpe Consulting Services. 2019. Review of the Peary and Dolphin and Union Caribou Traditional Knowledge Project from 2011-2013. April 2019. Prepared for Inuvialuit Game Council, Joint Secretariat, and Wildlife Management Advisory Council (NWT) by Thorpe Consulting Services, Vancouver, BC, v + 92 pp.
- Tomaselli, M., S. Kutz, C. Gerlach and S. Checkley. 2018. Local knowledge to enhance wildlife population health surveillance: Conserving muskoxen and caribou in the Canadian Arctic. Biological Conservation 217: 337-348.
- WMAC (NWT). 2019. Meeting notes from Dolphin and Union caribou Ulukhaktok community meeting: March 2019. Wildlife Management Advisory Council (NWT), Joint Secretariat, Inuvik, NT.
- WMAC (NWT). 2020. Dolphin and Union caribou management consultation results and meeting minutes: October 2020. Wildlife Management Advisory Council (NWT), Joint Secretariat, Inuvik, NT.
- WMAC (NWT). 2021a, August 30. Letter to Environment and Natural Resources re: Assistance needed to increase wolf sample incentives within Dolphin and Union caribou range. Wildlife Management Advisory Council (NWT), Joint Secretariat, Inuvik, NT.
- WMAC (NWT). 2021b, August 30. Letter to Environment and Natural Resources re: Management actions for the Dolphin and Union caribou herd. Wildlife Management Advisory Council (NWT), Joint Secretariat, Inuvik, NT.
- Hanke, A. and Wildlife Management Advisory Council (NWT) (WMAC (NWT)). 2023. A three-staged story towards caribou conservation: Ulukhaktokmiut reports on 'Dolphin and Union' and Peary caribou in 2011-2014 and suggested conservation efforts in 2022. In preparation.

Several additional sources and research projects focused on Inuvialuit and Inuit knowledge of caribou are under various stages of research, some of which have not yet fully been verified with the participating communities. This includes a final report on the 2011-2013 Dolphin and Union Caribou Traditional and Local Knowledge Project conducted by GNWT-ENR and being finalized by a contractor through the WMAC (NWT) (Nathoo pers. comm. 2021). The transcripts from this

project were verified in 2013, and the results were verified in 2022. Some quotes and information from this project were incorporated into this report. It is also anticipated that the Hunters and Trappers Committees and Organizations in the Dolphin and Union range, in collaboration with Environment and Climate Change Canada, will publish an Addendum to the 2017 COSEWIC Assessment and Status Report on the Dolphin and Union Caribou Population in the near future (Duclos pers. comm. 2021). This status report also includes results from papers in preparation or submitted to journals from the Kutz research lab at the University of Calgary (Fernandez Aguilar, in prep; Hanke *et al.,* in review). The results from these forthcoming sources were incorporated into the finalized status report when the study leaders granted permission:

- Fernandez Aguilar, X., Leclerc, L.-M., Kugluktuk Angoniatit Association, Ekaluktutiak Hunters and Trappers Organization, Olokhaktomiut Hunters and Trappers Committee, Mavrot, F., Roberto-Charron, A., Tomaselli, M., Mastromonaco, G., Gunn, A., Pruvot, M., Rothenburger, J., Thanthrige-Don, N., Zeini Jahromi, E., and Kutz, S. (in prep.) An integrative and multi-indicator approach for wildlife health applied to an endangered caribou herd. In preparation.
- Fernandez Aguilar, X., Mavrot, F., Thanthrige-Don, N., Thanthrige-Don, O., Leclerc, L.-M., Davison, T., Hunter and Trappers Associations, Tomaselli, M., and Kutz, S. (in prep.). Brucellosis emergence in the Arctic, Canada. In preparation.
- Hanke, A., Niptanatiak Dumond, A., Adams, C., Di Francesco, J., Milton, T., Leclerc, L.-M., Blue, G., and Kutz, S. In review. Inuit-described metrics for monitoring caribou populations articulate a caribou decline. [submitted for publication]

ABOUT THE SPECIES

Names and Classification

Common Name - English:	Dolphin and Union caribou [Island caribou (NWT and Nunavut); Arctic-island caribou (NWT and Nunavut); Mainland caribou (Ulukhaktok); Caribou (Dolphin and Union population)]
Kangiryuarmiutun (K)	Tuktu (singular); Tuktuk (plural) (Elias 2022; Kitekudlak 2022)
Sallirmiutun (S)	Tuktu (singular); Tuktuk (plural) (Elias 2022; Kitekudlak 2022)
Uummarmiutun (U)	Tuttu (ICC 2014)
Inuinnaqtun (Nunavut)	Kiilliniq caribou (Thorpe *et al.* 2001)
Common name (French):	caribou du troupeau Dolphin-et-Union (Poole *et al.* 2010)
Scientific name:	*Rangifer tarandus groenlandicus x pearyi*
Life form:	Large land mammal, caribou

Differing and variable uses of local names and evolving scientific analyses and definitions have changed the groupings of designatable caribou units over time ("discrete and evolutionarily significant units of the taxonomic species") (COSEWIC, 2011; GNWT and GN 2018). The Dolphin and Union caribou population was named after the Dolphin and Union Strait as, historically, this strait was their main migration path (Manning, 1960; Survey of Elders compiled by Albert Elias in Gunn 2005: Appendix A).

Ulukhaktok residents sometimes refer to Dolphin and Union caribou as 'mainland caribou', 'island caribou', or 'arctic island caribou' to distinguish them from Peary caribou (Hanke and WMAC (NWT), in prep). However, Ulukhaktok residents also speak of the difference between Dolphin and Union caribou and the barren-ground caribou, often calling the latter later 'mainland caribou' (Hanke and WMAC (NWT), in prep). Cambridge Bay residents have sometimes called Dolphin and Union caribou 'Peary' or 'island' caribou to distinguish them from barren-ground caribou (Gunn 2005), while others from Cambridge Bay *(Ekaluktutiak/Iqaluktuuttiaq/Ikaluktuuttiak)* and residents of Kugluktuk, Brown Sound, Kingauk/Qinqaut (formerly Bathurst Inlet), and Umingmaktok (*Omingmaktok/*Bay Chimo) sometimes call Dolphin and Union caribou Kiilliniq/Kiiliniq tuktungit or Victoria island caribou (Elias 2022, Hanke *et al.* 2021, Kitekudlak 2022, Thorpe *et al.* 2001;).

Description

Within the Dolphin and Union caribou range area, residents commonly recognize and distinguish between three types of caribou on Victoria Island: Peary caribou, Dolphin and Union caribou, and barren-ground caribou. These three caribou types have different sizes and body proportions, hair colour, taste and smell, and behaviour (Survey of Elders compiled by Albert Elias in Gunn 2005: Appendix A; Dumond, 2007; Thorpe Consulting Services 2019; WMAC (NWT) 2019; Dolphin and Union caribou User-to-User group 2022). Peary caribou are the smallest and whitest; they have the most tender meat, and are often found around Minto Inlet. Barren-ground caribou are the largest and darkest, and they have the toughest and most "green"-tasting meat; they are often found on the mainland. Dolphin and Union caribou are described as in-between Peary and barren-ground caribou on those all accounts, often found on Victoria Island during the summer and the mainland during the winter (Figure 4; Dumond 2007; Hanke and WMAC (NWT), in prep; User-to-User Group 2022, WMAC (NWT) 2019). Generally, Dolphin and Union caribou are said to be more similar in body size, appearance, and colour to Peary caribou than barren-ground caribou (Nishi 2000). Similar to Peary caribou, they have pale gray antler velvet, but their legs remain brown throughout the year (User-to-User Group 2019-2022, WMAC (NWT) 2019).

Figure 4. Dolphin and Union caribou. Photo courtesy M. Dumond.

Relationship with People

For millennia, Inuvialuit and Inuit peoples residing in the Canadian Arctic have interacted with and depended on caribou. Archaeological evidence of caribou hunting on Victoria Island and the adjacent mainland dates back over 4,000 years, spanning the entirety of modern Inuit occupation in the region (COSEWIC 2017, Manning, 1960). The long history of Inuit harvesting caribou in this area is further detailed in the Inuit land-use study, a key supporting document for the Nunavut Land Claims Agreement Act (Freeman 1976).

Caribou remain highly valued for subsistence, economic, and cultural purposes and are an integral part of Inuvialuit and Inuit identity and wellbeing (ENR unpubl. data 2011-2013, COSEWIC 2017, Thorpe *et al.* 2001). Community members often link their lives, culture, upbringing, memories, and family practices to caribou and caribou cycles and their interactions with other species (Hanke *et al.* 2021, Hanke *et al.* in review, Tomaselli *et al.* 2018a, WMAC (NWT) 2019)." For instance, Ulukhaktok knowledge holders described their knowledge of caribou in relationship with the cycles of their lives, in relationship with time, moments of their lives, the movements of people on the land, and changing lifeways over the decades (Hanke and WMAC (NWT) in prep). Opportunities to speak and share their memories helped Elders reconnect with their past and had a positive impact on their mental health:

"She's really glad today because of the questions you had really made her see in the past. Really made her vision sharp again, or something I guess, because she said she really seemed to see what she was talking about. She really saw the animals that she was talking about in her own mind. She's really thankful and happy for that." (Elder (translated) from Ulukhaktok in Hanke and WMAC (NWT), in prep).

Dolphin and Union caribou provide important country food for communities within their range. For instance, caribou is preferred by some residents of Cambridge Bay over other country foods, such as muskoxen, as caribou is easier to butcher, transport, and process (Tomaselli *et al.* 2018a). In Kugluktuk, some families prefer Dolphin and Union caribou over other caribou types because of their family's history with harvesting that caribou type (Hanke *et al.* in review). Meanwhile in Ulukhaktok, some residents rely on Dolphin and Union caribou to offset declines in Peary caribou availability (Hanke and WMAC (NWT), in prep). In addition to a source of food, parts of the animal are also used as raw material for tools and crafts. Caribou antlers and bones are carved to make hand tools and art, while the hides are sewn with sinew to make parkas, tents, and sleeping skins (GNWT and GN 2018, OHTC *et al.* 2016).

Dolphin and Union caribou are highly regarded in Inuvialuit and Inuit spirituality. Spiritual traditions convey that caribou should be treated with respect and undue harm towards the animal should be avoided. Prayers and offerings are often made before going on a hunt. Traditions of sharing the harvest within the community and avoiding waste are rooted in values

of respect and reciprocity (GNWT and GN 2018) and remain important aspects to harvesting today (Hanke *et al.* 2018, 2021). For instance:

"What she just told me, as extended family, they would travel around, travel around. Sometimes not all together, but when they do meet up with each other and whoever needs meat or [bullets] or whatever they need, they share what they have with their extended family when they meet with them." (Elder (translated) from Ulukhaktok in Hanke and WMAC (NWT), in prep).

Biology and Behaviour

Life cycle and reproduction

Caribou will start to calve when they are two or three years old and generally calve every year until they reach a certain age, after which they will not have calves (Thorpe *et al.* 2001). Unlike barren-ground caribou, Dolphin and Union caribou do not aggregate to calve, so they do not have clearly delineated calving grounds (Nishi 2000). Caribou follow a seasonal cycle of migrating north over the sea ice in the spring to Victoria Island, calving, gaining weight in summer feeding grounds, then breeding in the fall before or during the migration south to over-wintering grounds. A subset of 'lead' caribou guides the path of the annual migration (Berdahl 2018). The information on life cycle and reproduction in this section primarily comes from a study done with Nunavut Inuit from the following communities: Brown Sound, Cambridge Bay *(Ekaluktutiak/Iqaluktuuttiaq/Ikaluktuuttiak)*, Kingauk/Qinqaut (formerly Bathurst Inlet), and Umingmaktok (*Omingmaktok/*Bay Chimo) (Thorpe *et al.* 2001).

During the spring migration, the cows usually migrate onto Victoria Island and past Prince Albert Sound before the bulls, but the fall migration takes place with bulls and cows together (Kuptana 2022). Bulls normally migrate together as a group; cows migrate separately except during the rut. The rut begins in mid-October after a summer of feeding when the animals are at their healthiest (Kuptana 2022). Cows and bulls come together at this time, before the crossing from the southern shore of Victoria Island to the mainland, to mate and remain together for about a month while waiting for ice to form (Kuptana 2022). The groups separate again in November after the crossing. During the rut, bulls make loud snorting sounds and may fight for one or more cows (Thorpe *et al.* 2001). When they fight, their clashing antlers are heard by Inuit hunters as a thundering sound that carries across the tundra for miles. Inuit hunters avoid hunting during the rut as bulls are dangerous and their meat is unpleasantly flavoured. Non-breeding animals such as yearlings and calves stay with 'barren cows' a short distance away from the mating animals. Yearlings and calves continue to eat during this time and 'get fat' (Thorpe *et al.* 2001). Bulls are not healthy after the rut, until spring, and Dolphin and Union bulls have more fat in the spring than mainland barren-ground bulls (Dumond 2007).

Cows are pregnant for the migration south after the rut, during the winter, and during the migration north. Pregnant cows lead the northward migration with bulls travelling behind. Just prior to calving, cows become very restless. Caribou may calve on their spring migration before they reach their calving areas. If this happens, the caribou and calf will rest for a time and then move again to the calving areas. Warm weather increases the likelihood of calf survival (Thorpe *et al.* 2001). A caribou calf can walk and join the other caribou once their fur is dry enough, usually within an hour after birth. The new calf and its mother will walk around the calving area for a time, feeding and gaining strength, before walking further distances. The calves drink their mothers' milk and eat forage soon after birth. Calves learn how to eat from watching their mothers and from experimenting. They also learn how to migrate. Calves run and play around their mothers. Sometimes the mothers lay and rest while their calves run around them (Thorpe *et al.* 2001).

Physiology and adaptability

Dolphin and Union caribou are migratory species who make grand movements across the sea ice to reach their summer ranges on Victoria Island and their winter ranges on the mainland. These seasonal movements align with important life cycle events, including rut in the late fall and calving in early summer. Harvesters explained that migration, rut, and calving are energetically expensive activities that can result in poor body condition, i.e. skinnier caribou (Hanke *et al.* 2021). Further, they said that Dolphin and Union caribou recover from the nutritional debt spurred by these energetically costly life stages during the following summer and fall (bulls and cows) and winter (bulls) (Hanke *et al.* 2021). Traditional knowledge reports regarding the physiological impacts were influenced by the context observations were held. For instance, Ekaluktutiak residents primarily reported on the influence of rut and Kugluktuk residents primarily reported on the influence of migration when discussing body condition (Hanke *et al.* 2021). In Ulukhaktok in 1998, community members commented that the caribou were really skinny in early-July across Prince Albert Sound, and that overall, the caribou used to be in better condition. They had less fat and a different taste than in the past (ENR 1998). People suggested that these changes in body condition might be due to changes in food or because the animals are migrating farther than in the past, saying that in the fall, caribou simply walk south and do not feed very much (ENR 1998). Cambridge Bay residents interviewed in 2014 reported some changes in caribou body condition. Before the decline of the population near Cambridge Bay in the mid-2000s, hunters would often encounter caribou with a healthy layer of back fat, about 5 to 8 cm thick. However, by 2014 the majority of the caribou they hunted had little back fat, often amounting to 1 cm or less (Tomaselli *et al.* 2018b). Caribou have been described as "thinner than usual" by Cambridge Bay residents interviewed in 2015 (Panikkar and Lemmond 2020). In these latter cases, body condition may be an indicator of survival, as discussed further in Health.

Inuvialuit and Inuit said body condition could be reduced further by extreme temperatures (hot and cold), rough snow conditions, and rain during snow seasons (Hanke and WMAC (NWT), in prep., Hanke *et al.* 2020, 2021). Hard winters with extreme cold, deep or hard snow, or rain that creates an ice layer on the ground surface during freezing temperatures can result in skinny caribou, or mortalities (Hanke and WMAC (NWT), in prep., Hanke *et al.* 2021). "When the snow is [very] hard" (Ekaluktutiak 10, Hanke *et al.* 2021), it is difficult for caribou to access vegetation and "freezing rain" (Ekaluktutiak 3, Hanke *et al.* 2021) creates a layer of ice over the vegetation that blocks access to food (Hanke et al 2021):

"You know, like, in the fall time it's starting to get, it's starting to freeze, but it also rains and when it rains it goes on the ground and it freezes over their feeding ground or the food that they eat and they go through hunger. Because it freezes. And they have no way of getting to their- because they don't have nails to scratch and they have so flat feet and then to try and break the ice is difficult for them. So they go through great hungering at those times." (Elsie Klengenberg (translated) from Hanke and WMAC (NWT), in prep.)

Adaptations to Environment

To mitigate losing access to their food, caribou will leave an affected area to find access elsewhere:

"He said in the fall time if we get snow and then rain the caribou leave that area and go somewhere else. They don't hang around in that area where they would have stayed. Due to weather, ice conditions on top of the snow, they will not stay." (Allen Joss (translated) from Hanke and WMAC (NWT), in prep.)

To help regulate their body temperature, caribou will adjust their position near big bodies of water, the ocean or big lakes, along with the direction of the wind and daytime. For instance:

"An eastern wind (wind coming off the ocean) and nighttime makes being close to the coast cooler while a western wind (wind coming from inland) and daytime makes being close to the coast warmer. Knowledge keepers explained that caribou will adjust seasonally and daily to these temperature changes." (Hanke and WMAC (NWT), in prep.)

Parasites, such as nasal worms, have been observed in caribou by Cambridge Bay residents since the 1980s, especially on the mainland hunting grounds (Tomaselli *et al.* 2018b). According to local communities, insect harassment of caribou has increased since the 1970s (Bates 2006, Dumond 2007, Thorpe *et al.* 2001) and is worse with warmer and wet summer conditions (Hanke and Kutz 2020). Swarms of insects cause caribou to move in circles or run to try to shake them off. This behaviour uses energy and may prevent caribou from resting or eating, resulting in the loss of fat stores and poorer overall body condition (First Joint Meeting 2015, Hanke and Kutz 2020, KHTO 2016, Second Joint Meeting 2016 *in* GNWT and GN 2018). Some hunters in Kugluktuk reported

seeing Dolphin and Union caribou with very thin skin that tears during skinning in the fall time (ENR 1998).

Caribou are known by knowledge holders in Ulukhaktok to be very sensitive to noise, strong smells, and disturbance, especially while they are calving (Klengenberg 2023). Some participants in workshops in Nunavut related to the impact of mines said that some individual caribou can adapt to some types of noise quite well:

We know caribou and muskoxen are less sensitive to noise. They've gotten used to it. Caribou and muskox have gotten used to airplanes, skidoos. They're probably more tolerant. Many years ago, when the wildlife had contact with machinery, they were easily spooked. That's not the case today. They have adapted to trucks, skidoos, and airplanes. They've adapted. And all terrain vehicles too. They have adapted to almost every day noise levels. That wasn't the case years ago (Moses Koihok in Golder 2003: 29).

It was also noted that their response to noise pollution can vary depending on the weather; for example, on still, clear, and cold days the caribou tend to shy away, but on cloudy days, they allow people to drive closer (Golder 2003). People indicated that all wildlife are less tolerant of noise when they are about to have their young; "Those are critical times in their life" (Phillip Kadlun [Kugluktuk] *in* Golder 2003:30). Caribou are known to have good hearing and eyesight and are particularly sensitive to disturbance when calving (Golder 2003, Thorpe *et al.* 2001). However, these responses to noise pollution may be a function of their population size. Tolerance to noise was documented in and prior to 2003, near the time of their probable population peak. In interviews in Kugluktuk from 2018-20, harvesters said that caribou are more sensitive to sound than compared to the past and will respond quite rapidly to the sound of a snowmachine or all-terrain vehicle (Hanke *et al.* in review).

Traditional knowledge suggests that caribou adapt their distribution and group size in response to low abundance. Residents in Kugluktuk and Ulukhaktok had reported an eastern shift in the Dolphin and Union caribou distribution since the 1990s (Hanke and WMAC (NWT), in prep.; Hanke *et al.* 2020, 2021). Meanwhile, Ekaluktutiak residents, survey results, and collar results indicate a shift in density of caribou towards the west (Tomaselli *et al.* 2018b; Leclerc & Boulanger 2018, 2020). The caribou have contracted their distribution west and east alongside their decline in abundance. Dolphin and Union caribou stopped migrating during the past population low and remained on Victoria Island year-round (Hanke *et al.* 2020). The recent observations of Dolphin and Union caribou on Victoria Island during the winter and the declining population estimates may suggest a possible change in migratory behaviour (Campbell *et al.* 2021).

Participants in Ekaluktutiak reported changes to group size as the population abundance changed. Prior to the decline, they used to see "hundreds of caribou gathered in a single herd" staging along the coast. Fewer and fewer caribou were seen over the years, and eventually there

were “very small, very few, and very scattered herds” of caribou, ranging from 3 to 30–40 individuals, but more frequently less than 10 caribou” by 2014 (Tomaselli *et al.* 2018b, p. 340). This response was reported by Kugluktuk residents as well. Harvesters used to see caribou spread across the land in non-discrete groups before the population decline (Hanke *et al.* in review). As there were fewer and fewer caribou, the caribou started to group up with 15-20 caribou around 1-5 miles apart then became smaller groups that were further apart as year went on (Hanke *et al.* in review).

Diet and Feeding Behaviour

Caribou eat many different types of plants, depending on the time of year and plant availability, although they depend heavily on lichen (*Aqiarungnaq/Tuktut niqait*), including reindeer lichen, snow lichen and worm lichen (Bandringa 2010; Thorpe Consulting Services 2019). Caribou calve and over-winter in areas which offer different plants and conditions (Thorpe *et al.* 2001). Caribou eat dwarf birch, willows, berries, and mountain avens (Thorpe *et al.* 2001), as well as the young leaves of various willows and the leaves of Arctic/Mountain sorrel (*Qungiliq*) (Bandringa 2010; Thorpe Consulting Services 2019). They also feed on *Ningak/Ningnaq* (moss campion or *Silene acaulis)*, which grows in sandy areas (OHTC *et al.* 2016; Bandringa 2010). Ulukhaktok community members have observed that caribou will also eat duck eggshells (Thorpe Consulting Services 2019). Inuit hunters determine that caribou have been feeding in an area based on signs such as feces and snagged hair, browsing, broken branches, and full rumen. The Inuit say that diet affects differences in the taste of the meat (Dumond 2007, Thorpe *et al.* 2001). Generally, caribou start eating greening willow and then grass in the summer, and lichens in the fall and winter (Dumond 2007).

After the snow melts (mid-July), caribou feeding generally focuses more on moist sites and their diets include sedges, grasses and willows, as well as mountain sorrel (OHTC *et al.* 2008). Caribou have been described by Ulukhaktok residents as having a very green stomach in the summer (Ulukhaktok TK interviews 2011-2013 *in* GNWT and GN 2018). Caribou taste like grass in the summer, when they will eat any vegetation including willow buds, damp moss and Labrador tea. They will also eat ‘moist mud’ and occasionally pebbles are found in their stomachs with the damp moss and grass (Thorpe *et al.* 2001). They feed on the lush vegetation around shorelines and wet areas at the base of hills or marshy areas (Thorpe *et al.* 2001). Inuit hunters start finding mushrooms in caribou stomachs in August. The mushrooms are considered to be like a ‘water bottle’ to the caribou and keep the caribou’s mouth moist during warm temperatures. They are also known to contain fat or promote fat. Finding mushroom ‘peels’ indicates that caribou have been eating them. Two types of mushrooms are eaten by caribou (Thorpe *et al.* 2001):

Maybe you have seen those ones with the really smooth top. Some of those that get really big, they feed on those and some of those little ones with red on top, red coloured on top and sort of

mesh in the bottom, just like a cone on the bottom. They have those ones also (Bobby Algona, Kugluktuk in Thorpe et al. 2001: 119).

Caribou are known to seek mushrooms - they dig them out of flat areas on the ground, and from under the snow (Golder 2003, Thorpe *et al.* 2001). They find the mushrooms by scent under the snow. In the fall, Dolphin and Union caribou start to eat lichens and are also known to eat seaweed as they wait for the sea ice to form (Carpenter pers. comm. *in* SARC 2013: 33) and in the winter they eat lichen and grasses (OHTC *et al.* 2008, Thorpe *et al.* 2001). The mainland wintering areas tend to have more abundant winter feeding – willows, moss, and lichens (Thorpe *et al.* 2001).

Relationship Within and Among Species

She said when she first started realizing things, there was nothing scary. Nothing scary in this world. When she was growing up, there was no scary animals, nothing. But now, in the recent years, just recently, we're getting all these wolves and grizzlies coming around and those are the scary animals. (Elder from Ulukhaktok in ENR unpubl. data 2011–2013).

Wolves

Harvesters report that wolves are the main predators of caribou in many areas; in places where the wolf numbers increase, caribou numbers decrease (Adjun 1990, Dumond 2007). Wolf populations cycle with caribou populations, and during times with low caribou numbers, wolf pups may perish (Thorpe *et al.* 2001). Wolves are known to keep caribou populations healthy by removing sick individuals (Dumond 2007). Through tracking, hunters can observe signs of wolf predation on caribou. For instance, hunters in Ulukhaktok observed signs of wolves chasing caribou in 2020 in an area about 100 miles north of the community (Dolphin and Union User-to-User Group 2019-2022).

Harvesters said the Government of Northwest Territories used poison for wolf control around the west end of Victoria Island and east of Ulukhaktok prior to the 1970s (Adjun 1990). Interviewees thought the poisoning program was effective (Adjun 1990). Since that predator control program ended, more wolves were being seen in several areas, including northeast of Walker Bay, the Minto Inlet area, Fish Lake, Glenelg Bay, Kagloryuak River, the west side of Victoria Island, Berkley Point, and Prince Albert Sound (Adjun 1990).

That increase in wolves was around the return or re-appearance of Dolphin and Union caribou in the 1960s (Adjun 1990). Harvesters thought the caribou increase may have contributed to the increase in wolf numbers over the previous 10 to 20 years [1970s-80s] (Adjun 1990). Ulukhaktok residents interviewed in 2011-2013 reported a continued increase in wolf numbers on Victoria Island and concern of increased predation on caribou (Hanke and WMAC (NWT) in prep.). These concerns were repeated by Ulukhaktok knowledge holders interviewed about Dolphin and Union

caribou management in 2020 (WMAC (NWT) 2020). The wolves also seem to be bolder than in the past, making people afraid for the safety of their communities as well as caribou (Thorpe Consulting Services 2019, Hanke and WMAC (NWT) in prep.):

I was growing up, not many wolves those days. See them once in a while. But today it's different. Different today. Wolf population is too high on this island. Too much. Too much. Way too much. Long ago, when you seen them, they just go away from you right away. Right now, when they see you, wolf in the pack, they could come to you. Even you calling them, howling like wolf, they could come right at you. They are different. Even last year, last summer, not this summer, last year's summer, I should say, one of my boys gets seized by a pack of wolves. (Patrick Ekpakohak [Ulukhaktok], Hanke and WMAC (NWT) in prep.)

Communities from Nunavut have also expressed repeated concern about increasing wolf numbers (Dumond 2007, Hanke *et al.* 2020, 2021 in review, Tomaselli *et al.* 2018b;). Some residents from Kugluktuk explained that there were fewer people harvesting predators today than in the past because it requires extensive time, resources, and expert knowledge, and the resulting compensation rarely justified the financial and resource investment required (Hanke *et al.* in review). They were concerned that declines in predator harvesting was negatively affecting the natural caribou population cycle by creating an imbalanced predator pressure on caribou (Hanke *et al.* in review).

Grizzly Bears

She said when she was young, when she started hunting, there was never any grizzly bears. Only up in the mainland. Just recently, we started getting grizzly bears around this area crossing over. She said they [grizzly bears] will eat anything. Caribou, any animal they come across they will eat. (Elder from Ulukhaktok in ENR unpubl. data 2011-2013).

On the mainland, grizzly bears prey on barren-ground caribou. However, grizzly bears are rarely fast enough to be effective predators of caribou (Thorpe *et al.* 2001 in SARC 2017). Grizzly bears predate on barren-ground caribou calves when they are vulnerable during the post-calving season (Advisory Committee for Cooperation on Wildlife Management [ACCWM] 2014, Benson 2015, Soublière 2011, Thorpe *et al.* 2001 in SARC 2017).

In the Mackenzie Delta grizzly bears are common, however their distribution further north in the Inuvialuit Settlement Region onto the arctic islands has been increasing (GSCI and GRRB 2014 in SARC 2017: 65, SARC 2017). Grizzly bears may wait by the ocean shore to hunt caribou, and they are observed following the Dolphin and Union caribou on their northward migration to Victoria Island (User-to-User Group 2019-2022). Foxes and grizzly bears may hunt sick caribou co-operatively – the fox will bark when it finds the caribou (Thorpe *et al.* 2001).

Community members are very concerned about grizzly bears as a new predator establishing itself on Victoria Island, and they have questions about grizzly bear diet and impacts on the ecosystem,

including caribou and fish (User-to-User Group 2019-2022). The first reported sightings of grizzly bears on Victoria Island were near Wynniat Bay in the mid-1990s (WMAC (NWT) 2020). By the late 1990s, people from Kugluktuk reported seeing more grizzly bears and wolves on the island. However, at that time these predators were not considered problems for Dolphin and Union caribou (ENR 1998). By the 2010s, residents of Ulukhaktok and Cambridge Bay began expressing serious concerns over the rise in grizzly bear numbers on Victoria Island and increased predation on caribou (First Joint Meeting 2015, EHTO 2016, Kugluktuk HTO 2016, and Second Joint Meeting 2016 *in* GNWT and GN 2018, Thorpe Consulting Services 2019, Tomaselli *et al.* 2018b). Ulukhaktok Elders interviewed in 2011-2013 described how the behaviour of grizzly bears was changing and they were becoming more aggressive predators like polar bears (Thorpe Consulting Services 2019, WMAC (NWT) 2020). By 2021, residents of Ulukhaktok began observing grizzly bear dens along with grizzly bear mothers and cubs north of the community – indicating for the first time that a grizzly bear population is being established on Victoria Island (WMAC (NWT) 2022).

Scavengers

Other predators and scavengers may finish the caribou remains, such as foxes, hares, wolverine, and numerous types of birds and rodents. Bald eagles and golden eagles are known to hunt caribou calves; some communities are observing more bald eagles than in the past (KHTO 2016 *in* GNWT and GN 2018). Wolverines will mainly feed on wolf and bear kills, but they can also kill caribou by tiring them out. One harvester reported a wolverine that chased a caribou for over 80 km (Dumond 2007). Caribou cows may charge predators to prevent predation of calves, but this is not seen as successful very often (Thorpe *et al.* 2001).

Caribou get eaten fast. No matter what, caribou get eaten alive. A whole pack of wolves can finish one big caribou in half the night. I've come across caribou carcasses that have just been recently eaten, you can usually tell when it is been eaten or when it is been caught or how long it was there by fresh blood. On the ground, no blood on the ground, few days old. Wolf is usually the one [to kill caribou], but I witnessed a bear tackle caribou. I witnessed wolf tackle caribou, I witnessed wolverine tackle caribou, even a fox try to tackle a caribou. Everything likes caribou meat. It is pretty much similar the way they hunt caribou. Stalk and kill, stalk and kill, stalk and kill, stalk and kill (Bobby Algona [Kugluktuk] in Thorpe et al. 2001: 105).

Muskoxen

There is some overlap in the feeding areas of muskoxen and Dolphin and Union caribou during the growing season, but they tend to feed in different areas for the rest of the year (OHTC *et al.* 2008). Hunters and Elders interviewed in Ulukhaktok in the 1990s indicated that muskoxen and caribou did not appear to compete for food or habitat and could be observed in close proximity to each other (Elias 1993). However, while some Elders from the community interviewed in 2011-

2013 similarly expressed that muskox and caribou ate different food, others said that they competed for vegetation (Thorpe Consulting Services 2019). Near Umingmaktok (*Omingmaktok/*Bay Chimo), some community members have observed caribou and muskox sharing habitat and grazing in the same area in the winter months in the past 25 years (First Joint Meeting 2015 *in* GNWT and GN 2018).

Hunters and Elders interviewed in Ulukhaktok have observed fluctuations (ups and downs) in both caribou and muskox numbers within living memory (Gunn 2005). Elders describe how the populations of caribou and muskox interact within a 50-60 year cycle, where high muskox numbers coincided with low caribou numbers and vice versa (WMAC (NWT) 2019). Muskox and caribou numbers both increased near Ulukhaktok between the 1960s and the 1980s (Gunn 2005; WMAC (NWT) 2019). In the late 1980's to early 1990's, one Ulukhaktok elder noted that the caribou population declined as the muskox population rose WMAC (NWT) 2019). When Peary and/or Dolphin and Union caribou, but not muskoxen, started to decline near Ulukhaktok, some residents suggested that the caribou had moved toward Cambridge Bay to escape the muskoxen at Minto Inlet (Gunn 2005). Some Ulukhaktok Elders have suggested that the smell of muskoxen drove the caribou away from the coastal shoreline and further inland (Thorpe Consulting Services 2019). It was also suggested that there were many muskoxen around Cambridge Bay, and the movements toward Cambridge Bay were part of the annual cycle of the Dolphin and Union caribou (Gunn 2005). The movement of caribou away from Ulukhaktok was thought by residents to represent a trend that began in the early 2000's or 2010's (Tomaselli *et al.* 2018a, WMAC (NWT) 2019).

In Ulukhaktok, [people's diet] already shifted [from caribou to muskoxen] in the last 20 years... because the caribou were gone from the area... (Interviewee 13 in Tomaselli et al. 2018a: 7).

One Ulukhaktok resident interviewed in 2019 indicated that people used to go to the hills outside of Ulukhaktok to see muskox; nowadays, they have to travel at least 50-60 miles before they see signs of them (WMAC (NWT) 2019).

A possible consequence of higher numbers of muskoxen near Ulukhaktok is that they provide alternate prey for wolves and therefore could maintain high numbers of wolves even while caribou are declining. This could possibly lead to relatively high predation on the remaining caribou or slow their future recovery (Gunn 2005). Interviews with Cambridge Bay residents suggest the relative abundance of both muskoxen and caribou near the community increased from the 1980s to early 2000s. Progressively smaller groups of both muskoxen and caribou have been observed by some Cambridge Bay residents, with a major decline in both populations evident from the mid-2000s to the end of 2014. Disease outbreak and increased predation are thought to be the key factors behind the decline of both caribou and muskoxen (Tomaselli *et al.* 2018b).

Not only muskox have declined, caribou too… [Caribou declined] the same way and the same time [as muskoxen] (Elder (Interviewee 6), Cambridge Bay in Tomaselli et al. 2018b: 340).

Ulukhaktok residents reported good signs of muskox at Prince Albert Sound in the winter of 2020. One harvester from Ulukhaktok observed eight groups of muskoxen in the area, with 25-30 individuals per group (Dolphin and Union User-to-User Group 2019-2022). Given the increased availability of muskox, an Ulukhaktok resident estimated that the community now harvests 200-300 muskox per year and fewer than 50 Dolphin and Union caribou to conserve the caribou population (OHTC 2021b).

Barren-ground caribou and Peary caribou

Dolphin and Union caribou were commonly harvested in the 1980s on the mainland west of Kugluktuk (Hanke *et al.* 2020, 2021, in review). This part of their range was not included in past range maps for the species (GNWT and GN 2018) and overlaps with the neighbouring Bluenose caribou population. However, Kugluktuk residents interviewed in 1998 did not know how much mixing takes place between mainland (Bathurst and Bluenose-East) caribou and the Dolphin and Union caribou (ENR 1998). Since the 1970s, overlap in the ranges of Dolphin and Union caribou and barren-ground caribou populations has increased in Nunavut and the Northwest Territories; this is increased "especially in the areas between Kingauk (Bathurst Inlet) and Umingmaktuuk (Bay Chimo)," (Thorpe *et al.* 2001). People in Cambridge Bay and Umingmaktok observed mixing between caribou populations in that area (the Bathurst, Ahiak and Dolphin and Union), as well as changes in their ranges, in the early 2000s (Golder 2003). However, Kugluktuk residents interviewed in 1998 did not know how much mixing takes place between mainland (Bathurst and Bluenose-East) caribou and the Dolphin and Union caribou (ENR 1998). The summer range of barren-ground caribou has extended north, and the winter range of Dolphin and Union caribou has extended south (Thorpe *et al.* 2001). Some barren-ground caribou even follow the Dolphin and Union caribou onto Victoria Island in the spring (Dolphin and Union User-to-User Group 2019-2022). One interviewee described this as a 'return' of non-Dolphin and Union caribou to Victoria Island (Thorpe *et al.* 2001). A southern extension of the Dolphin and Union caribou range around Contwoyto Lake has been observed by harvesters in Kugluktuk for several years (User-to-User Group 2019-2022). Harvesters said the apparent increase of interaction in the winter is due to warmer temperatures with resulting increase in availability of forage on the tundra (Thorpe *et al.* 2001).

Residents from Ulukhaktok reported mixed groups of caribou including Dolphin and Union caribou, Peary caribou, and barren-ground caribou on Victoria Island (WMAC (NWT) 2020), and residents from Cambridge Bay, Kugluktuk, and Ulukhaktok reported Dolphin and Union caribou with barren-ground caribou together year-round in the mid-2000s (Campbell *et al.* 2021). However, it is unclear whether Dolphin and Union caribou are joining barren-ground caribou on

their rutting grounds, which would suggest these emigrants are no longer reproductive members of the Dolphin and Union and are instead mixing with barren-ground caribou (Campbell *et al.* 2021).

Since the mid-1980s, southern and northern migration routes of different caribou types have come together more frequently and some individual caribou from different types were reported as migrating together in small groups before joining a larger group (Thorpe *et al.* 2001). At least one Inuit interviewee from Cambridge Bay thought the Dolphin and Union caribou population is possibly a mix of Peary caribou and the Bathurst population of barren-ground caribou:

Do you know how the Kiilliniq caribou came to be? The Bathurst caribou met up with the Peary caribou. Might not be, but that is what I think, (Naikak Hakongak [Ikaluktuuttiak] in Thorpe et al. 2001:81).

Ulukhaktok interviewees have made similar observations of intermixing between Peary caribou and Dolphin and Union caribou based on behavioural observations and morphological changes (Hanke and WMAC (NWT), in prep.; WMAC (NWT) 2019). Ulukhaktok residents have observed Peary caribou with very white legs were dominant in the 1970s on Victoria Island near their community. They say it is now (2019) less common for the community to see Peary caribou. Some Peary caribou that they do see have brown on their legs and back, suggesting Peary caribou are interbreeding with Dolphin and Union caribou (WMAC (NWT) 2019). Dolphin and Union caribou are also known to range as far north as Shaler Mountains, Hadley Bay, Wynniat Bay, Walker Bay, and Richardson Collison Inlet, where they can interact and mix with Peary caribou, as well as across the whole north shore of Prince Albert Sound, depending on physical and ecological conditions (Dolphin and Union User-to-User Group 2019-2022; OHTC 2021b, Kuptana 2022).

PLACE

Distribution

Dolphin and Union caribou are a single population found on most of Victoria Island, as well as sections of the NWT and Nunavut mainland coast (Figure 5). Their range includes parts of both the Northwest Territories and Nunavut (Nishi 2000). As the same population occurs in Nunavut and the NWT, information from both territories is included in this report.

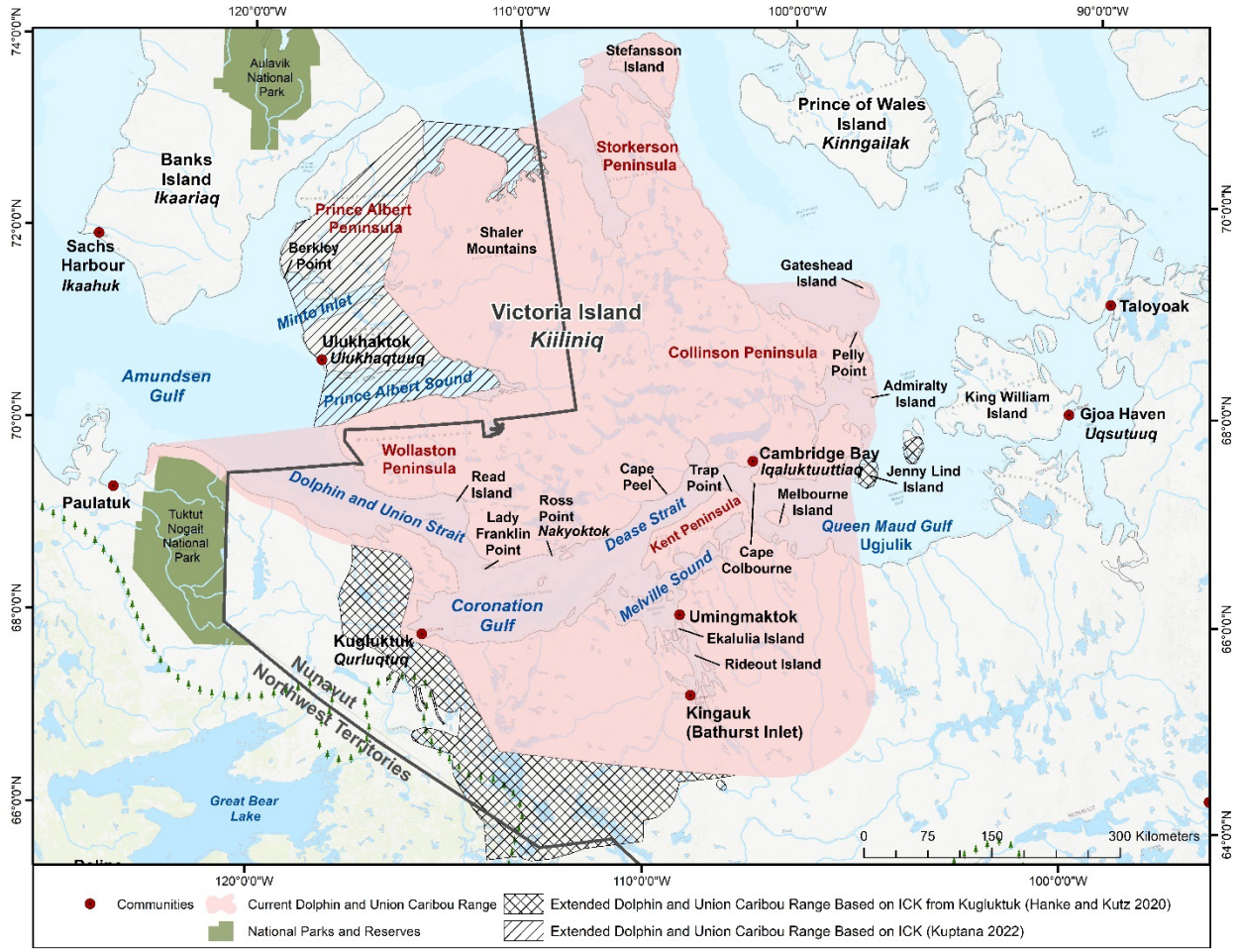

Figure 5. Current and extended range of Dolphin and Union caribou based on Indigenous and Community knowledge from Ulukhaktok and Kugluktuk. Map includes range extension on the Northwestern Prince Albert Peninsula provided by Kuptana 2022 (hatching), southern extent reproduced with permission from Hanke and Kutz 2020 based on observations by Kugluktukmiut knowledge keepers in 2018-2020 (cross-hatching) and the scientific range by Environment and Natural Resources, unpubl. data 2012 (pink shaded area). See also Figure 6 for additional information on observations in the southern range on the mainland.

Dolphin and Union caribou migrate seasonally between their characteristic summer range on Victoria Island and their winter range on the adjacent mainland approximately between Bernard Harbour to just east of Bathurst Inlet (Hanke *et al.* 2020, in review). The caribou migrate north in

the spring to disperse and calve on Victoria Island. Harvesters report calving locations in the Shaler mountains, north of Minto Inlet, inland of Prince Albert Sound, and across the southern part of the island (ENR unpubl. data 2011-2013, Hanke and WMAC (NWT) in prep., Kuptana 2022, Thorpe *et al.* 2001). During their migration north, Ulukhaktok knowledge holders have observed caribou crossing over the sea ice on Prince Albert Sound (ENR unpubl. data 2011-2013; Kuptana 2022, Hanke and WMAC (NWT) in prep.). Dolphin and Union and barren-ground caribou will sometimes migrate together northward and barren-ground caribou may be seen on Victoria Island. Peary caribou will sometimes join part of the Dolphin and Union migration south on Victoria Island (Dolphin and Union User-to-User Group 2019-2022, Hanke and WMAC (NWT) in prep., Thorpe *et al.* 2001). In late fall, Dolphin and Union caribou migrate south and east towards the coast of Victoria Island, wait for the ice to form, and cross the ocean ice to the mainland. Their annual range extends south to Brown Sound and Bathurst Inlet in the winter, and as far north as Stefansson Island (Nishi 2000). Dolphin and Union caribou are also known to travel to Read Island and Cambridge Bay (Elias 1993). Dolphin and Union caribou have been reported just north of Tuktut Nogait National Park (Gau pers. comm. *in* SARC 2013: 23). They sometimes travel far West on the mainland and are occasionally hunted by Paulatuk community members (Dolphin and Union User-to-User Group 2019-2022; WMAC (NWT) 2019). The distribution of Dolphin and Union caribou varied extensively over the past 50 years (Hanke *et al.*, 2020; in review).

Archaeological evidence on Victoria Island indicates that Dolphin and Union caribou have been crossing the sea ice for hundreds or thousands of years. However, the abundance and specific crossing locations have shifted over time (Poole *et al.* 2010). Distribution trends in Dolphin and Union caribou are closely linked to changes in the population cycle and migration patterns (see *Population*). Distribution changes may be responsible for the appearance of increases or decreases in Dolphin and Union caribou numbers. Because different communities observe different portions of the caribou at different points of its life cycle, the observations of all communities at any given time must be taken into account if attempting to draw conclusions about trends on population or distribution (Hanke 2020).

A large group of caribou migrated between Victoria Island and the mainland in the late 19th century and the early part of the 20th century, although it appeared to stop migrating in the early 1920s (Anderson 1922; Manning 1960; COSEWIC 2004; Gunn 2008). Observations from Cape Lambert in the spring of 1916 were of "...countless caribou - mainly bulls, their antlers already starting to grow - crossing the straits from the mainland..." (Charles Denny LaNauze *in* Jenkins 2005). A few years later, it was reported that an entire population of caribou from south-east Victoria Island migrated to the Kent Peninsula. Given their locations, these caribou were most likely Dolphin and Union caribou. Dolphin and Union caribou were very rarely seen again until, at least, the 1940s (Hanke and WMAC (NWT), in prep., Hanke *et al.* 2020).

When I was young, there was no bears, no muskox, no caribou those years [on Victoria Island]. A lot of changes happened over the past 18 years. Now there are bears. In the 1950s nothing on Victoria Island, only fish, rabbit and birds (Marion Bolt [Kugluktuk] in Dumond 2007: 18).

Ulukhaktok

Ulukhaktok residents saw no caribou at Prince Albert Sound during the 1940s, but some (likely Peary caribou) were north of Minto Inlet (Survey of Elders compiled by Albert Elias in Gunn 2005: Appendix A; ENR unpubl. data 2011-2013). Some residents began seeing very few Dolphin and Union caribou in the 1950s between Rymer Point and Prince Albert Sound (ENR unpubl. data 2011-2013). From the 1960s to the 1990s, their observations of Dolphin and Union increased as the caribou distribution seemed to expand around the north and south of Prince Albert Sound (ENR unpubl. data 2011-2013, OHTC *et al.* 2008). Other Ulukhaktok harvesters reported seeing Dolphin and Union caribou along the northern shoreline of Prince Albert Sound in the 1990s, but it was not known whether those animals overwintered on Victoria Island or continued migrating east and then south to the mainland (Nishi and Gunn 2004). Ulukhaktok observations of Dolphin and Union caribou decreased after the 2000s as they seemed to move more inland on Victoria Island (ENR unpubl. data 2011-2013). In 2019, Ulukhaktok residents said Dolphin and Union caribou appeared to be entering a recovery phase of their population cycle, with community members indicating they were able to harvest 50% or more Dolphin and Union caribou (compared to Peary) on Victoria Island during the 2018-2019 winter, and the 2018 summer harvest was also successful (WMAC (NWT) 2019). In the summer months, caribou were sighted just south of Ulukhaktok, which indicated that the population was coming back (WMAC (NWT) 2019). However, in 2021 and 2022, harvesters observed that the caribou around Ulukhaktok were scarce, and in 2021 the community harvested approximately 20 of the new community limit of 50 Dolphin and Union caribou per year; in this case, this was because harvesters were travelling and looking for caribou, but were not able to find and harvest them (Dolphin and Union User-to-User Group 2019-2022). Ulukhaktok representatives also noted that the fall migration in 2021 did not seem to pass its usual area east of Prince Albert Sound, but they speculated that there might be caribou where the conditions were better toward Richardson Collinson Inlet and Wynniat Bay (Dolphin and Union User-to-User Group 2019-2022).

Ulukhaktok residents harvest Dolphin and Union caribou close to Ulukhaktok and throughout Northwest Victoria Island, including north of Minto Inlet where they make regular use of areas such as Anmalokitak Lake, Akiarlik Lake, and Aliguglak Lake (Figure 5; Kuptana 2022). They are also known in generational memory to range as far north as Shaler Mountains, Hadley Bay, Wynniat Bay, Walker Bay, and Richardson Collison Inlet, where they can interact and mix with Peary caribou, as well as across the whole north shore of Prince Albert Sound, depending on physical and ecological conditions (Figure 5; Kuptana 2022, User-to-User Group 2019-2022).

Mainland

People began seeing Dolphin and Union caribou around Umingmaktok around and after the 1970s (David Kaomayok in Gunn *et al.*, 1997; Thorpe *et al.* 2001). In the mid-1970s "a few" Dolphin and Union caribou were crossing the sea ice to the mainland, and Inuit hunters began to report more caribou sightings on southern and central Victoria Island by the late 1970s (Gunn *et al.* 1997). Harvester reports supported biologists' surveys that found a progressive shift in the winter distribution of Dolphin and Union caribou to the south and east on southern Victoria Island during the 1980s (Gunn *et al.* 1997). In the 1980s-late 1990s, Kugluktuk residents were regularly harvesting Dolphin and Union caribou west of their community (Figure 6; Hanke *et al.* 2020, 2021).

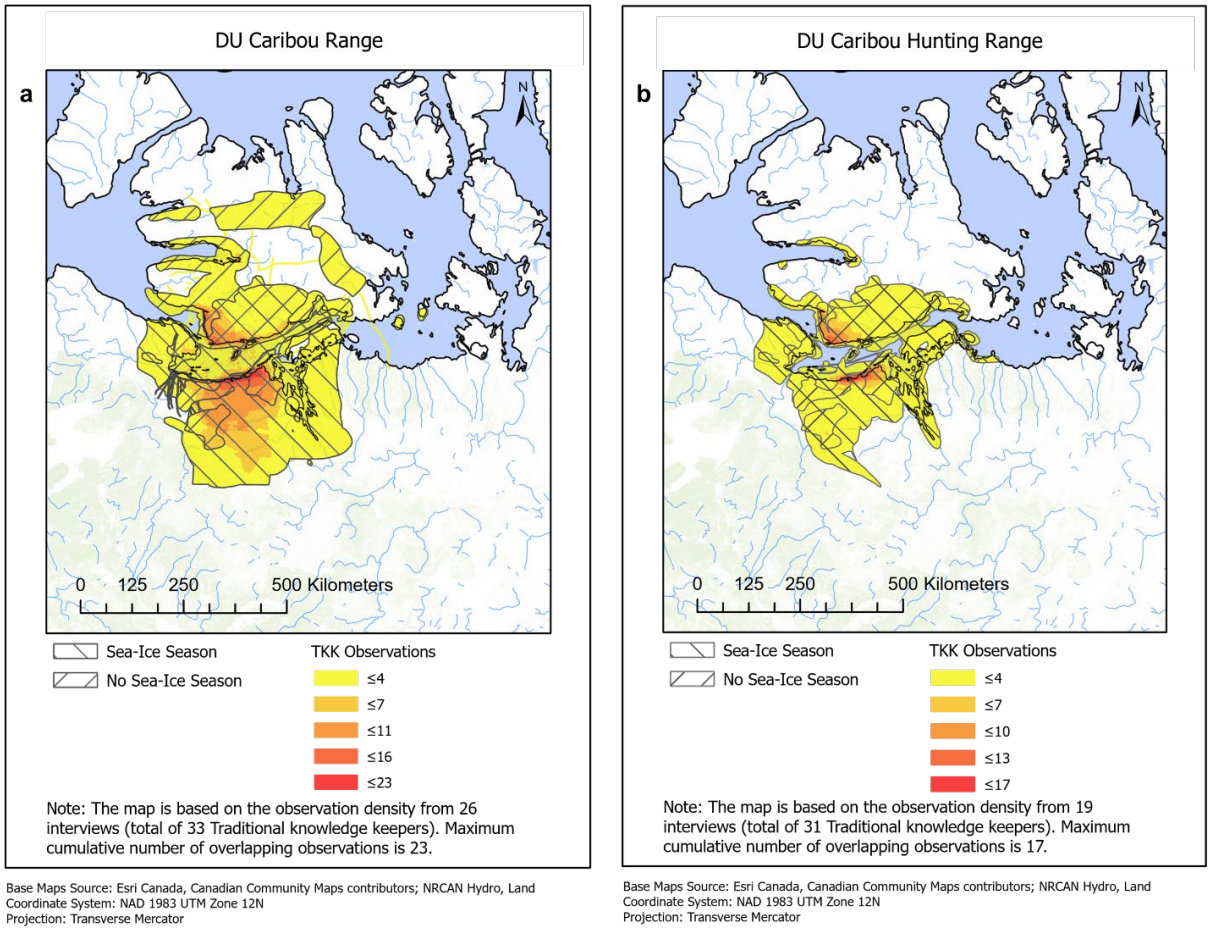

Figure 6. Maps of Dolphin and Union caribou range (a) and hunting range (b) as reported by Kugluktukmiut knowledge keepers in 2018-2020. Colour gradient is based on the density of observations (Hanke and Kutz 2020).

Hunter observations from outpost camps near Read Island, Ross Point (Nakyoktok) and Cambridge Bay suggest that the Dolphin and Union caribou's annual fall migration was consistent

and extensive through the early and mid-1990s (Nishi and Gunn 2004). Kugluktuk residents were also seeing Dolphin and Union caribou on the north side of Great Bear Lake and in the Hope Lake area (ENR 1998). Dolphin and Union caribou were also reported west to Tuktut Nogait National Park (Figure 5; WMAC (NWT) 2012). During the late 1990s, harvesters started travelling east of Kugluktuk towards Tree River and further inland from their camps on Victoria Island (i.e., Rymer Point, Lady Franklin Point) to find caribou (Hanke *et al.* 2020, 2021, in review). In the early 2000s, Elders reported that the Dolphin and Union caribou winter range was extending further south than in the past, into areas used by barren-ground caribou in the summer (Figure 5; Thorpe *et al.* 2001).

We know caribou migrate all the way down to the tree line. So the Elders from what we heard go from the coast line to the barren lands to go hunting because they know where the caribou are. The Victoria Island caribou herd is starting to migrate to the tree line. These are the white coated caribou. But that was not the case years ago. And they are starting to mix with the mainland herds. You can see them mixing (Phillip Kadlun in Golder 2003).

Kugluktuk knowledge keepers indicate the western boundary of Dolphin and Union caribou range has shifted eastward, coinciding with a reported decline in Dolphin and Union caribou abundance in western portion of its range (Figure 7; Hanke and Kutz 2020). As a result, some Kugluktuk harvesters are now (2018) travelling even further east on the mainland, near Grays Bay, Wentzel River, and beyond to Bathurst Inlet, to find Dolphin and Union caribou (Figure 5 and 6).

We used to just... go 40 miles in the '80s, '90s and get some. Now we gotta go... 120 plus miles [to Grays Bay and Wenzel River in winter]... One way, yep. And that's quite a ways.... [...] We would get a few west of here. ... Island caribou, yeah... Used to be... quite a few too, west but... no more. Nobody goes over there anymore. (Elder Stanley Carpenter [Kugluktuk] in Hanke et al. in review).

The earlier formation of sea ice in the eastern portion of the Dolphin and Union caribou range and delayed freeze-up in western areas near Kugluktuk are thought to be factors behind the change in distribution by some Kugluktuk residents (Hanke and Kutz 2020; Panikkar and Lemmond 2020).

They [the Dolphin and Union caribou] would be coming from Victoria Island and they don't do that anymore. Because of the late freezing, I think they go by more east, towards Cambridge Bay and somewhere around Bathurst area maybe (Study participant, Panikkar and Lemmond 2020: 8).

Cambridge Bay

Some Cambridge Bay residents argued that the migration did not cease and continued throughout the 1900s in numbers small enough to appear undetectable. As well, Inuit still

reported sightings of a very few caribou on Victoria Island (Bates 2006, Gunn 2008). Although a few were seen by Inuit hunters, caribou were very scarce in the 1920s and 1930s. Cambridge Bay Elders had different reasons for why the caribou seemed to disappear: caribou moved away from the community following major disturbances (e.g., ice crusting events); an autumn rainfall that had left a crust of ice over the snow that led to competition between caribou; muskoxen shamans had made the mistake of fighting over the caribou (Bates 2006). However, most respondents told of the caribou having gone away and then having come back and would sometimes suggest routes by which the caribou would return (Bates 2006).

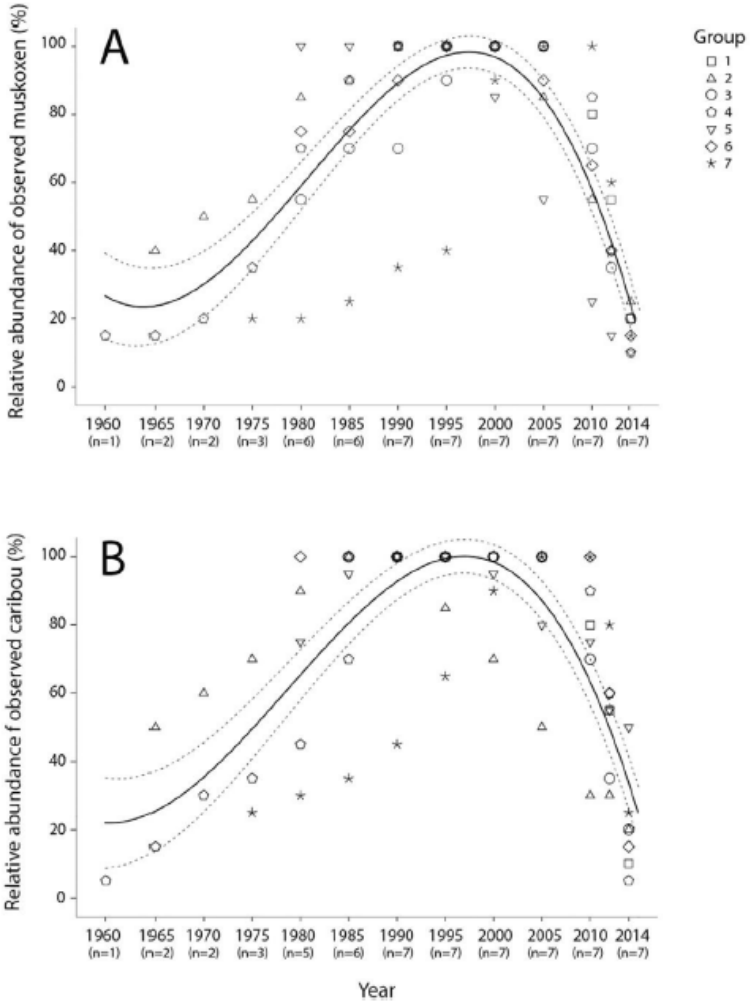

Figure 7. Graphs depicting participants' observations of relative abundance (%) of muskoxen (A) and caribou (B) between 1960 and 2014 in the Cambridge Bay area. The number of participant groups providing observations is specified in parenthesis under each year (Tomaselli *et al.* 2018b).

Low numbers of Dolphin and Union caribou were observed by some Cambridge Bay residents in the 1960s and 1970s. In the mid-1980s, residents noticed caribou migrating within a few miles of the community. People would often observe large groups of caribou in the fall, gathered on the shoreline near Cambridge Bay, waiting for the sea ice to freeze. Cambridge Bay residents observed the most Dolphin and Union caribou near their community in the 1980s. In the 1990s, people used to see "hundreds of caribou gathered in a single herd" near the community as the caribou waited for the sea ice to freeze before migrating to the mainland. However, residents observed progressively fewer caribou over the years, and by 2014 only "very small, very few, and very scattered herds" of caribou, ranging between 3 to 40 individuals were observed, with frequently less than 10 caribou (Tomaselli *et al.* 2018b: 340). According to these interviews, populations of both caribou and muskox progressively declined from the mid-2000s to the end of 2014 in the Cambridge Bay area (Figure 7; Tomaselli *et al.* 2018b).

While ecological science describes a decline in population, Inuit respondents generally seemed to consider that the caribou had gone elsewhere (Bates 2006). Community-based observations of abundance changes alongside distribution changes suggest that these two statements are interconnected rather than in disagreement (Hanke *et al.* 2020, in review). Table 1 summarizes changes in the range of Dolphin and Union caribou by decade from 1980-2020, as mapped by Kugluktukmiut knowledge keepers in 2018-2020 (Figure 6). These values suggest an overall decline in Dolphin and Union caribou range and hunting range near Kugluktuk by approximately one-third between 1980 and 2020 (Hanke and Kutz 2020). It is important to note that the maps in Figure 6 show only the portion of the range reported by Kugluktuk knowledge holders. They do not represent the whole Traditional and community knowledge understanding of the Dolphin and Union caribou range (Hanke 2020). Figure 5 of this report attempts to illustrate a more fulsome representation of Traditional and community knowledge understanding of the Dolphin and Union caribou range (see Figure 5).

Table 1. Dolphin and Union caribou range and hunting range summarized by decade from 1980-2020, as mapped by traditional knowledge keepers in 2018-2020. The values reflect absolute areas and do not consider overlapping areas. Percent of total indicates the percent of the related 1980-2020 interval range (maximum) represented in the specific year interval. Percent change indicates the percent change in area from the previous decade (reproduced from Hanke and Kutz 2020 with permission).

Range Type	Year Interval	Total Area	% of Total	% Change
Dolphin and Union Caribou Range and Hunting Range (absolute area)	1980-2020	247 200 km^2	100%	n/a
Dolphin and Union Caribou Range	1980-2020	240 400 km^2	100%	n/a
	1980-1989	122 800 km^2	51%	n/a
	1990-1999	158 300 km^2	66%	29%
	2000-2009	133 300 km^2	55%	-16%
	2010-2020	156 200 km^2	65%	17%
Dolphin and Union Caribou Hunting Range	1980-2020	138 700 km^2	100%	n/a
	1980-1989	66 400 km^2	48%	n/a
	1990-1999	64 500 km^2	47%	-3%
	2000-2009	77 600 km^2	56%	20%
	2010-2020	93 700 km^2	68%	21%

Movement and Dispersal

Fall Migration

The migration path of the Dolphin and Union caribou requires crossing between the mainland coast and Victoria Island twice a year. In August, caribou cows and calves start to migrate with a few bulls. Most bulls migrate a week or two afterwards. Young caribou will follow the main group (Thorpe *et al.* 2001). In September and October, the majority of caribou move south, congregating in staging areas along the southern coastline of Victoria Island while waiting for freeze up (Bates 2006, COSEWIC 2017, Leclerc and Boulanger 2021, Nishi and Gunn 2004). Most caribou depart from just a few locations on the coast, which are often used consistently from year to year (Poole *et al.* 2010). Caribou begin to cross in lines (e.g., not scattered) and when the sea ice is still flexible (EHTO 2019). Thousands of Dolphin and Union caribou cross from the Cape Colbourne area to Kent Peninsula (south of Trap Point) within a matter of days (Nishi and Gunn 2004). The caribou pass through Iqalulialuk (Ekalulia Island) Island (Thorpe *et al.* 2001). Hunters based out of the outpost camps near Read Island, Ross Point (Nakyoktok) and Cambridge Bay have observed fall migrations of Dolphin and Union caribou towards and along the southern coast of Victoria Island through the early and mid-1990s, indicating that the Dolphin and Union caribou's annual fall migration was consistent and extensive at that time (Nishi and Gunn 2004).

Some caribou die during this crossing, particularly on newly formed, weak sea ice (Nishi and Gunn 2004). Drowning deaths are considered common and Inuit often find frozen caribou remains in the sea ice or passages with fast currents (Bates 2006, Hanke *et al.* 2020). However, Kugluktuk harvesters from more recent interviews say that drownings were most common in the 1990s-early 2000s and that caribou learned how to cope with the changing sea ice conditions (Hanke *et al.* in review).

A lot of caribou drown in the fall time because they fall in the water and drown from October to November, (Moses Koihok [Iqaluktuuttiaq] in Golder 2003:42).

Historically, it is known that some caribou do not migrate and remain on the Island (Bates 2007, Thorpe *et al.* 2001). Some Ekaluktutiak and Kugluktukmiut knowledge holders interviewed in 2003 have attributed this behaviour to low population densities; during population lows, caribou do not muster in large numbers on the coastline and cease to migrate (Hanke *et al.* 2021). Additional factors potentially causing delays in migration include low population size, late freeze up, and weather events (see also *Changes in Distribution)*. Dolphin and Union caribou have been observed for the past few years overwintering on Victoria Island (Dolphin and Union User-to-User Group 2019-2022). For instance, Ulukhaktok community members have observed caribou overwintering in the Shaler Mountains, Wynniat Bay, and some years on Prince Albert Sound. Caribou harvested near Ulukhaktok in the winter of 2018-2019 were confirmed by observation

and genetic analysis to be Dolphin and Union caribou (Fernandez Aguilar pers. comm. 2022). The winter of 2018-2019 was unusual however, because part of the migration was stopped by a rain-on-snow event on the East side of Prince Albert Sound (Kuptana and Klengenberg 2022). These observations are consistent with the 2020 population survey for Dolphin and Union caribou, as described in *Population.* The survey recorded a low number of caribou aggregating on the coastline as well as caribou farther north than expected on Victoria Island, suggesting that fewer individuals were preparing to make the crossing at the time of the survey (Campbell *et al.* 2021).

Spring migration

As spring approaches and temperatures start to rise near the end of March, Dolphin and Union caribou move towards the northern shores of the mainland and the first groups start to appear on the coast and on Melbourne Island (Bates 2006). In 1998-1999, interviewees discussed the northward migration of Dolphin and Union caribou in the spring, indicating that they leave the Brown Sound area in April. The caribou travel "from Arctic Sound and Rideout Island towards Elu Inlet then across to Cambridge Bay" on their migration to Victoria Island (Archie Komak, [Ikaluktuuttiak] *in* Thorpe *et al.* 2001: 94). Inuit interviewees recorded caribou crossing the Coronation Gulf west of Bathurst Inlet, between the Kent Peninsula and Victoria Island north of Bathurst Inlet, and from Kent Peninsula to near Cambridge Bay (Thorpe *et al.* 2001). Most of the Dolphin and Union caribou move back to Victoria Island in April and May, when cows can be seen crossing from the mainland. However, not all caribou make it to Victoria Island in the spring before the sea ice melts (Hanke *et al.*, in review). These caribou spend their summers on the mainland and join the rest of the group when they migration south for the winter (Hanke *et al.* in review). Some harvesters said this behaviour is normal and has happened in the past while others said that more caribou are being left on the mainland today (2018) than previous years (Hanke *et al.* in review). For the caribou that made it to Victoria Island, some will cross the strong spring sea ice on Prince Albert Sound and Minto Inlet during their spring northward migration; they do not cross those waters in the fall when the ice is weaker (ENR unpubl. data 2011-2013, Hanke and WMAC (NWT) in prep., Kuptana and Klengenberg 2022). Ulukhaktok hunters at the end of Prince Albert Sound near the Kuuk River saw Dolphin and Union caribou migrating north in the spring of 2020 (Dolphin and Union User-to-User Group 2019-2022). Caribou may disperse across the landscape including over rough areas as they migrate north:

They do not always go in one direction; they are all over the land around here and here. The land is full of caribou. They would walk in all directions (this may apply to Dolphin and Union caribou and/or barren-ground caribou) (May Algona [Kugluktuk] in Thorpe et al. 2001: 90).

[A]round the beginning of June... the Dolphin and Union herd has by this time moved into the interior of the island north of Ferguson Lake for calving and is scattered widely. (Bates 2006).

Changes in Distribution

Historically, Dolphin and Union caribou crossed the sea ice on Dolphin and Union Strait twice a year during their northward spring migration to Victoria Island and southward fall migration to the mainland Nunavut and NWT (Survey of Elders compiled by Albert Elias *in* Gunn 2005: Appendix A). The main migratory route has since shifted east, and the caribou now migrate across Coronation Gulf, Dease Strait, and Queen Maud Gulf (COSEWIC 2017, GNWT and GN 2018, Hanke *et al.* 2021). Changes in migration seem connected to changing climate. Delays in sea ice formation were reported by Kugluktukmiut and Ekaluktutiak harvesters in 2003 to cause changes in caribou staging and migrating behaviour. In years with later sea ice formation, the lack of ice presents a barrier to migration, resulting in Dolphin and Union caribou congregating in the southern Victoria Island staging area and moving further east while they wait for the sea ice to form (Hanke *et al.* 2021). Kugluktukmiut and Ekaluktutiak interviewees reported that long delays cause some caribou to abandon migrating behaviour altogether and remain on the island (Hanke *et al.* 2021). Ulukhaktok residents similarly report that delays in the timing of freeze up cause caribou to migrate later (WMAC (NWT) 2020). There are areas Dolphin and Union caribou used to cross in the Dolphin and Union Strait along the mainland coast west of Bernard Harbour and along the southern coast of Victoria Island between Lady Franklin Point and Ross Point (Figure 8; Kuptana 2023). These areas no longer completely freeze due to currents as a result of climate change, which prevent caribou from safely crossing (Kuptana 2023). Unusual conditions, such as rain-on-snow events on the migration route, have caused caribou to change or halt their southern migration – this was observed in 2018-2019 and 2022-2023 (Kuptana and Klengenberg 2022; Kuptana 2023).

Changes to vegetation may also cause a shift in migration patterns; however, there is uncertainty among local communities around this phenomenon. Dolphin and Union caribou will shift their migration route due to insects, changes to spring melt, ice thickness, water levels, temperature, and other weather factors such as heat and wind (Bates 2006, Thorpe *et al.* 2001).

Kugluktukmiut saw their most caribou around the 1975-1990s and Ekaluktutiakmiut (Cambridge Bay) saw their most caribou around the 1990s-2000s (Hanke *et al.* 2022). In the 1970s, the Dolphin and Union caribou did not pass close to Cambridge Bay (*Ekaluktutiak)*, but in the 1980s hunters could find them about 30 miles (48 km) from the community (Thorpe *et al.* 2001). They moved even closer in the late 1980s, and continued to migrate closer to the community, a small amount every year (Thorpe *et al.* 2001). In the 2000s, the Dolphin and Union caribou passed by Cambridge Bay (*Ekaluktutiak)* twice a year and were hunted regularly by Inuit from that community (Bates 2007).

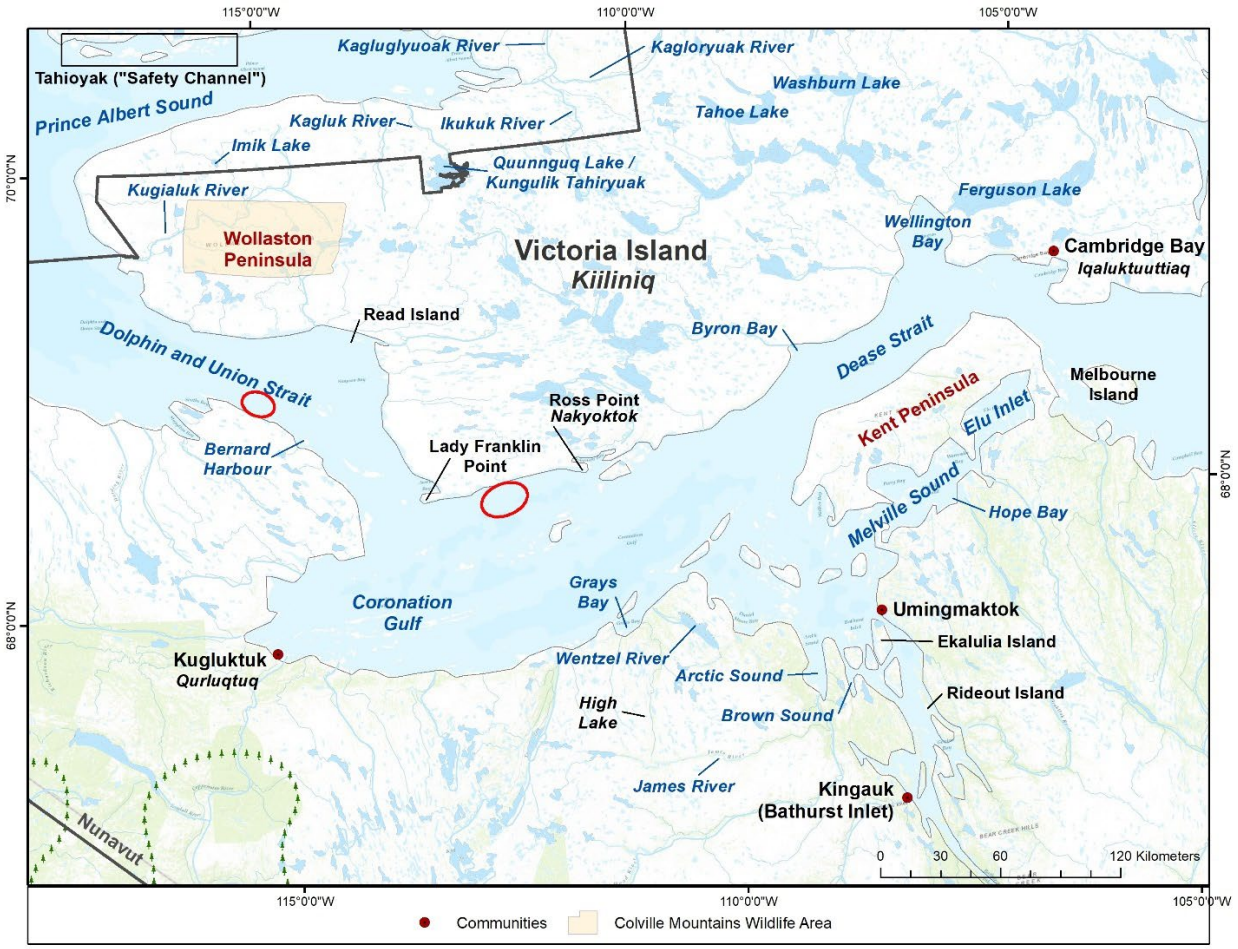

Figure 8. Areas identified as no longer completely freezing due to currents as a result of climate change, which prevent caribou from safely crossing (Kuptana 2023).

Dolphin and Union caribou (and barren-ground caribou) will also "shift their migration routes once they "eat up" most of the tundra along their traditional routes" resulting in lower-quality vegetation (Thorpe *et al.* 2001). The caribou will also trample and consume the food available in one area and will seek other areas for calving. Community knowledge in Nunavut largely agrees that it can take 50-100 years for vegetation damaged during caribou migrations to recover (Leclerc pers. comm. 2013).

Kugluktukmiut knowledge keepers have observed some Dolphin and Union caribou remaining on the mainland in the summer months more frequently than observed in the past. The sea ice between Victoria Island and the mainland is thawing earlier, preventing all caribou from making the crossing. Caribou are migrating further south and are taking more time to return to the mainland shoreline (Hanke and Kutz 2020). Smaller-scale changes in calving areas, migration, and wintering areas are discussed further in *Habitat* and *Population* sections below.

Inuit recognize the importance of the caribou leading the migration. Several interviewees indicated that the leader will be a cow without a calf (Thorpe *et al.* 2001). There are different beliefs about whether the leaders of a group of caribou should be harvested as some people say the leading caribou are the migration knowledge keepers: "We were told not to shoot the leader of the caribou, the matriarch, or else they could not continue on their journey. They are following the leader," (Joseph Niptanatiak *in* Golder 2003). However, some Inuit hunters try to harvest a whole group of migrating caribou know to shoot the leader first. The remaining caribou will stop, or scatter in all directions, instead of continuing their route (Thorpe *et al.* 2001).

Search Effort and Harvest Patterns

Search effort is a way of describing how well people know where the animals are. How search effort is determined varies. With Indigenous and community knowledge, search effort has a longer timeframe (many generations) and smaller spatial coverage (local, seasonal hunting areas) compared to aerial surveys used by biologists (COSEWIC 2018). Search effort may be approximated by hunters' efforts to locate Dolphin and Union caribou, either through visits to caribou harvesting areas or other harvesting areas, locations relative to camps or other landmarks, and how frequently caribou are seen.

Harvesting Dolphin and Union caribou remains an important practice among Inuvialuit and Inuit communities. Today, Dolphin and Union caribou is harvested exclusively by Indigenous groups of the Northwest Territories and Nunavut. Resident and guided harvest for Dolphin and Union caribou is currently closed (GNWT and GN 2021).

Ulukhaktok residents traditionally harvest Dolphin and Union caribou during the spring and fall migrations and opportunistically during the winter and summer months (Kuptana 2022). Their harvesting primarily occurs during the fall migration past Prince Albert Sound; however, some harvesters have camps further north around Minto Inlet where Dolphin and Union caribou also spend time or migrate through (Kuptana 2022). Paulatuk residents harvest Dolphin and Union caribou only rarely and opportunistically during the winter east of the community on the mainland (User-to-User Group 2022). Kugluktuk residents traditionally harvest Dolphin and Union caribou in the winter and spring on the mainland and during the fall migration on southwest Victoria Island (Bates 2006, GNWT and GN 2018, Hanke *et al.* in review). Kugluktuk's primary harvest is in April and May when Dolphin and Union caribou are heading north to the mainland coast (Bates 2006). Cambridge Bay residents harvest Dolphin and Union caribou in all seasons (GNWT and GN 2018). In the spring, some harvesters from this community may cross to the mainland to catch caribou as they migrate back to Victoria Island (GNWT and GN 2018). Most Cambridge Bay harvesting takes place in the fall and winter, during their southward migration

when caribou gather at the coast to wait for the sea ice to form (October-November) and on the mainland at their overwintering grounds (Figure 6; Bates 2006).

Attention now becomes focused ... on the coast of the island, especially around Wellington Bay. This deep bite into the island's southern shoreline, and the Surrey River which flows into it, give access for boats a good distance inland, allowing interception of the migrating herds. While this journey is much easier than that across the straits to the mainland, the arrival of the Dolphin and Union herd coincides with a turn for the worse in the weather. Nonetheless, at this time of year this area is the most frequently visited coast by boats from Cambridge Bay and it can seem as though much of the community is out patrolling the shore (Bates 2006).

The number of animals harvested annually varies from year to year, depending on the distribution and accessibility to communities (Second Joint Meeting 2016 in GNWT and GN 2018, Hanke *et al.*, in review). Additionally, the types of animals (bulls, cows) vary seasonally alongside seasonal health and life stage changes in caribou. Harvesters do not take bulls during and after the rut because they are no longer healthy and the meat stinks (Hanke *et al.* 2021).

My father and mother used to do a lot of hunting. In late summer, people used to harvest caribou when the fur was nice and thick. People would move to the narrow channels and people would wait for the caribou to cross. They would hunt for their food and for their clothing. We survived... (Lena Kamoayok [Umingmaktok] in Golder 2003: 42).

We take our bulls in, August, September. When they're at their prime. You know, and then we leave them alone... and then we take the females in winter. The one that don't have no calves. Females. First year that, never been under stress before! Never had a... carry the, fetus before. Those are the best tasting. And we know those. And you can tell... which ones, under stress and, you know, which ones have calves, no calf, we can tell, you know. And that's where hunter education comes in. (Jorgen Bolt [Kugluktuk] in Hanke et al., in review)

Overland all-terrain vehicle (ATV) travel is more limited than snowmobile travel, and the summer terrain is more difficult to traverse, so summer months are a comparatively quiet period in terms of caribou hunting. Caribou tend to be more scattered in the summer, possibly making them more difficult to encounter than they are on their regular migration routes (Bates 2006). However, some young people from Ulukhaktok travel to Kuuk River and Tahiryuak Lake by ATV in the summer and early fall, where they often see female caribou and calves (WMAC (NWT) 2019). Meat is less preferred in the summer, and more difficult to preserve and travel with when it cannot freeze. Yet some summer hunters may select animals for their hides as well as for their meat since summer hides, with their finer hair, are desirable for use in mukluks (Carpenter pers. comm. *in* SARC 2013: 25). Sometimes calves are also selected for their hides.

Harvesters plan their hunt according to seasonal cycles in caribou movements, along with knowledge of the land how caribou move across it (Bates 2006, Hanke *et al.* in review). A common practice is to drive to a specific area, sometimes a family camp or community cabin, and hunt

caribou when they are seen (Bates 2006; Hanke *et al.* in review). The fall aggregation along the south coast of Victoria Island increases a hunter's likelihood of finding and harvesting Dolphin and Union caribou (Figure 7; Bates 2006). While Inuvialuit and Inuit hunters have camps along migration routes that they use to hunt, they do not generally hunt at places where caribou calve. Calving areas and the calving period are considered important to caribou, and avoidance is culturally appropriate. However, in the past, some Inuit may have hunted at calving areas for calf skins to make clothing (Dumond pers. comm. *in* SARC 2013: 28, Thorpe *et al.* 2001).

Harvesting Rates

Harvesting Rates in the NWT

Residents of Ulukhaktok shift towards harvesting Dolphin and Union caribou in the spring and fall from the Prince Albert Sound area during their migrations and when Peary caribou near Minto Inlet are scarce (OHTC *et al.* 2016). Ulukhaktok residents began relying more on Dolphin and Union caribou around the 1980s (when Peary caribou numbers began declining) until approximately the mid-1990s (when the Dolphin and Union caribou numbers began declining) (Hanke and WMAC (NWT), in prep., OHTC 2021b). One Ulukhaktok resident recalls how the community used to rely on harvesting Dolphin and Union caribou until approximately the mid-1990s when the population started to decline, noting that upwards of 200-300 caribou were harvested per year during the period from approximately the 1980s to mid 1990s (OHTC 2021b). An estimated 40-400 Dolphin and Union caribou were harvested per year out of Ulukhaktok in the Prince Albert Sound area of Victoria Island between 1991 and 2010 (J. Nagy unpubl. data 1998 and ENR 2011 *in* SARC 2013). One knowledge keeper noted that, in the 80s and 90s when the Dolphin and Union caribou population was high, harvest practices were less influenced by cultural practices and elders' teachings than they are now, and harvesters would take entire groups without leaving some to grow; this type of harvesting may have impacted the health of the overall population (Klengenberg 2023).

Harvesting rates in the Prince Albert Sound area after 2010 are not reported in the most recent harvest data from ENR (2021). The 2018 Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study[2] reports a total harvest of 109 Dolphin and Union

[2] The Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study was a systematic and comprehensive effort to collect harvest data from Inuvialuit communities. Studies conducted in 2013, 2016, and 2017 did not separate out the caribou harvest into the Peary, Dolphin and Union, and barren ground caribou. Therefore, these findings have not been included in the report.

caribou by active harvesters from Paulatuk and Ulukhaktok that year, including 98 caribou harvested by Ulukhaktok during the summer and fall of 2018 and a further 11 individuals harvested opportunistically by Paulatuk during the winter (Joint Secretariat 2018). The harvest from Paulatuk in 2018 was unusually high, as harvesters travelled far east that year to find caribou.

In 2021, the Olokhaktomiut Hunters and Trappers Organization requested their members to voluntarily close their smaller spring harvest from April 15 to July 15 to allow pregnant cows to migrate to their calving grounds unbothered and to have a chance to calve (OHTC 2021a). They also placed a voluntary community maximum harvest of 50 caribou per year (OHTC 2021a). As reported to the Dolphin and Union user-to-user meetings, the 2021 and 2022 harvests did not approach or exceed the community limit of 50, because Dolphin and Union caribou were scarce in the area those years (User-to-User Group 2022). In order to track the voluntary harvest limit, WMAC (NWT), with support from the OHTC recommended ENR implement mandatory sampling and reporting for all caribou harvested on Victoria Island through the OHTC by-laws in the *Wildlife Act* (OHTC 2021a, WMAC (NWT) 2021b). If implemented, NWT co-management partners will have exact harvest information of Dolphin and Union range, with the exception of the opportunistic harvest from Paulatuk.

Harvesting Rates in Nunavut

Harvest levels and the overall harvest rate for Dolphin and Union caribou in Nunavut were relatively unknown until recent years (Figure 9). In Dumond's (2007) workshop, it was suggested that caribou harvest levels in Kugluktuk may have been higher in the 1950s when caribou meat was used to feed dog teams. However, the community was also smaller at that time, so trends in harvesting patterns over that period have not been confirmed (Dumond 2007). The community of Cambridge Bay harvests Dolphin and Union caribou in all seasons, and in the spring, some hunters from the community may cross the to the mainland to hunt caribou as they migrate back to Victoria Island (GNWT and GN 2018). In the 1990s, the communities of Cambridge Bay, Kugluktuk, Umingmaktok, and Bathurst Inlet[3] were known to harvest Dolphin and Union caribou on the mainland during the winter months (Nishi 2000). At this time, Nunavut hunters may have taken between five and 70 caribou per year for their own use and for their families' needs

[3] In the past, the herd was also harvested in the winter and spring by the communities of Umingmaktok and Kingauk/Qinqaut (formerly Bathurst Inlet.). These communities are no longer permanent settlements. Residents have primarily moved to Cambridge Bay *(Ekaluktutiak/Iqaluktuuttiaq/Ikaluktuuttiak)* and Kugluktuk (*Qurluqtuq*) (Kuptana pers. comm. with Nathoo, 2022).

(Thorpe *et al.* 2001). There have been some concerns among biologists and resource managers that this harvest, when added to the harvest by Ulukhaktok hunters, would result in a risk of overharvest for Dolphin and Union caribou. With an extrapolated harvest of 2,000-3,000 caribou (based on the reported harvest from the Kitikmeot Harvest Study (Gunn *et al.* 1986), and the proportion of Arctic Island caribou reported in recent harvest studies (see Gunn and Nishi 1998), the current rate of harvest with respect to the October 1997 population estimate is high (Gunn *et al.* 1986 in Nishi and Gunn 2004). In the late 1990s, Kugluktuk residents suggested that the harvest of Dolphin and Union caribou might be too high, and that they might have to stop hunting during migrations and avoid pregnant cows (ENR 1998).

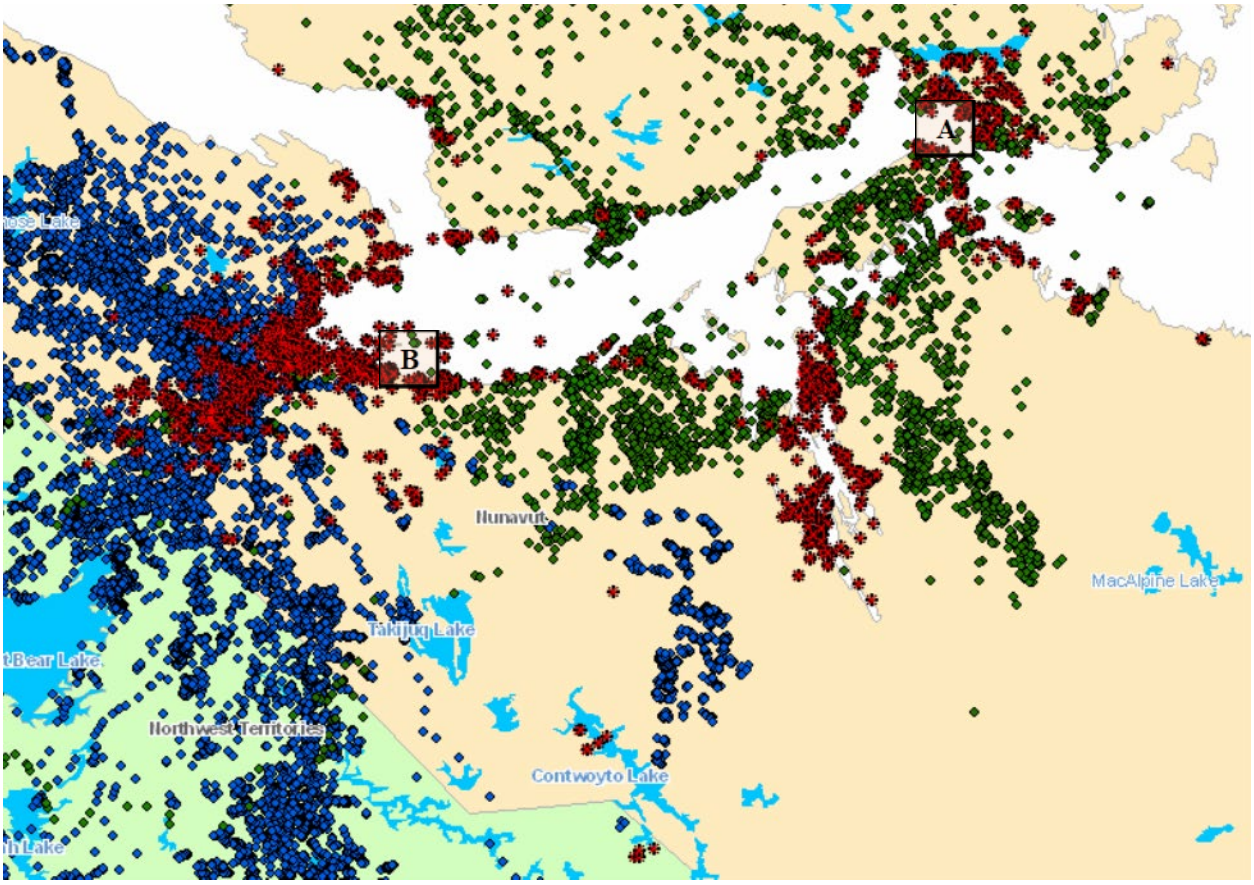

Figure 9. Caribou harvest locations (red dots) based on the Nunavut Wildlife Harvest Study (1996-2001). The blue dots are the collar locations of the Bluenose-East barren-ground caribou herd (1996-2006) and the green dots are the collar locations for the Dolphin and Union caribou (2002-2004) (Dumond 2007, with permission). A = Wellington Bay. B = Tree River.

In 2007, some Kugluktuk residents thought that the focus on bulls by sport hunters may be negatively impacting the caribou, and others further thought that a more balanced hunting approach was warranted (Dumond 2007, Hanke *et al.* 2020). In June 2018, the Nunavut Wildlife Management Board established an annual harvesting limit of 35 tags for non-Inuit sport hunters on Dolphin and Union caribou through the Nunavut Agreement Section 5.6.16 (14 June 2018,

Letter to Minister Savikataaq from Chairperson Daniel Shewchuk, Nunavut Wildlife Management Board). In September 2020, the Government of Nunavut implemented a Total Allowable Harvest of 42 caribou (1% of the 2018 abundance point estimate) through the Nunavut Agreement Section 5.3.24 interim decision (4 September 2020, Letter to Chairperson Daniel Shewchuk from Minister Savikataaq). In December 2020, the Nunavut Wildlife Management Board established a Total Allowable Harvest for Dolphin and Union caribou of 105 caribou (2.5% of the 2018 abundance point estimate) through the Nunavut Agreement Sections 5.6.16 and 5.3.3(a) (10 December 2020, Letter to Minister Savikataaq from Chairperson Daniel Shewchuk, Nunavut Wildlife Management Board). Harvest of Dolphin and Union caribou remains under a Total Allowable Harvest of 105 caribou in Nunavut (17 January 2022, Letter to Minister Akeeagok from Chairperson Daniel Shewchuk, Nunavut Wildlife Management Board).

When their numbers were higher and they were very healthy, [I'd harvest] anywhere from 15 to 20 [DU caribou], no higher. Last year was the first year I didn't shoot one. Since I've seen the number going down steadily... I haven't harvested over 10 [DU caribou] in the last 10 years... I've been avoiding hunting DU caribou... I saw them, but I didn't shoot them. Why? I was brought up by my parents and my grandparents to manage and help sustain wildlife. We were told that if you know that they've not in a healthy state, don't harvest them... because they'll come back... so I also heed and listen to those words and just abide by them" -Elder Allen Niptanatiak (Hanke et al., in review).

Key Habitats

Habitat Requirements

In some places [...], we know where the place where we used to see caribou [and] thought it was a good feeding ground. If there's not much snow in that area, then we, that's where we look for caribou. We try to find a place where we hunt caribou and we know the caribou are going to be there because every year the caribou, you know, another group goes towards being there before. Like I said, this used to be our best way of hunting caribou for the fall time. Now we haven't changed for 15 years. Now we're going to try to find out and see if any changes have been made from the animals, see if they're still at the same feeding ground or if there's more than there used to be or if the number has gone down. The only way we're going to find out is if we go up there this fall. But there's other places where we always hunt, where we used to see caribou. We know there's less caribou. As long as there's no snow or rain. If there's snow, it's okay, but if there's now rain on top of the snow, they can't smell through the ice. They got to have a good whiff for feeding. – Elder from Ulukhaktok in Hanke and WMAC (NWT) in prep.

The seasonal movements of Dolphin and Union caribou are broadly similar to those of Peary caribou on Victoria Island and barren-ground caribou on the mainland, in that the caribou move north in the spring to calve and south in the fall to over-winter (Survey of Elders compiled by Albert Elias *in* Gunn 2005: Appendix A; Thorpe *et al.* 2001).

Caribou habitat/harvesting areas are identified in the Olokhaktomiut Community Conservation Plan (OHTC *et al.* 2008, 2016). Two caribou habitat/harvesting areas are located south of Wynniatt Bay: a large area southeast of Glenelg Bay and an area along the Kuujjuak River (see Figure 3). Another large habitat area is located east of Prince Albert Sound, extending north to Tahiryuak (Tehek [sic]) Lake on the Kuuk River (Figure 3; OHTC *et al.* 2018). These areas are considered important year-round habitat for several species, including caribou. Important caribou habitat is located on Wollaston Peninsula south of Prince Albert Sound. The Hikongiyoitok Lake and Kugaluk River Region on Wollaston Peninsula is an important habitat/harvesting area for caribou, while the Colville Mountains Wildlife Area of Special Interest is identified as an important calving area for Dolphin and Union caribou. With the exception of the Colville Mountains Wildlife Area of Special Interest, the Olokhaktomiut Community Conservation Plan does not mention Dolphin and Union caribou specifically; however, the relevance of these areas to Dolphin and Union caribou can be inferred by their location (Figure 10; OHTC *et al.* 2008, 2016). Figure 10 represents some important Dolphin and Union caribou habitat, but it does not represent the full extent of Dolphin and Union caribou distribution in the NWT (Klengenberg 2023). The current and extended range of Dolphin and Union caribou based on Indigenous and Community knowledge from Ulukhaktok and Kugluktuk is shown in Figure 5. Knowledge holders described general areas they would expect to find caribou: low valleys where water collects and promotes vegetation growth, high hills in the winter where there is little snow and/or rocks, and shores where, in the winter, it is wetter and warmer than inland and gets less snow and, in the summer, it is cooler (, ENR unpubl. data 2011-2013, Hanke and WMAC (NWT) in prep.).

Seasonal and regional differences in availability and quality of vegetation contribute to the need for caribou to migrate. In general, caribou seek areas where high quality forage is available, and which provide relief from the elements, predation, difficult terrain, and insects. Favourites include “islands, shorelines, snow patches, valleys, and spots that are either damp or shaded” (Thorpe *et al.* 2001). If it’s too hot the plants dry up, forcing caribou to feed on food of low value; likewise, if there’s too much variation in the weather, the animals suffer (Dumond 2007). Low snow conditions allow caribou good access to winter food on Victoria Island. Such conditions were observed by Ulukhaktok harvesters on the island in the winter of 2018-2019 on the north shore of Prince Albert Sound, east of Ulukhaktok (WMAC (NWT) 2019).

Caribou seek easy terrain when migrating. They will take a route around rocky mountains instead of over them but will go over hilltops. They are known to travel along eskers which are like ‘roads’ and have the added benefit of the wind, which keeps insects away (Thorpe *et al.* 2001).

Dolphin and Union caribou travel across the sea ice to access other areas of their range for foraging. With later ice freeze-up and earlier spring thaw happening more frequently, Inuit

hunters have recorded hundreds of Dolphin and Union caribou dying after breaking through the ice (Gunn 2008; First Joint Meeting 2015 and Second Joint Meeting 2016 *in* COSEWIC 2017). Caribou may fall through ice and drown if the ice is not strong enough to hold their weight, as observed by residents of Cambridge Bay and Kugluktuk (Hanke *et al.* 2021, Panikkar and Lemmond 2020).

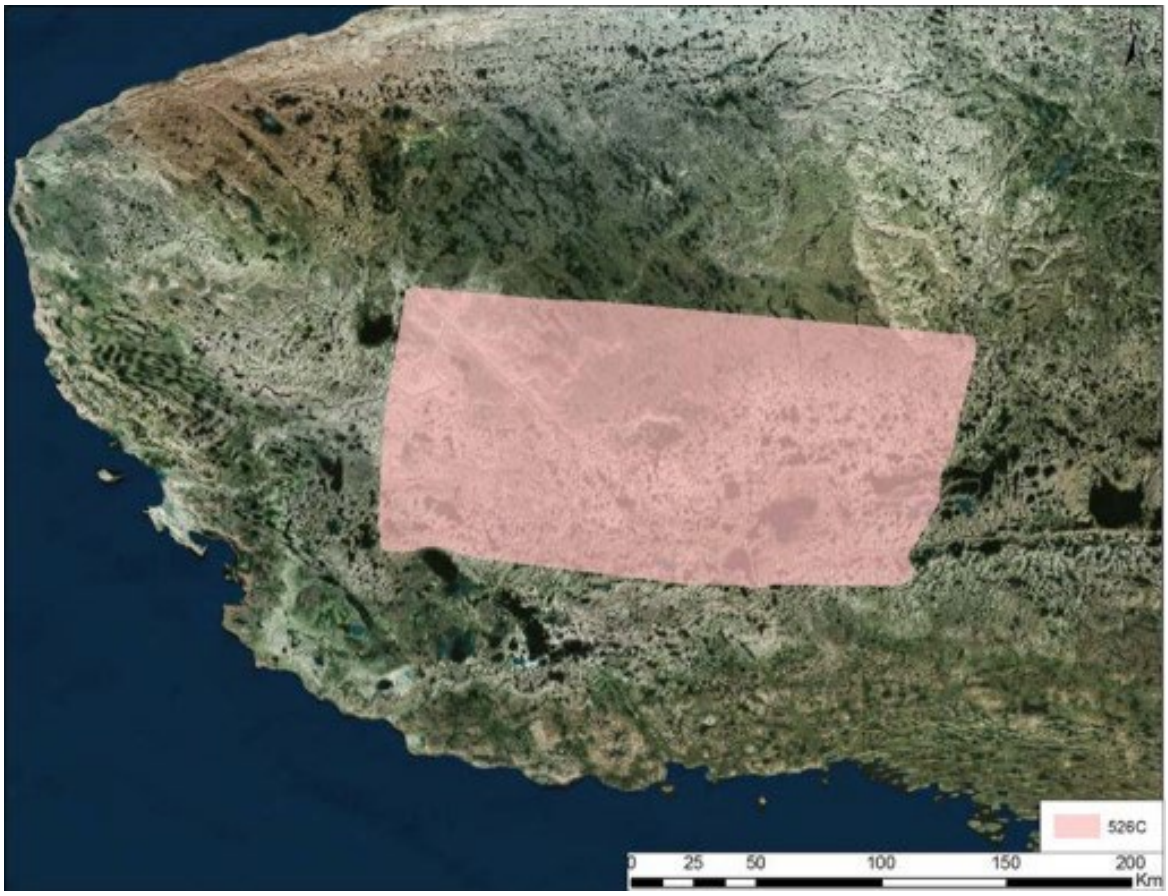

Figure 10. Map of Colville Mountains Wildlife Area of Special Interest, Wollaston Peninsula, Victoria Island, Nunavut. This region was identified as a Dolphin and Union caribou calving area (reproduced from OHTC *et al.* 2016).

Seasonal Habitat Requirements

Those high areas the caribou never leave those high areas. There're a few spots. Very high ground. Very high cliffs. Mountains. Hills. They never really left them. They like to stay out of the wind in these big high hills. These are in the winter and then in the summer you see caribou just anywhere in the summer. In the summer, what they look for is grassy areas. They [harvesters] know that the caribou is going to be where there's a lot of vegetation. Different high-ground, or in low areas, but high vegetation. This time of the year [September], what caribou are eating is lichen. (Elder from Ulukhaktok in ENR unpubl. data 2011-2013).

Spring

Caribou often seek patches of snow in the spring and lay in them to cool down. They avoid iced over ('sleet-covered') deep snow as it prevents them from accessing food. Caribou will also stay in areas where there is less snow when the snow is hard from very cold weather (Thorpe *et al.* 2001). They continue to eat lichen in the spring (OHTC *et al.* 2008, Thorpe *et al.* 2001).

During the spring migration, certain coastal areas are important for "staging" (i.e., areas where Dolphin and Union caribou concentrate to feed and rest). It is suggested that the caribou use these areas to feed intensively before crossing the sea ice to Victoria Island (Gunn *et al.* 1997). The Ekaluktutiak Hunters and Trappers Association in Cambridge Bay reported that Melbourne Island is one important staging area in early spring for caribou migrating from the mainland back to Victoria Island (Gunn *et al.* 1997).

Although little is known about the habitat requirements for calving areas, caribou likely choose large flat areas for calving to facilitate effective detection of predators (Thorpe *et al.* 2001). They avoid shaded areas and areas of high elevation (Thorpe *et al.* 2001). They select areas with less snow and ice, although patches of snow provide relief from the heat (Thorpe *et al.* 2001). Although a flat open area may be chosen largely for safety, it should also have a good supply of food for the newborn calf and its mother, who has high nutritional needs (Thorpe *et al.* 2001). For this reason, caribou may seek areas exposed to sunlight earlier than other areas. Cottongrass may be the first vegetation consumed by calves after their mothers' milk (Thorpe *et al.* 2001). Caribou will use the same general region for calving year after year, but the specific location shifts over time based on many factors. The condition of the tundra may impact where cows choose to calve; over-grazed and trampled areas might be avoided. Some Inuit interviewees indicated that caribou return to the area where they were born to calve (Thorpe *et al.* 2001).

Kugluktuk residents felt that there is not enough information available on calving locations of Dolphin and Union caribou (ENR 1998). Most Inuit hunters in Nunavut have not seen calving grounds for several reasons: they are generally far from the community, calving happens when snow conditions are not good for travel, and many Inuit feel that calving caribou should be left alone. Ulukhaktok, on the other hand, is very close to caribou calving grounds, Inuvialuit harvesters are very protective of those areas, which they have shown by consistently opposing development and, more recently, closing the spring harvest to protect pregnant and calving caribou (Klengenberg 2023). Unlike barren-ground caribou, Dolphin and Union caribou do not gather to calve in clearly identifiable calving grounds, but community members in Ulukhaktok know that there are preferred areas on the land to calve (Nathoo, pers. comm. 2022). Because of their proximity to the calving areas, Inuvialuit harvesters from Ulukhaktok commonly observe calving caribou (Klengenberg 2023).

The Olokhaktomiut Community Conservation Plan (2008, 2016) identifies the Colville Mountains Wildlife Area of Special Interest as an important calving area for Dolphin and Union caribou (Figure 10). This area overlaps with a portion of the Hikongiyoitok Lake and Kugaluk River region, which spans Wollaston Peninsula south of Prince Albert Sound and provides important caribou habitat and hunting grounds for the community of Ulukhaktok (OHTC *et al.* 2016). Some Dolphin and Union caribou are known to calve at Tahiryuak Lake northeast of Prince Albert Sound (WMAC-NWT 2019).

Summer

Calves must grow quickly and store fat for the coming winter, so high-quality forage is important at this time of year (Thorpe *et al.* 2001). Caribou are known to seek cooler and moist areas in the summer, including shorelines but also the wet areas at the base of hills or marshy areas. They feed on the lush vegetation in these areas (Thorpe *et al.* 2001). Caribou prefer shorelines and islands for several reasons. High winds provide escape from insects and the summer heat. Caribou may also go into the water to escape heat and predators and can be seen standing in water and swimming in lakes. They use ocean and lake shorelines to escape the heat in June and July. The moist soil provides large and lush vegetation used for forage and shade. In the summer evenings, caribou may walk along shorelines and graze. They graze during the day and lay down at night. Shorelines provide protection from wolves in particular at night, so caribou will head to shorelines during the nighttime (Thorpe *et al.* 2001). Caribou may also go to the ocean shore to lick salt. Occasionally they eat seaweed (Thorpe *et al.* 2001).

Fall and Winter

Hunters frequently report variability in use of winter ranges (Gunn 2005). They move or 'roam' around during the winter months and are not known to stay in one location for long periods of time (Thorpe *et al.* 2001). Caribou are also observed on higher ground during the winter, where there is less snow and more rocks (Thorpe Consulting Services 2019).

Look for caribou where the "water runs down, and you know the area where the water usually settles is where the growth of the plants are. And in the wintertime, more of the high places where there's less snow than, that's where they'd be." (Elder from Ulukhaktok in ENR unpubl. data 2011-2013).

Habitat Trends and Fragmentation

Inuit hunters interviewed by Thorpe *et al.* (2001) identified some changes in the winter and summer habitat of the Dolphin and Union caribou. These changes relate to climate warming since the 1970s which has promoted plant growth on the tundra. The hunters interviewed by Thorpe *et al.* (2001) indicated that better forage is increasingly available on Victoria Island and some of these hunters also note an increase in caribou numbers, with Dolphin and Union caribou

seen as increasingly healthy, even as individuals, in the late 1990s (Thorpe *et al.* 2001). In contrast, in records provided by Environment and Natural Resources, hunters in Kugluktuk noted that grass was quite sparse on the Dolphin and Union summer range (ENR 1998).

Table 2 summarizes Inuit observations of climate change impacts in the two ecological regions relevant to Dolphin and Union caribou, as compiled from various sources by Golder (2003). In general, Inuit state that earlier spring melt and much later fall freeze-up are causing longer summers, particularly since the mid-1990s. Temperatures are also warmer overall. Sea ice and other ice crossings may have changed: leads in the sea ice open earlier, ice is thinner overall due to warmer temperatures and shorter winters, and summer water levels are lower. Lower water levels cause creeks and lakes to dry out in late summer, and shorelines to drop, exposing new areas. Early spring melts and increased snow can cause changes in break-up; streams and rivers may open earlier, and the current may be very strong, sometimes carrying ice. Dolphin and Union caribou have benefitted from some changes to the landscape, such as an increase in quality and quantity of tundra forage, but they have also suffered from changes in sea ice conditions and variable freeze/thaw cycles in spring and fall (Thorpe *et al.* 2001).

In the Wildlife Management Advisory Council (NWT) (WMAC (NWT)) co-management plan for Minto Inlet, several gaps in information were noted, including: the condition of seasonal ranges for caribou; how year to year changes in winter conditions affect the availability of ranges for caribou and muskoxen; and whether caribou and muskoxen compete for the food that is available (WMAC (NWT) 1997). While this document focused primarily on Minto Inlet Peary caribou, these information gaps likely apply to Dolphin and Union caribou also.

Table 2. Documented Inuit knowledge of climate change in the Kitikmeot region (reproduced from Golder 2003 with permission).

Ecological Region	Observations	Source cited in Golder (2003)
Mainland	• Profound changes in climate, particularly since the 1980s • Longer period of summer-like conditions (late fall freeze-up) and shorter period of winter-like conditions (early spring break-up) • Sporadic freeze-thaw cycles in the spring • Spring melt happens quickly and leads in the sea ice open much earlier • Ice thinning (both lake and sea ice) • Not as much snow • Lower water levels (lakes, rivers and sea ice) • Temperatures not as cold in the winter but much warmer in the summer • Shifts in caribou migrations • Changes in flora and fauna (increase in species diversity and abundance; new bird species being seen; changes in ranges of grizzly bears, polar bears, caribou, etc.) • Changes in weather are more variable and unpredictable	Nunavut Tunngavik Incorporated (NTI). 2001. Proceedings from the Elders' Conference on Climate Change 2001. March 29th-31st, Cambridge Bay, NU. Thorpe *et al.* 2001
Arctic Island	• Sea ice is freezing later and breaking up sooner than in the past • Sea ice is not reaching the thickness it once did • Icebergs have disappeared from the ocean north of King William Island • Multi-year ice has been drastically reduced • Snow accumulation is later in the season and the yearly accumulation has declined • The snowpack has become harder • Fresh water ice is freezing later and breaking up earlier • Fresh water ice is not reaching the thickness it once did • The prevailing wind has shifted and the orientation of snowdrifts has changed • Water levels in rivers have gone down • More rough ice • Fewer icebergs • Less multi-year ice	Atatahak, G. And V. Banci. 2001. Traditional Knowledge Polar Bear Report. Government of Nunavut, Department of Sustainable Development. Kugluktuk, NU. Keith, D., J Arqviq, L. Kamookak, and J. Ameralik. 1992. Inuit Qaujimaningit Nanurnat: Inuit Knowledge of Polar Bears. Unpublished report for the Gjoa Haven Hunters and Trappers Organization.

POPULATION

Abundance, Population Dynamics, and Changes in Population Size

Population surveys of Dolphin and Union caribou led by the Government of Nunavut were conducted in 1997, 2007, 2015, and 2018. These surveys followed a "coastal survey methodology" originally developed by Nishi (2004), based on hunter observations and Inuit Qaujimajatuqangit (IQ) regarding Dolphin and Union caribou. In preparation for migration to the mainland, the majority of Dolphin and Union caribou are known to gather on the southern coastline of Victoria Island in fall, making this the ideal time and location to survey the population along a narrow band of coastline (Leclerc and Boulanger 2018). In 2020, due to recent local knowledge indicating that migration patterns were changing, caribou were congregating less on the coast, and some caribou were not migrating across the sea ice from the mainland or Island, different survey methods were used. Results of the 2018 population survey, historical and current collar data (including a spatial assessment of historical collar data), and local ICK and IQ were used to develop population abundance strata over a larger area of Victoria Island and the mainland (Figure 11; Campbell *et al.* 2021). Community members from Ekaluktutiak HTO, Kugluktuk HTO, and Olokhaktomiut HTC provided input on the survey strata and participated in the 2020 survey.

The population estimate from the 2018 survey was 4,105 caribou and the estimate from the 2020 survey was 3,815 caribou. Although the 2020 population estimate is not significantly different from the 2018 estimate, it represents a decline in numbers from the surveys conducted in 1997 (34,558), 2007 (27,787), and 2015 (18,413), respectively (Leclerc and Boulanger 2020). Results of the 2020 survey also indicate that although caribou aggregate on the coastline in preparation for the fall migration, some (~30%) Dolphin and Union caribou are observed inland beyond the historically surveyed coastal areas (Figure 11). This finding aligns with the IQ of participating communities that during population lows, Dolphin and Union caribou ceases to migrate to the mainland (Campbell *et al.* 2021; Hanke *et al.* 2021). This represents a shift in migratory behaviour for Dolphin and Union caribou. Further investigation is needed to understand factors that influence Dolphin and Union caribou migration to the mainland (e.g., declines, low population size, sea ice conditions, late freeze up, and weather events) and how the population can be effectively managed into the future (Campbell *et al.* 2021).

When discussing population trends in 1998-1999, Inuit had differing understandings of whether caribou numbers were increasing or decreasing at that time.

The question of whether caribou numbers are increasing or decreasing is not easy to answer. It depends on people's perception of change as well as references to particular time frames or

seasons. Some people believe that the population is generally increasing. At the same time, many others say that there are increases in certain types of caribou fatalities, most of which are directly linked to climatic influences (Thorpe et al. 2001).

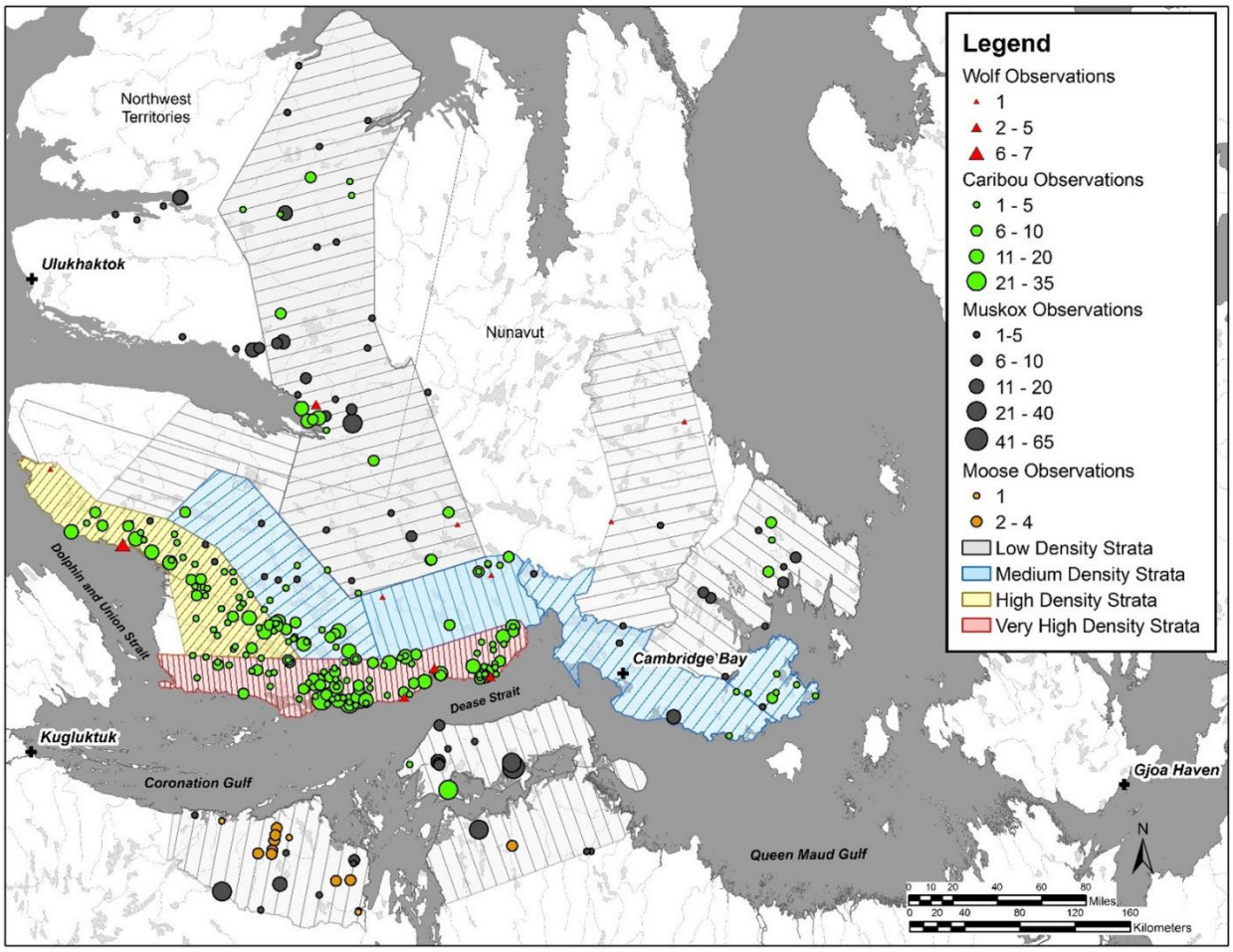

Figure 11. Map depicting caribou (green dots), wolf (red dots), muskox (black dots), and moose (brown dots) observations recorded during the Dolphin and Union fall 2020 abundance survey in the NWT and Nunavut (Campbell *et al.* 2021).

Other people said the caribou seemed to be declining or possibly moving east due to climate change, although other interviewees also described fewer caribou seen as possibly relating to changes in migration path (Thorpe *et al.* 2001). However, reports on caribou abundance seem closely tied to changes in caribou distribution (Hanke *et al.* 2020, 2021, in review). This section on *Population* should be considered and interpreted alongside the section on *Distribution*. Knowledge keeper observations apply to areas of observation their community's hunting grounds.

Cambridge Bay hunters indicated that there appeared to be fewer bulls available to hunt during the fall in the late 1990s (ENR 1998). Cambridge Bay residents observed fewer calves and yearlings in 2014 compared to the 1990s. Residents observed an increase in the proportion of

adults during the same time period, with some residents observing an increase in the number of adult female caribou (Tomaselli *et al.* 2018b). Some residents of Cambridge Bay have reported an increase in caribou deaths attributed to predation in 2014 compared to the 1990s (Tomaselli *et al.* 2018b). However, information regarding the timing, age class (e.g., young, adults), or estimated total number of deaths attributed to predation was not reported in this source.

Studies with residents of Kugluktuk and Cambridge Bay suggest the population of Dolphin and Union caribou, near their communities, reached a peak in the 1980s and 1990s respectively, and declined until the mid-2010s (Figure 12; Hanke and Kutz 2020; Tomaselli *et al.* 2018b). Harvesters interviewed in Cambridge Bay observed approximately 80% fewer caribou in 2014 compared to the 1990s, including a decrease in the number of calves and yearlings. Residents attributed the decrease in population to several factors, including an increase in predators, changes in migratory routes, human disturbance, environmental change, and declining health condition of caribou (Tomaselli *et al.* 2018b).

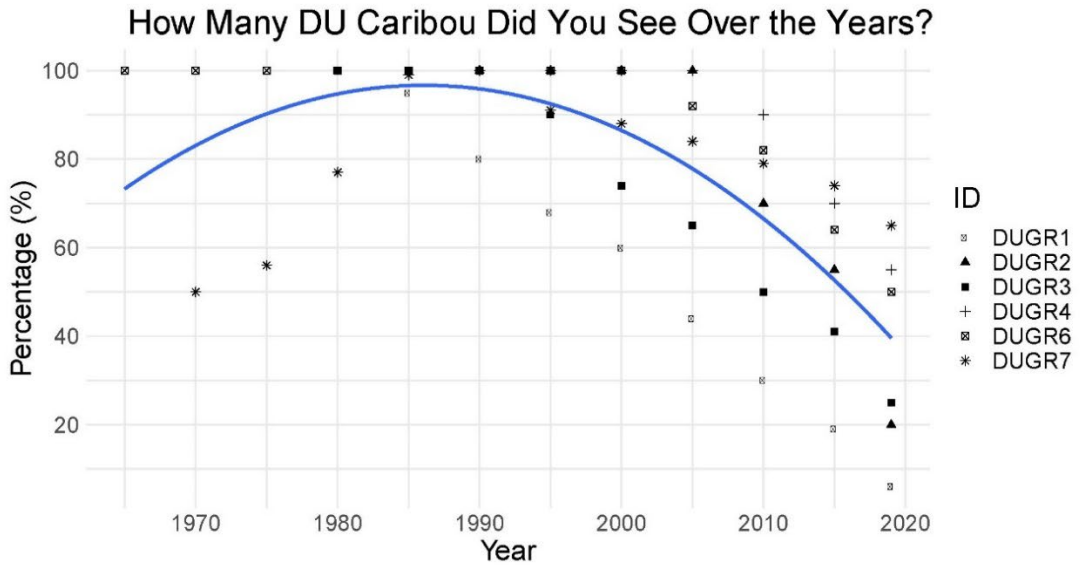

Figure 12. Graph illustrating the collective Dolphin and Union caribou abundance trend between 1960 and 2020, based on Kugluktukmiut knowledge. The list of participant IDs represents each focus group that participated in a proportional piling exercise. The blue line represents a smoothed quadratic linear model that was reviewed and accepted during feedback sessions in 2020 with Kugluktukmiut as representing the Dolphin and Union caribou abundance trend from a Kugluktukmiut perspective (Hanke and Kutz 2020).

In 2019, Ulukhaktok residents noted that Dolphin and Union caribou were closer to the community and more accessible to harvesters (WMAC (NWT) 2019). However, in 2021 and 2022, harvesters observed that the caribou around Ulukhaktok were scarce, and in 2021 the community harvested approximately 20 of the new community limit of 50 Dolphin and Union caribou per year; in this case, this was because harvesters were travelling and looking for caribou, but were not able to find and harvest them (Dolphin and Union User-to-User Group 2019-2022).

Ulukhaktok representatives also noted that the fall migration in 2021 did not seem to pass its usual area east of Prince Albert Sound (Dolphin and Union User-to-User Group 2019-2022).

According to historical and scientific sources, a large group of caribou was noted to migrate between Victoria Island and the mainland in the late 19th century and the early part of the 20th century, although it appeared to stop migrating in the early 1920s (Anderson 1922, COSEWIC 2004, Gunn 2008, Manning 1960). Observations from Cape Lambert in the spring of 1916 were of "...countless caribou - mainly bulls, their antlers already starting to grow - crossing the straits from the mainland..." (Charles Denny LaNauze *in* Jenkins 2005). A few years later, it was reported that an entire population of caribou from south-east Victoria Island migrated to the Kent Peninsula. From the locations noted in these reports, these caribou undoubtedly belonged to the Dolphin and Union caribou.

In 1919, Diamond Jenness recorded the following passage in his journals:

Bows and arrows have passed with other weapons into the darkness of the past, and a new mechanical age has brought magazine rifles, shotguns, steel traps, and even gasoline engines. The caribou are passing with the bows and arrows; of all the herds that once crossed the narrow strait to Victoria Island hardly one now reaches the Arctic shore... (in Jenkins 2005).

While the cessation of the caribou migration coincided with the introduction of rifles and hide trading in the area in the late 19th century, Banks Island muskoxen also disappeared at this time; their disappearance was attributed to an ice storm. It is not known which factors impacted the caribou (Gunn 2008). However, some Cambridge Bay residents argued that the migration did not cease and continued throughout the 1900s in numbers small enough to appear undetectable. As well, Inuit still reported sightings of a very few caribou on Victoria Island (Bates 2006; Gunn 2008). Although a few were seen by Inuit hunters, caribou were very scarce in the 1920s and 1930s. In 1937, hunters reported that it was necessary to go toward Richard Collinson Inlet on the north side of Victoria Island to find caribou; these were likely Peary caribou. Dolphin and Union caribou were reported in southern Victoria Island again in the 1950s (OHTC *et al.* 2008).

Elders and hunters interviewed in Ulukhaktok said that there were no caribou at Prince Albert Sound during the 1940s, but some (likely Peary caribou) were north of Minto Inlet (Survey of Elders compiled by Albert Elias *in* Gunn 2005: Appendix A). However, as noted in *Distribution*, some Inuit indicate that Dolphin and Union caribou had left or moved off, rather than decreased in numbers (Bates 2006). Dolphin and Union caribou increased in number and sightings from the 1970s or 1980s to the 1990s (COSEWIC 2004, Bates 2006, Gunn *et al.* 1997, Gunn 2008).

Health

Dolphin and Union caribou body condition is known to fluctuate according to the seasons, as reported by residents of Ulukhaktok, Ekaluktutiak, and Kugluktuk (Hanke *et al.* 2021, Thorpe Consulting Services 2019). Interviews with Ekaluktutiak and Kugluktuk harvesters in 2003 indicate that caribou are typically fat during the summer and fall, moderate during the winter, and skinny during the spring. Migration and rut are the life stages with the greatest impact on body condition, with Kugluktuk interviewees reporting the influence of migration and Ekaluktutiak reporting the influence of rut. The opportunity to regain body condition after migration and rut occurs during the following summer and fall (Hanke *et al.* 2021).

In Ulukhaktok in 1998, community members commented that the caribou were really skinny in early-July across Prince Albert Sound, and that overall, the caribou used to be in better condition. They had less fat and a different taste than in the past (ENR 1998). People suggested that these changes in body condition might be due to changes in food or because the animals are migrating farther than in the past, saying that in the fall, caribou simply walk south and do not feed very much (ENR 1998). Some harvesters in Kugluktuk said that the Dolphin and Union caribou seemed healthy (ENR 1998), but others were concerned about the health of caribou. In a 1980-1993 study of caribou on Victoria Island, hunters did not report observations of diseased caribou (Gunn 2005). However, in the late 1990s some people in Cambridge Bay noticed that Victoria Island caribou appeared less healthy, but they did not specify if these caribou were Dolphin and Union or Peary caribou (ENR 1998).

Kugluktuk harvesters interviewed in 2003 said that they encountered caribou with rashes, green meat, spleen abnormalities and other indications of disease while Ekaluktutiak interviewees described sick caribou with big stomachs, green meat, irritated spleens, and hoof problems (Hanke *et al.* 2021). White muscle cysts, liver cysts, hoof anomalies, traumatic lesions and abscesses, and other conditions were described by residents of Cambridge Bay interviewed in 2014 (Table 3; Tomaselli *et al.* 2018b). Individual participants reported other lesions they noticed in individual caribou or limited to certain age classes, including: “scabs on the nose and mouth,” hard and swollen testicles consistent with orchitis, “different colour patches” in the lung of a caribou consistent with pneumonia, liquid cysts in the lung parenchyma, and yellow colouration of subcutaneous tissue, associated with pale skeletal muscle (Tomaselli *et al.* 2018b: 344). Harvesters from Kugluktuk and Cambridge Bay, harvesters reported: swollen or watery leg joints and limping caribou, descriptions consistent with brucellosis; little, white cysts in the meat, descriptions consistent with *Taenia* cysts; rashes or hairlessness on legs, symptoms often associated with *Besnoitia tarandus* infection (Hanke *et al.* 2021, Tomaselli *et al.* 2018, Tryland and Kutz 2019).

Table 3. Group interviews: participants' perceptions on diseases (lesions/syndromes), expressed as relative prevalence (%), and observations of disease occurrence (provided by groups that reported the specific disease), in the hunted and observed caribou in the Iqaluktutiaq (Cambridge Bay) area, Victoria Island, Nunavut, during the decline period of the mid-2000s to the end of 2014, (reproduced from Tomaselli *et al.* 2018b with permission).

Observed lesions	**Relative Prevalence**				**Disease Occurrence**	
	N	**Median**	**IQR**	**Range**	**N**	**Observations**
Warble flies	7	40	30-50	20-70	7	Always noticed in almost all the animals during spring and summer time (7/7). It was even a source of food when Inuit lived in outpost camps and prior to life in the community.
Nasal worms	7	2	0-10	0-30	4	Noticed since the 1980s, especially on the mainland hunting grounds (4/4). Considered an occasional and stable finding since then (3/4).
White muscle cysts	7	15	10-25	3-25	7	Noticed since the 1980s-1990s (3/7). The majority of the groups noticed an increasing trend after 2000-2005 (5/7).
Liver cysts	7	2	0-3	0-5	4	Noticed since the 1990s as an occasional finding (2/4). Two groups noticed it starting from 2005 (2/4).
Swollen joints - limping	7	5	5-15	2-15	7	Noticed since the 1980s as an occasional finding (3/7). Considered more frequent in the 1990s and since 2007-2008 had decreased being occasional again (3/7).
Sandpaper	7	5	4-10	0-10	6	Noticed since the 1980s as an occasional finding (4/6). Either stable (3/7) or slightly increasing since 1990-2000 (3/7).
Hoof anomalies/ infections	7	1	0-10	0-10	4	Noticed since the 1990s as an occasional finding (1/4). The majority of the groups started to notice it with an increasing trend after 2000 (3/4).
Traumatic lesions/ abscesses	7	5	3-30	0-35	6	Always noticed (6/6) with a stable (5/6) or slightly increasing trend (1/6). Due to inter- (i.e., predators, including hunters) or intra-specific interactions (i.e., other caribou, especially during the rutting season), and other natural causes.

Brucellosis is caused by a bacterium that negatively affects reproduction and productivity in caribou and can be transmitted to humans (Forbes 1991; Tryland and Kutz 2019). Historically, brucellosis appeared absent on Victoria Island, with zero of 62 caribou collected in April 1987 – 90 from southeastern Victoria Island (probably Dolphin and Union caribou) testing positive by serology (Gunn *et al.* 1991). Ekaluktutiakmiut and local knowledge keepers observed Dolphin and Union caribou with swollen joints and limping in the 1980s, with increasing frequency in 1990s (Tomaselli *et al.* 2018b). Brucellosis was described again by Kugluktuk harvesters in 2018-2020, and they said that they first noticed signs in the 1980s that peaked in the mid-2000s and started to become less common by mid-2010s (Hanke *et al.* 2020, in review). Harvesters in 2003 from Kugluktuk and Ekaluktutiak reported or described caribou with brucellosis (Hanke *et al.* 2021). A few Ulukhaktok Elders interviewed in 2011-2013 observed similar symptoms of brucellosis in caribou, however most Elders thought the caribou seemed mostly healthy and free of disease (Thorpe Consulting Services 2019). In 2015 – 16, seroprevalence for brucellosis was 15% (CI: 6-29, n = 41) in female Dolphin and Union caribou, which was higher than that reported in most barren-ground caribou herds (Carlsson *et al.* 2019). The potential impacts of brucellosis to caribou populations is concerning for residents (EHTO 2016, First Joint Meeting 2015, OHTC *et al.* 2016, and Second Joint Meeting 2016 *in* GNWT and GN 2018).

Taenia cysts are caused by common cestode found in the musculature of caribou. At high infection intensity, harvesters have reported impacts on body condition; however, infection intensity is often low and clinical signs are rare (Tryland and Kutz 2019; Hanke *et al.* 2021). Ekaluktutiakmiut and local knowledge keepers reported white muscle cysts in Dolphin and Union caribou since the 1980s and 1990s with an increase in observations after 2000-2005 (Tomaselli *et al.*, 2018b). White cysts in muscle was described again by Kugluktuk harvesters in 2018-2020, and they said that they first noticed signs between the 1980s and 2020s (Hanke *et al.* 2020, in review). However, there were fewer complaints about *Taenia krabbei* in caribou from southern Victoria Island than from the mainland (Gunn *et al.* 1991). Harvesters in 2003 from Kugluktuk and Ekaluktutiak reported or described caribou with white cysts in the muscle (Hanke *et al.* 2021).

Besnoitiosis is caused by a protozoan that is commonly seen in barren-ground caribou throughout North America as tissue cysts in the skin, subcutaneous tissues, and periosteum of the lower legs, and it causes skin thickening and hair loss (Ducrocq *et al.* 2012, Hanke *et al.* 2021). In 2014, Ekaluktutiakmiut and local knowledge keepers reported a sandpaper-like feeling in DU caribou since the 1980s, which was stable or increasing between 1990 and 2000 (Tomaselli *et al.* 2018b). Gunn *et al.* (1991) reported Besnoitia in 6 of 82 caribou cows sampled from southeastern Victoria Island in April 1987 – 90. *Besnoitiosis* was described again by Kugluktuk harvesters in 2018-2020, and they said that they first noticed signs between the 1990s-2000s (Hanke *et al.* 2020, in review)

There were also concerns raised around the levels of radioactive materials in caribou and the possibility that the caribou are being exposed to more disease by travelling farther to the south (ENR 1998). The potential impacts of these health conditions are discussed further in Threats and Limiting Factors.

Rescue Effects

Dolphin and Union caribou are only found in the Northwest Territories and Nunavut. There is no possibility of rescue from neighbouring populations, as populations 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 as threats to the Dolphin and Union caribou population on Northwest Victoria Island and on the mainland. Global climate change is an important threat that impacts caribou habitat (e.g., changes to factors that influence migration and changes to forage conditions), these changes impact caribou body condition and survivorship. Important threats to the migratory behaviour of Dolphin and Union caribou include drownings, dangerous ice crossings and increased ship traffic. Climate change may also limit or changes access to forage through increases in icing on snow and vegetation events, heavy precipitation events, and increases in temperatures. Industrial activities and other human disturbances are also potentially important threats or limiting factors. The degree of threat posed by over-harvesting in the past is difficult to determine; however, increases in harvest reporting and studies are now contributing to management decisions. Disrespectful harvesting (e.g., wounding loss) is also a concern that is being discussed and addressed through cultural teachings and educational opportunities. In recent years, much work has been done to understand that state of Dolphin and Union caribou health and the prevalence and impact of diseases and parasite on individuals and the population. Interactions with predators and increases in goose populations are also threats to Dolphin and Union caribou.

Drowning and Dangerous Ice Crossings

Dolphin and Union caribou rely on sea ice to migrate between their summer and winter ranges, as described in *Distribution.* With later freeze-up and earlier spring thaw happening more frequently, Inuit hunters have recorded hundreds of Dolphin and Union caribou dying after breaking through the sea ice (Gunn 2008, First Joint Meeting 2015 and Second Joint Meeting 2016 *in* COSEWIC 2017). Caribou may fall through sea ice and drown if the sea ice is not strong enough to hold their weight, as observed by residents of Cambridge Bay and Kugluktuk (Hanke *et al.* 2021, Panikkar and Lemmond 2020). Both spring and fall ice crossings are affected. During

the 1990s, Inuit hunters saw hundreds of caribou frozen along shorelines after they had drowned (Thorpe *et al.* 2001). There were observations of a drowning event of Dolphin and Union caribou during a fall migration to the wintering grounds in the late 1990s:

Last year I noticed the ice close fairly late from the years before. That is when a few caribou were trying to cross from Cape Peel, in Victoria Island (Kiilliniq). I heard from the guys that were working from the North Warning System, that some caribou drowned near Cape Peel, about 70 miles west from Cambridge Bay (Ikaluktuuttiak). They were trying to migrate across towards Surrey Lake and Wellington Bay (Iqaluktuuq), come towards Cambridge Bay (Ikaluktuuttiak) area. I heard not lots drowned but not hundred, but less than a hundred, I think. (George Kavanna [Ikaluktuuttiaq] in Thorpe et al. 2001: 142).

Freshly formed sea ice and unstable ice conditions during caribou migration have been observed by local residents. For instance, a Ulukhaktok resident reported that sea ice conditions were "rough" near the community the early winter of 2022 (Dolphin and Union User-to-User Group 2019-2022). Other residents of the community have encountered caribou walking on freshly formed ice near Cambridge Bay and are concerned that these conditions lead to fewer caribou overall due to drownings (WMAC (NWT) 2020). An Ulukhaktok resident encountered a group of about 70 Dolphin and Union caribou that fell through unstable sea ice when they tried to make the crossing (WMAC (NWT) 2020). In addition to drowning events, these conditions have resulted in individual caribou becoming stranded on the ice and drifting out to sea (KHTO 2016 *in* COSEWIC 2017), where they perish from exhaustion, starvation, or hypothermia. Caribou that fall through sea ice but manage to get out of the water have been reported to lose most of their fur and later die of hypothermia:

[It caused] a lot of the energy loss from the body, [leaving] hardly any fur on them; the front legs totally no hair on them. Patches of ice on their back, all matted on backs, chunks of ice hanging. I've seen them die of hypothermia. (Participant 6 [Kugluktuk] in Hanke et al. 2021: 447).

Increasing numbers of Dolphin and Union caribou are being observed on the mainland in December with a thick coat of ice on their fur; this is thought to be the result of falling through the ice during migration (Poole *et al.* 2010). Caribou who have fallen through ice are also observed with balls of ice attached to their bodies, such as on their legs and back (Hanke and Kutz 2020). A build-up of ice on their fur causes stress for caribou (KHTO 2016 *in* GNWT and GN 2018).

In the spring, caribou may swim through channels of water in the ice and not be able to get out, leading to drowning (Thorpe *et al.* 2001). Community members in Kugluktuk have also noticed some drowning occurring in the spring leads where the edges of the ice are too slippery, or where fresh snow covers the leads (ENR 1998). Kugluktuk residents have also explained that caribou can fall through ice near islands or fast-flowing currents (Hanke and Kutz 2020). Changing ice

conditions and an unusual amount of open water was observed near Ulukhaktok in 2019, raising concerns for the impacts to caribou migration from Victoria Island to the mainland. One Ulukhaktok resident remarked that sea ice used to be about 7-8 feet deep, but nowadays they are lucky to encounter ice that is 5 feet deep (Dolphin and Union User-to-User Group 2019-2022). Warmer temperatures resulting from climate change are reducing the extent of sea ice and delaying the timing of freeze-up (see Table 1 in Golder 2003, Gunn 2008):

Snowmobile trails had disappeared "in a couple of days from the wind. No more ice; the ice we just travelled on is all open water from the wind" (Participant 3 [Ekaluktutiak] in Hanke et al. 2021: 446)

If the ice is too thin to cross but other factors (like length of daylight, sun, or seasonal triggers) cause the caribou to migrate anyway, they may waste energy by looking for a better place to cross (Hanke *et al.* 2021, Thorpe *et al.* 2001). If caribou encounter thin ice, they may fall through and drown or abandon attempts to migrate for the year (Hanke *et al.* 2021, Thorpe *et al.* 2001). Harvesters have reported increases in drowning events (Hanke *et al.* 2021, Thorpe *et al.* 2001). The population level impact of drownings is not known.

Increase in Shipping Traffic

An increase in shipping traffic in the Northwest Passage during sea ice formation or during the ice season poses a threat for Dolphin and Union caribou. The shipping season is also longer than in the past and may become longer with warmer temperatures in the region (EHTO 2019). Additional shipping traffic may prevent sea ice from forming, which increases the risk of caribou drownings due to unstable or thin ice conditions (First Joint Meeting 2015, EHTO 2016, and Second Joint Meeting 2016 *in* GNWT and GN 2018). Ship tracks in the sea ice also disrupt caribou movement over the ice and may lead to more drowning events (EHTO 2019). Caribou drownings are already on the rise due to changes in ice conditions, changes in the timings of freeze-up and spring thaw, and other factors (ENR 1998; First Joint Meeting 2015, *in* GNWT and GN 2018). Local communities are also concerned about the potential impacts of increased shipping and ice breaking activities to the safety of harvesters on the ice (EHTO 2016 *in* GNWT and GN 2018) and the potential for hunters to become stranded by unplanned or unannounced ice breaking (EHTO 2019). Representatives for Paulatuk HTC have voiced concerns for increased shipping traffic associated with the Grays Bay Deep Water Port and Road Project, as project-related shipping activities would have "a huge impact" on marine life (including migrating caribou) and potentially limit caribou harvesting opportunities for members (PHTC 2018). This project is also planned to go through an area that is heavily used by both caribou and harvesters.

Some Cambridge Bay residents observed a ship breaking through approximately 30 cm of ice in mid-October, coinciding with the Dolphin and Union caribou's fall migration (EHTO 2016 *in*

COSEWIC 2017). This event raised concerns among local residents for many reasons including: caribou require at least 10 cm of sea ice to make the crossing from the mainland to Victoria Island, there is not enough time for the ice to re-freeze after an ice disturbing event like icebreaking (single transit), and increased traffic in the fall may prevent or significantly delay the formation of ice from reaching 10 cm, which is needed for crossing (multiple transits) (First Joint Meeting 2015 *in* COSEWIC 2017).

Ulukhaktok representatives are very concerned about the potential impacts of shipping traffic to Dolphin and Union caribou and highlight the importance of strong enforcement against icebreaking in the area (Klengenberg 2023).

Icing on Snow and Vegetation/Heavy Precipitation Events

Ice-covered snow and/or tundra vegetation have caused problems for Dolphin and Union caribou in the past. The ice crust prevents the caribou from feeding as they cannot 'dig' through it, and it may be difficult for the caribou to walk over. Additionally, a variable freeze/thaw cycle in the fall may cover vegetation in ice and starve caribou. One particular event was described near Wellington Bay where rain occurring after snowfall caused starvation. The effects were locally variable: some areas were affected while others were not based on local conditions and presence of rainfall. Interview participants in Ulukhaktok noted that during freezing rain caribou could die of starvation or would move away to better grazing land; however, the population of caribou was not specified for this observation (Survey of Elders compiled by Albert Elias *in* Gunn 2005: Appendix A). An example was given in which interviewees noted that following a heavy snowfall and big rain one fall, muskoxen and caribou died of starvation as a result of the extreme weather (Hanke *et al.* 2020, 2021, ENR unpubl. interviews 2011-2013, Survey of Elders compiled by Albert Elias *in* Gunn 2005: Appendix A). It was also noted that because Victoria Island is a huge island, the caribou have no trouble finding ice-free vegetation (Survey of Elders compiled by Albert Elias *in* Gunn 2005: Appendix A).

Die-offs of Peary caribou in the early 1970s on the southern Queen Elizabeth Islands were associated with icing conditions (Gunn and Dragon 2002, Miller *et al.* 1977). A lack of other caribou (Dolphin and Union or Bathurst) was noted during that time as well (Harding 2004, Thorpe *et al.* 2001). These icing and crusting events could have potentially greater effects on Dolphin and Union caribou if climate change increases the frequency or severity of the events. Knowledge holders interviewed by Thorpe *et al.* (2001) reported that there are more cases of freezing rain and sporadic freeze-thaw cycles over the last 20 years. Years with increased freeze-thaw cycles during spring and/or fall have been associated with decreases in caribou populations since lichen and other plants can become covered in ice and unavailable as caribou forage, which can result in starvation (Thorpe *et al.* 2001).

The snow was covered in ice. It had rained after a big snowfall. That is when some of the caribou starved to death, but in another area of land, where it is not so rough, they were fine...Some areas were fine where it did not rain... (Archie Komak [Ikaluktuuttiak] in Thorpe et al. 2001: 84).

One spring, a lot of caribou died because of freezing rain and sleet. There were no areas for them to feed around...They had starved to death because of sleet. They had nowhere to eat. The ice was too thick...They could not dig through it (Moses Koihok [Ikaluktuuttiak] in Thorpe et al. 2001: 148).

Freezing temperatures during calving may also result in the death of calves (Thorpe *et al.* 2001). In addition, snow and hail in large amounts have been seen in summer when this was not seen in the past (Thorpe *et al.* 2001). Reports from Ulukhaktok knowledge holders suggest that freezing rain is also happening more frequently now than in the past (Ulukhaktok TK interviews 2011-2013 *in* Government of NWT and Nunavut 2018).

Impacts of Warmer Temperatures

Warm and dry weather causes a longer and more intense insect season, especially regarding mosquitoes, whereas warm and wet years produce more warble flies and nose bots (Dumond 2007). An increase in insect harassment for caribou has been seen since the 1970s (Bates 2006, Dumond 2007, Thorpe *et al.* 2001), which community members associate with longer summers and warmer weather (First Joint Meeting 2015 *in* GNWT and GN 2018). Kugluktuk residents have also reported a change in insect intensity and diversity (Hanke and Kutz 2020).

Mosquitoes cause caribou to gather, move in circles and shake to get the insects off (Thorpe *et al.* 2001). This wastes energy and prevents feeding (Thorpe *et al.* 2001). If they lose too much body fat, they may not survive migration, water crossings and the winter (Thorpe *et al.* 2001). Cambridge Bay hunters said that during hot summers with many mosquitoes the caribou migrating past the town in the autumn would be thin, as they would have suffered constant insect harassment, whereas after cool summers the animals would be relatively fat (Bates 2006). In 1998, however, the temperatures were too hot for mosquitoes and the insects disappeared (Thorpe *et al.* 2001). It has also been reported that warble flies are being seen in spring as well as summer now (Dumond 2007).

Calm, hot days are also a threat to caribou as they may overheat while escaping insects and not feed (Thorpe *et al.* 2001). Extremely hot weather can cause caribou to lose body condition (Thorpe *et al.* 2001). Inuit interviewees have noted an increase in deaths from heat-related and insect-induced exhaustion (Thorpe *et al.* 2001). Hot temperatures combined with windy conditions can limit sea ice formation and delay lake and river freeze up by keeping temperatures above freezing and breaking up any ice that had formed (Hanke *et al.* 2021, Kuptana 2023). Participants in a caribou workshop in Kugluktuk indicated that hot weather can influence the

quality of caribou food and that climate change is causing weather to be less predictable and causing animals to suffer (Dumond 2007).

Industrial Activities and Other Human Disturbances

In the early 2000s, community members voiced concerns that mining may cause caribou to shift their annual migration routes. Community members have suggested that mines should not operate or should only conduct quiet activities when caribou are calving nearby and when caribou migrate by the mine. A recommended distance for a buffer around mines or other industrial development was 13-16 kms (Dumond 2007, Thorpe *et al.* 2001). Inuit have requested that mining be restricted, or should not happen near caribou calving grounds, as it will disturb the caribou (Golder 2003, Thorpe *et al.* 2001). Caribou are very sensitive and delicate animals, and they respond strongly to loud noises, small smells, and disturbances; this is why Ulukhaktok residents have always opposed in caribou habitat (Klengenberg 2023). Residents have expressed concerns regarding the impacts of future mining projects and possible expansion of current mining activities to caribou migration routes and winter-feeding grounds (EHTO 2016, First Joint Meeting 2015, Tuktoyaktuk Community Meeting 2014, OHTC *et al.* 2016, PHTC 2016, and Second Joint Meeting 2016 *in* GNWT and GN 2018).

Community concerns regarding potential impacts of a proposed gold mine (the Doris North Project) located at the north end of Doris Lake, Nunavut, approximately 160 km southwest of Cambridge Bay in the Hope Bay Belt, were summarized by Golder (2003). Concerns relevant to Dolphin and Union caribou are summarized in Table 4.

Water pollution and dust pollution from new and old mines were a concern for Kugluktuk hunters. They also identified a lack of resources at the Hunters and Trappers Organization level as a threat because there are not enough resources to properly review and comment on development permits (Dumond 2007).

Although caribou are not necessarily disturbed by all air traffic, noise from low-level aircraft flights are thought to cause disturbances for the caribou. Local communities have suggested that aircraft should be required to fly at high altitude over calving areas or should not be allowed to fly over while caribou are calving (First Joint Meeting 2015, EHTO 2016, KHTO 2016, and Second Joint Meeting 2016 *in* GNWT and GN 2018). Dumond (2007) recommended to improve compliance of minimum flying altitude by involving the public in reporting violations (communicating to them the rules respecting minimum flying altitude and the actions they're able to take) and requesting that the Hunters and Trappers Organization (HTO) look into enforcing a minimum flying altitude for ultra-light aircraft (Dumond 2007). One Ulukhaktok resident expressed concern for the impacts of the aerial abundance surveys to Dolphin and Union caribou, noting that low-flying planes scare away the caribou (OHTC 2021b). Individual caribou

are known by some hunters to tolerate some types of noise, such as machinery sounds from airplanes, vehicles, and snowmobiles. However, caribou may respond to noise pollution differently based on the weather conditions (i.e., clear and cold versus cloudy days), and are less tolerant of noise during calving (Thorpe *et al. 2001*; Golder 2003).

Table 4. Community comments related to caribou and mineral activity (reproduced from Golder 2003 with permission).

Comment	Sources cited in Golder (2003)
Mining companies do not bother caribou; when caribou aren't being bothered, they don't run away. Caribou usually stand outside mine buildings	M. Algona *in* Thorpe *et al.* 2001
Mining companies should shut down when caribou come through. They have good ears and eyes; it bothers them. They get more sensitive when calving	K. Haniliak *in* Thorpe *et al.* 2001
Should not allow mining companies to explore and use explosives on calving grounds; caribou get afraid	A. Komak *in* Thorpe *et al.* 2001
There is too much mining going on in the north; caribou might change their routes and not come around at all	Anonymous C *in* Thorpe *et al.* 2001
Some caribou do not mind the mining and the helicopters in the summer and spring. The caribou run away or sometimes just stand there	C. Keyok *in* Thorpe *et al.* 2001
Helicopters fly too low and the caribou start running	A. Kapolak *in* Thorpe *et al.* 2001
Caribou habitat should be protected	Nunavut Planning Commission. 2002. West Kitikmeot Land Use Plan. www.npc.nunavut

Roads and road construction near Bathurst Inlet impact caribou in several ways especially when caribou numbers are low. The physical presence of the road, disturbance from construction or traffic may change caribou behaviour and cause caribou to avoid the area (Thorpe *et al.* 2001). For instance, existing permanent or temporary roads that cross caribou migration routes can disrupt Dolphin and Union caribou during the spring migration (OHTC *et al.* 2016 *in* GNWT and GN 2018). Hunters on some Arctic islands have associated industrial exploration with unusual movements of caribou, but hunters from Ulukhaktok did not (Freeman 1975 *in* Gunn 2005). Increased industrial activity may cause caribou to scatter rather than staying in a large group (Dumond 2007). Refuse and infrastructure left behind after industrial activities may cause health or safety concerns for caribou. In the late 1990s, hunters in Kugluktuk noticed a shopping bag in a caribou stomach and have seen bulls tangled in wire during the rut (ENR 1998). A caribou was also observed with barbed wire from a Distant Early Warning (DEW) radar line caught in its antlers (First Joint Meeting 2015 *in* GNWT and GN 2018). Garbage left out on the land (i.e., in plastic bags) was noted as a general threat to wildlife (Dumond 2007). The area proposed for the Grays Bay Deep Water Port and Road Project is planned to go through an area that is heavily used by both caribou and harvesters. It is important that this proposed development is considered

alongside the management plan objective to minimize disturbance to habitat and preserve sea ice crossings of Dolphin and Union caribou (GNWT and GN 2018).

Disrespectful Harvesting and/or Over-harvesting

Harvest reported by ENR (2012) in 1991-2010 suggests a drop in harvest during 2009 and 2010 on western Victoria Island. While over-harvesting is suspected as a cause of past decline for Peary caribou on Victoria Island, it has not generally been identified in Indigenous and community knowledge sources as a concern or negative impact for Dolphin and Union caribou (Survey of Elders compiled by Albert Elias *in* Gunn 2005: Appendix A; Gunn 2005; GNWT and GN 2018). However, some biologists, resource managers and residents of Kugluktuk, Cambridge Bay, and Ulukhaktok have identified overharvesting and/or wounding loss as a potential threat (ENR 1998, Hanke and Kutz 2020, Nishi and Gunn 2004, WMAC (NWT) 2020).

Information from Gunn (2005) indicates that there was an increase in harvesting in Prince Albert Sound (i.e., Dolphin and Union caribou) from 1983 to 1996, based on harvests reported to the Kitikmeot Harvest Study and the Inuvialuit Harvest Study. This harvesting increase coincides with population increases reported by different communities in the 1980s and 1990s (see "Population"). One Ulukhaktok representative expressed concern that, in intergenerational memory, harvesting practices when the population was high were highly influenced by Western culture, commercial interests, and technology, and that harvesters in that time were not always following Elders' guidelines; for example, many harvesters would take a whole small group of caribou if they saw a group, without leaving any behind (Klengenberg 2023). Nowadays, harvesters are relying more on their cultural teachings, and are careful to limit how many caribou they take, and to avoid family groups, or taking a whole group; it will be very important to continue these practices in the future (Klengenberg 2023).

In Cambridge Bay, meeting participants suggested that the population was possibly being impacted by high wounding loss (ENR 1998). Wounding loss can be exacerbated if hunters are inexperienced. Recommendations arose as part of Dumond's (2007) work on the Western Kitikmeot Caribou Workshop, including: community hunts should have requirements for experienced hunters and Elders to provide education to those in need, and other educational initiatives should also be implemented. Similar recommendations were made by Kugluktukmiut knowledge keepers participating in the 2018-2020 Kitikmeot Traditional Knowledge Study. Poorer hunting practices by less experienced Inuit and non-Inuit hunters were noted as an important issue facing Dolphin and Union caribou, and participants expressed a desire for more educational opportunities for hunters as a potential solution (Hanke and Kutz 2020).

Some participants thought the Total Allowable Harvest (TAH) for the Bluenose East and Bathurst barren-ground caribou herds had resulted in additional harvesting pressure on

Dolphin and Union caribou, given they did not have restrictions at the time of the interviews. Although there was disagreement among participants as to the usefulness of harvesting restrictions, some indicated that a TAH or similar annual or seasonal restriction may be helpful for Dolphin and Union caribou in the short-term (Hanke and Kutz 2020). Harvesting restrictions for Nunavut residents began in 2020, as described in '*Harvesting Rates in Nunavut*'.

Levels of commercial, guided, or non-Indigenous resident harvesting vary between communities. Kugluktuk and some communities in Nunavut's Kivalliq region (Kivalliq region includes: Rankin Inlet (*Kangiqtiniq*), Arviat, Chesterfield Inlet (*Igluligaarjuk*), Baker Lake (*Qamanituaq*), Coral Harbour (*Salliq*), Repulse Bay (*Naujaat*), and Whale Cove (*Tikirarjuaq*)) supported some commercial harvesting until 2020 (Dumond 2007), while the Ekaluktutiak Hunters and Trappers Association (Cambridge Bay) stopped distributing tags for commercial hunts in 1997 until a hunt could be organized in a mainland location (ensuring that only barren-ground caribou would be harvested and protecting Dolphin and Union caribou from commercial harvest) (Nishi and Buckland 2000). Peaks in the Kugluktuk commercial harvest occur when the caribou are close by, and other communities ask for some meat; otherwise the commercial harvest is usually low (Dumond 2007). The commercial harvest of Dolphin and Union caribou in Nunavut was closed with the establishment of a Total Allowable Harvest in 2020 (September 4, 2020, Letter to Chairperson Daniel Shewchuk from Minister Savikataaq). Harvest of Dolphin and Union caribou is restricted to Inuit hunters only (GNWT and GN 2021). Ulukhaktok has the ability under the *Wildlife Act* to have resident harvests, but tags are not distributed through the HTC for this purpose.

Harvesting Dolphin and Union caribou remains an important practice among Inuvialuit and Inuit communities. However, harvest levels and the overall harvest rate for Dolphin and Union caribou were unknown until very recently making it is difficult to determine the degree of threat posed by harvesting activities. Adding to the complexity, the proportion of the annual harvest comprised of each caribou population varies from year to year, depending on the distribution and accessibility of each population to the communities or groups of caribou to the community (Second Joint Meeting 2016 *in* GNWT and GN 2018). It is anticipated that future years of documentation will build upon the Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study, which provides annual information on the caribou harvest of Inuvialuit communities and reported harvesting data specifically for Dolphin and Union caribou for the first time in 2018 (Joint Secretariat 2018). Management partners are also in the process of consulting toward a legislating for mandatory harvest reporting and sampling for all caribou in the ISR portion of Victoria Island via bylaws in the *Wildlife Act* (Nathoo pers. comm. 2022). If implemented by ECC in combination with the TAH implemented in Nunavut, harvest levels and proportions will be known for most of the range.

Health and Diseases

A range of diseases and parasites have been identified as impacting the Dolphin and Union caribou health, with local communities reporting observations of diseased caribou (e.g., brucellosis) starting around the 1980s (Tomaselli *et al.* 2018b; First Joint Meeting 2015 *in* COSEWIC 2017; Hanke *et al.* in review). The period of time with higher observations of diseased animals corresponds with the suspected population peak and subsequent decrease in population size (Population and Distribution). It is suspected that transmission of density-dependent pathogens increases at high population densities (Carlsson, Dobson, and Kutz 2018). In this case, the increased observations of some disease syndromes and their overall impact on the group's health may follow population density. These events are consistent with an Elder's explanation of how disease is a stressor that contributes to abundance declines:

Elder Allen Niptanatiak described a connection between caribou health and their population cycles, where "caribou were healthier before there were more" (Allen Niptanatiak [Kugluktuk] in Hanke et al. in review)

On the other hand, pathogens with frequency-dependent transmissions, such as *B. suis* biovar 4 or vector-borne diseases, may suppose a higher conservation threat when host population sizes and densities are smaller. Although rare, humans can become infected by brucellosis through the ingestion of raw or undercooked meat of infected animals and/or contact between open skin and infectious material (GNWT 2023).

It is difficult to detect, identify, and quantify infectious agents and its effects in free-ranging wildlife (Carlsson *et al.* 2018, Tomaselli *et al.* 2018), and so their role in health and population dynamics of *Rangifer* is often overlooked in wildlife management. However, there is evidence from the Dolphin and Union caribou harvester-based sampling program that they had relatively good body condition and pregnancy rates during the accelerated decline between 2015 and 2018 and that mortalities may have happened during these years (Fernandez Aguilar *et al.* in prep). Population trends and data from adult collared cows also indicated that survival was low (Leclerc and Boulanger 2018, 2020).

The average pregnancy rate of harvested adult females in early spring was 78.7% for the period of 2015-2019, which was similar to that documented for the period 1987-1991 (76.2%) and significantly higher than for the period 2001-2003 (57%) (Fernandez Aguilar *et al.* in prep a). These pregnancy rates are consistent with an increasing population in the late 1980s and the start of a decline in the population around the 2000s (Tomaselli *et al.* 2018b; Hanke *et al.* 2020, 2021, in review). However, the steep abundance decline recorded by the surveys from 2015-2020 is not consistent with the pregnancy rates and body condition recorded by the harvester-based sampling in 2015-2019 (Fernandez Aguilar *et al.* in prep a). This inconsistency suggests that the

steep decline during those years may have resulted from different processes than those driving the long declining trend since 2000s (Fernandez Aguilar *et al.* in prep).

Infectious agents may have contributed to low survival rates through increased mortality. *Brucella suis* biovar 4 was the main infectious agent isolated from abnormalities submitted by hunters during the study period of 2015-2021 (Fernandez Aguilar *et al.* in prep a). Some of the lesions detected in caribou with brucellosis were severe (Fernandez Aguilar *et al.* in prep a). The effects of brucellosis on caribou survival have not been properly assessed, but this disease is associated with poor reproductive parameters in caribou (Campbell 2013, Fernandez Aguilar in prep. B, Neiland *et al.* 1968). Harvesters in Kugluktuk and Cambridge Bay reported increased clinical signs consistent with brucellosis in the 1990s and beginning of the 2000s, corresponding with, and may have contributed to, the initial decline and lower pregnancy rates (Hanke *et al.* in review, Fernandez Aguilar in prep. a, Tomaselli *et al.* 2018b). Whilst the exposure to *Brucella suis* biovar 4 has been maintained in the Dolphin and Union caribou more or less stable in the recent years, the exposure in the sympatric muskoxen from NW Victoria Island has significantly increased (Fernandez Aguilar in prep. b)

Fernandez Aguilar *et al.* (in prep a) measured the highest seroprevalence of *Erysipelothrix rhusiopathiae* in DU caribou in 2016, in between the population estimates with the biggest decline (2015 and 2018), and levels decreased in the subsequent years. Exposure to *E. rhusiopathiae* may affect survival, as demonstrated in other Arctic species (Aleuy *et al.* 2022, Forde *et al.* 2016a). This pathogen is associated with major mortality and population declines of muskoxen (Kutz *et al.* 2015), is shared across multiple species (Forde *et al.* 2016b) and may be involved in caribou mortalities.

Exposure to α-herpesvirus, pestivirus, *Toxoplasma gondii, Neospora caninum* and the presence of diverse internal and external macroparasites have been documented in Dolphin and Union caribou (Carlsson *et la.* 2019, Fernandez Aguilar under prep. a, Hughes *et la.* 2009). These pathogens are less likely to cause significant mortality and are mostly associated with reproductive loss or other types of syndromes (Fernandez Aguilar in prep. a, Hughes *et al.* 2008). Their effects, however, may affect the resilience of the population to other stressors. A recent study also found high exposure to California serogroup of viruses in the Dolphin and Union caribou. This group of viruses are vector-transmitted and occasionally associated with disease in infected hosts, however, its effects on caribou health are still unknown (Buhler *et al.* 2023)

Predation

Wolves, wolverines, and grizzly bears are known predators within the range of Dolphin and Union caribou (Dumond 2007, Golder 2003, Thorpe Consulting Services 2019, see *Interactions with predators*). Harvesters report increased wolf abundance in the 1970s and 1980s, possibly in

response to increases in caribou and muskoxen abundance during the 1970s (Adjun 1990). The impact of increased wolf abundance on Dolphin and Union caribou was not discussed in interviews conducted in Ulukhaktok (formerly Holman) in the 1990s (Gunn 2005), but several Ulukhaktok residents interviewed in 2011-2013 reported that the increased abundance and bolder behaviour of wolves and grizzly bears on Victoria Island posed an important threat to caribou survival (Thorpe Consulting Services 2019).

Grizzly bears were first observed on the Island in the 1990s, and community members are concerned about this new predator becoming established in the portion of the range where Dolphin and Union caribou calve (WMAC 2020).

When I was young, there was no bears, no muskox, no caribou those years [on Victoria Island]. A lot of changes happened over the past 18 years. Now there are bears. In the 1950s nothing on Victoria Island, only fish, rabbit and birds (Marion Bolt [Kugluktuk] in Dumond 2007: 18).

Kugluktuk community members did not think that predators were a problem for Dolphin and Union caribou in the 1990s (ENR 1998). By the mid-2000s, it was common for communities to express serious concerns regarding the number of grizzly bears and wolves and how their predation affects caribou and muskox (First Joint Meeting 2015 and Second Joint Meeting 2016 in GNWT and GN 2018, Leclerc, pers. 2013). This was confirmed by Kugluktuk knowledge keepers interviewed in 2018-2020. These participants said predator harvesting requires significant amounts of time, resources, and specialized knowledge. As such, predator harvesting is not practiced to the same extent as it was in the past and has resulted in increased relative abundance of predators compared to the past. Interviewees expressed a desire for more investments of resources and financial support and/or educational opportunities to help reinstate balance in the predator population (Hanke and Kutz 2020). As a step towards improved predator management and in response to community concerns, ENR and WMAC (NWT) implemented a program in 2021 to increase financial incentives for wolf harvesting in the Dolphin and Union range in the Inuvialuit Settlement Region, as described in *Positive Influences.* The OHTC and Inuvialuit Game Council also contributed funds and efforts to increase harvesters' ability to hunt predators (Klengenberg, 2023). Efforts to reduce the grizzly bear population on Victoria Island are supported by Ulukhaktok residents and are currently being pursued with the OHTC (OHTC 2021b).

Increase in Goose Populations

Populations of geese have increased within the wintering range of Dolphin and Union caribou, particularly on the east side of Victoria Island (*Kiiliniq*) and Queen Maud Gulf (*Ugijulik*) (COSEWIC 2017). Higher populations of geese are leading to habitat destruction for caribou in geese nesting

areas. Elders have observed the overabundance of geese is leading to the elimination of vegetation in some areas and intensive trampling is turning the soil into mud (First Joint Meeting 2015 and Second Joint Meeting 2016 *in* GNWT and GN 2018). Some residents have requested there be future work to investigate the impacts of snow geese on caribou habitat (Hanke and WMAC (NWT) in prep.).

POSITIVE INFLUENCES

Several important conservation measures have been established for Dolphin and Union caribou. Dolphin and Union caribou were listed as Special Concern in the NWT under the *Species at Risk (NWT) Act* in 2015. Listing of Dolphin and Union caribou under the *Species at Risk Acts* at the federal and territorial levels meant that there was a territorial and federal requirement to establish a management plan. Before that management plan was completed, COSEWIC re-assessed Dolphin and Union caribou as 'Endangered' in 2017 (COSEWIC 2017). The COSEWIC assessment in 2017 led to the proposed federal listing of Dolphin and Union caribou as 'Endangered' alongside the implementation of the management plan resulted in prioritized research and synthesis across the range. In 2018, the Dolphin and Union Caribou Management Plan was published by the Governments of Nunavut and Northwest Territories with goals to increase use of Indigenous knowledge and promote collaboration across the NWT and NU boundary. These priorities included an increased effort to collect and synthesize Indigenous and community knowledge in research, of which was serendipitous with academic research efforts from the University of Calgary.

The Olokhaktomiut Community Conservation Plan (2016) recommended certain parts of the Dolphin and Union caribou range on Victoria Island for special land management. For example, the Colville Mountain Wildlife Area of Special Interest (Site No. 526C) includes the calving area for Dolphin and Union caribou, and is a category "C" management zone, defined as:

Lands and waters where cultural or renewable resources are of particular significance and sensitivity during specific times of the year. These lands and waters shall be managed so as to eliminate, to the greatest extent possible, potential damage and disruption (OHTC et al. 2016).

The plan recommends various conservation measures to protect caribou (OHTC *et al.* 2016). These include:

- Identify and protect important habitats from disruptive land uses.
- Share harvests with others in the community.
- Do not harvest more than is needed.
- Harvest on sustainable basis, and in manner consistent with recommendations of the OHTC.
- The HTC will implement restrictions on caribou hunting where required.
- A management plan for Dolphin and Union caribou will be developed.

The Inuvialuit region has made progress towards filling the harvest information gap for Dolphin and Union caribou in the NWT through the 2018 Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study. For the first time, the study specifically reported harvest data for Dolphin and Union caribou (Joint Secretariat 2018). Previous studies did not report harvest information by type (Dolphin and Union, Peary, barren-ground), making it difficult to infer changes in harvest rates for the different types from year to year. The Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study is currently paused and undergoing review, but when it resumes, it should continue to provide information. WMAC (NWT) recommended, with support from the OHTC, to ENR in 2021 to implement mandatory sampling and reporting for all caribou harvested on Victoria Island through the OHTC by-laws in the *Wildlife Act* (OHTC 2021a, WMAC (NWT) 2021b). This recommendation is in continued consultation with the community of Ulukhaktok. If this is implemented, in combination with Nunavut TAH and the Ulukhaktok voluntary harvest limit, exact harvest information will be known throughout the Dolphin and Union range, with the exception of the opportunistic harvest from Paulatuk. These actions responded to a high priority knowledge gap noted in the management plan, a need to gather accurate harvest numbers of Dolphin and Union caribou (GWNT and GN 2018).

WMAC (NWT) and ENR implemented a program in 2021 to increase financial incentives for wolf harvesting in the Inuvialuit Settlement Region. This action was done in tandem with activities led by the OHTC, including increased public education, a recommendation for mandatory caribou harvest sampling and reporting for all caribou harvested on Victoria Island, a voluntary maximum harvest of 50 caribou per year with a closure of Dolphin and Union caribou hunting in the spring season in order to allow pregnant cows to migrate and calve (WMAC (NWT) 2021a).

The Ice Breaking Workshop held in Cambridge Bay by the Ekaluktutiak Hunters and Trapper Organization in October 2019 led to the development of specific actions and protocols for mariners while travelling through the Northwest Passage in 2019. Workshop participants

collectively identified the key considerations for operators travelling through the region and dates to avoid ice breaking and other activities for the safety of caribou and hunters (EHTO 2019). Solutions were also discussed for improving communications between local communities and mariners to avoid conflicts with caribou or people. This information was compiled into a Notice to Mariners (NOTMAR) and a communications protocol to "support both voyage planning and actions during a voyage to avoid impacting migrating caribou or people travelling on the sea ice between Victoria Island and the mainland" (EHTO 2019: 9). The outcome of this workshop resulted in the development of a *Notice to Mariners (*NOTMAR*) for Vessels Intending to Navigate the Kitikmeot Region in Canada's Northern Waters,* to mitigate the risks of icebreaking to people traveling on ice and wildlife (DFO-CCG 2022, Transport Canada 2022). The NOTMAR has been in place since 2020. The NOTMAR provides information to mariners about the time (seasonal) and area (location of caribou and people on the ice) considerations that operators traveling through the region should be made aware of. In the NOTMAR, from October 15 to June 30 the vessels are required to provide one week's notice over the phone and/or email to the hamlet of Cambridge Bay and EHTO and to follow-up in advance of their passage (DFO-CCG 2022, Transport Canada 2022). The NOTMAR includes voluntary measures for vessels to slow down to minimum safe speeds if caribou or people are encountered, use local information to avoid passing in front of caribou or people, and avoid opening multiple leads in the ice (DFO-CCG 2022, Transport Canada 2022). In these ways, the NOTMAR is a communications and awareness tool to help avoid a conflict between vessels and caribou migration, as well as people.

As noted in Habitat Trends and Fragmentation, forage is becoming increasingly available on Victoria Island due to climate change. The changes relate to warming temperatures promoting plant growth on the tundra, resulting in vegetation that is richer and more abundant (Thorpe *et al.* 2001). For example, shrubs have increased, plants used for forage and shade are taller, and tundra plants on Victoria Island are more variable and widespread with an increased number of plants growing there (Thorpe *et al.* 2001). Some areas of Victoria Island had no vegetation in the past and are now supporting plant life (Thorpe *et al.* 2001). The changes in vegetation bring caribou to these areas of rich forage, and also change migration routes (Thorpe *et al.* 2001). The increase in forage may lead to an increase in caribou numbers and the health of Dolphin and Union caribou may increase (Thorpe *et al.* 2001).

Harvester Education about wasting caribou meat has had a positive influence in the Kugluktuk area:

Wastage has gone way down compared to past years due to education. However, we used to (with my parents) use even the legs right down to the hoofs but I don't do that anymore. I still bring the legs but we give them away to other people or the dogs. Same for the caribou heads (Allen Niptanatiak [Kugluktuk] in Dumond 2007: 25).

Conservation officers are also educating Kugluktuk community members about efficient and humane hunting practices to decrease wounding loss of caribou, and to ensure hunters understand how to select caribou to promote conservation (Dumond 2007). Kugluktuk harvesters continue to advocate for prioritization of harvester education, covering topics from proper harvesting techniques, etiquette around meat sharing, and specialized predator knowledge, and focusing on hands-on activities that connect harvesters who want to learn with harvesters who want to teach (Hanke *et al.* 2020).

The collaboration on the new survey design used 2020 was an important success for co-management partners. The new survey design was initiated because of community concerns that the survey may be invalidated because of changes in Dolphin and Union caribou behaviour and distribution (more details in Distribution), minimal collars remaining from the spring of 2018 that limited necessary telemetry data, and an urgent co-management need for a new survey following the reporting if a 78% decline in population estimates from 2015 and 2018 (Campbell *et al.* 2021). The survey in 2020 was designed using previous years' survey results, historical and current collar data, a spatial assessment of historical collar data, and new input from community members from Ekaluktutiak HTO, Kugluktuk HTO, and Olokhaktomiut HTC as well as Inuit Qaujimajatuqangit made recently available from academic studies (Campbell *et al.* 2021; Hanke *et al.* 2021, in review). As a result, the new survey design covered a much larger area than previous coastal surveys, including 130,187 km2 (Campbell *et al.* 2021). Of this, 105,577 km2 was on Victoria Island, representing half of the island's surface area, and the remainder was on the mainland (Campbell *et al.* 2021). The change in abundance estimates between the fall 2018 and fall 2020 were not significant but do suggest a continuing decline in abundance of 7% to 13% (Campbell *et al.* 2021). The collaborative process of designing and doing a new population survey for Dolphin and Union caribou in 2021 validated community concerns regarding changes in caribou behaviour and distribution as well as population decline first reflected in the 2018 population estimate, perhaps garnering trust in the contributions among the co-management partners. Further, the survey results suggest important implications for continued monitoring of Dolphin and Union caribou, including locations for collar deployment (Campbell *et al.* 2021).

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2023 Update

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Two preparers from Integral Ecology Group (IEG) were involved in compiling updates for this report. Dr. Thomas Dyck and Megan Spencer both have experience analyzing published and unpublished sources of local and traditional knowledge as part of literature reviews and Indigenous knowledge studies. They are also both familiar with traditional knowledge policies and procedures for sharing community information. Their relevant qualifications and experience are described below.

Thomas Dyck, Ph.D., is an applied human ecologist and geographer. He completed his Ph.D. in the Department of Geography and Environmental Studies at Wilfrid Laurier University (2015) where he explored human environmental interactions and their implications to society, focusing on resource management and environmental change. Thomas works in partnership with Indigenous communities, governments, and industry, contributing his knowledge of social science theory, methodology, and environmental resource management. He has worked throughout Canada, primarily in British Columbia, Alberta, and Ontario.

Megan Spencer, B.A., is a social scientist with a background in ethnoecology and ethnobotany. She received a B.A. in Anthropology and Environmental Studies (2015) and a Diploma in Restoration of Natural Systems (2018) from the University of Victoria. She has worked in the not-for-profit and public sectors on a variety of ethnoecological research projects, with a focus on examining the impacts of environmental change to indigenous food systems. Megan joined IEG in 2019, where she supports land use and cultural research projects with Indigenous communities, governments, and industry, including indigenous knowledge studies, cultural impact assessments, and traditional foods surveys. She has worked in British Columbia and Alberta.

SCIENTIFIC KNOWLEDGE COMPONENT

ABOUT THE SPECIES

Names and Classification

Scientific Name:	*Rangifer tarandus groenlandicus x pearyi (*T. H. Manning 1960)
Common Name (English):	Dolphin and Union caribou; barren-ground caribou (Dolphin and Union population); Victoria Island caribou; Island caribou
Common Name (French):	Caribou de troupeau Dolphin-et-Union
Populations/subpopulations:	Dolphin and Union caribou
Synonyms:	caribou
Class:	Mammalia
Order:	*Artiodactyla*
Family:	Cervidae (Deer)
Life Form:	Animal, vertebrate, terrestrial mammal, deer, caribou

Dolphin and Union caribou are named after the Dolphin and Union Strait; historically, they crossed the strait over sea ice between summer range on Victoria Island and winter range on the mainland (Manning 1960).

Dolphin and Union caribou were first assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as part of Peary caribou (*Rangifer tarandus pearyi*: Gunn *et al.* 1979, Miller 1991), but COSEWIC's latest assessments (COSEWIC 2004, 2017) and COSEWIC's (2011) designatable units report treat Dolphin and Union caribou as a discrete and evolutionarily significant unit (Designatable Unit [DU2]).

Systematic/Taxonomic Clarifications

In terms of evolutionary history, Dolphin and Union caribou belong to the Beringian-Eurasian Lineage, along with barren-ground (*Rangifer tarandus groenlandicus*) and Peary caribou (COSEWIC 2011, Yannic *et al.* 2014).

Dolphin and Union caribou are genetically distinct from barren-ground caribou and Peary caribou (Jenkins *et al.* 2018, McFarlane *et al.* 2016, Serrouya *et al.* 2012, Zittlau 2004) and are estimated to have diverged from barren-ground caribou subpopulations on the mainland about 1000 years ago (Eger *et al.* 2009, McFarlane *et al.* 2016). While Dolphin and Union caribou share haplotypes with members of adjacent Designatable Units (DUs), the retention of some distinct genetic

lineages suggests local adaptations by these caribou. Their physical similarity to Peary caribou (DU1) may reflect similar evolutionary selection pressures, but genetic information suggests a different origin (Eger *et al.* 2009). The uniqueness of Dolphin and Union caribou may also be reflective of a severe population bottleneck that may have occurred in the early 1900s (Manning 1960; Zittlau 2004; McFarlane *et al.* 2014); however, evidence of a past bottleneck was not detected by genetic tests used (McFarlane *et al.* 2016). Although Dolphin and Union caribou are genetically distinct from other caribou, some gene flow has been detected between Dolphin and Union caribou and barren-ground caribou on the mainland (McFarlane *et al.* 2016).

In addition to being genetically distinct from neighbouring caribou, Dolphin and Union caribou differ morphologically from barren-ground caribou in skull shape, antler velvet colour, hoof size, and breeding pelage pattern (Gunn and Fournier 1996; see Description), and are geographically or temporally isolated from most other caribou throughout the year, including for calving and rutting (Gunn and Fournier 2000a, Nagy *et al.* 2011, Nishi and Gunn 2004, Poole *et al.* 2010).

Description

Dolphin and Union caribou are highly recognizable and Inuvialuit easily distinguish them from both barren-ground (mainland) and Peary caribou. Compared to Peary caribou, Dolphin and Union caribou are relatively large in stature and with longer legs (Carpenter pers. comm. 2013 in SARC 2013) and face. Barren-ground caribou are larger than Dolphin and Union caribou and generally darker in colour. The early winter coat of Dolphin and Union caribou is distinctive, being white with a pale brown back. In summer, the coat is light to darker on top and has a less pronounced flank stripe than is typical for barren-ground caribou (Figure 13). The belly is white, and the legs are mostly white except for a narrow frontal brownish stripe. Pelage color is variable between individuals. The pale gray antler velvet is a distinguishing characteristic compared to the brown velvet of barren-ground or woodland caribou.

Figure 13. Dolphin and Union caribou. Photo courtesy K. Poole.

Life Cycle and Reproduction

Information on the breeding strategies of Dolphin and Union caribou is limited, but breeding strategies are likely similar to other caribou/reindeer, where bulls typically mate with more than one cow (Mysterud *et al.* 2003). The rut likely occurs in mid-October during fall migration or during staging on the south coast of Victoria Island, where Dolphin and Union caribou wait for freeze-up before crossing to the mainland (Dumond and Lee 2013, Leclerc and Boulanger 2018, 2020, Nishi and Gunn 2004, Poole *et al.* 2010;).

Calves are born in early to mid-June (Gunn and Fournier 2000a; Nishi 2000; Nishi and Buckland 2000), but it is unclear whether annual variation in the timing of calving reflects the annual variation in the timing of the rut and/or the condition of the cows during pregnancy. Although pre-calving migration is relatively gregarious (groups of dozens of cows), calving is dispersed over much of central Victoria Island east to the eastern coast, and to a lesser extent in the northern portion of the island (Campbell *et al.* 2021, Gunn and Fournier 2000a, Nishi 2000, Nishi and Buckland 2000, Roberto-Charron 2021). Fidelity to calving sites appears to be highly variable with distances between calving sites for individuals in successive years ranging from 10 to hundreds of kilometres (Nishi 2000).

Although reproductive capacity of Dolphin and Union caribou has not been studied, it is likely similar to that of Peary caribou, which usually first breed at two years of age and therefore first calve at three years of age (Thomas 1982). However, under high forage availability and a corresponding high rate of body growth, cows can calve at two years of age (Thomas 1982). Caribou typically give birth to a single calf, and calves generally remain with their mothers until

they are one year old. Annual variation between condition of individual cows and productivity may be high (Moyes *et al.* 2011). When forage availability is high, cows can have a single calf every year. The reproductive lifespan of Dolphin and Union caribou is likely about 12 years as caribou are relatively long-lived. Hughes *et al.* (2009) reported that harvested Dolphin and Union caribou cows were 1.8 years to 13.8 years with a mean age of 6.5 years.

Generation time for Dolphin and Union caribou is estimated as eight to nine years, based on generation time estimates of eight to nine years for barren-ground caribou (SARC 2016) and nine years for Peary caribou (COSEWIC 2015).

Information on adult male composition is limited to two composition surveys: a helicopter reconnaissance survey of eastern Victoria Island in June 1994 (Nishi and Buckland 2000) and a fixed-wing survey along the south shore of Victoria Island in October 2016 (Leclerc and Boulanger 2018). Ratios of bulls/100 cows were 29 bulls/100 cows (56/193) in June 1994 and 15 bulls/100 cows (134/873) in October 2016. Leclerc and Boulanger (2018) suggested interpreting the October 2016 survey with caution due to the difficulty of classifying caribou from fixed-wing aircraft.

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

Physiology and Adaptability

The physiology and adaptability of Dolphin and Union caribou has not been specifically studied. Although they are adapted to extreme cold, their tolerance of heat is unknown. Like all caribou, Dolphin and Union caribou have relatively broad hooves for their body mass (Manning 1960), which is likely an adaptation to their forage being covered in snow 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 possibly higher levels of natural wind-blown dust on the forage. Adult reindeer/caribou coats have thick hollow guard hairs with air-filled cavities and thin woolen underfur which provides insulation. This is the primary mechanism used by adult reindeer/caribou to thermoregulate in the cold (Soppela *et al.* 1986). Hollow fur also keeps reindeer/caribou buoyant when swimming.

Dolphin and Union caribou likely adapt to varying forage availability through their foraging strategies, which include local or long-distance movements and migrations when winter snow and ice conditions are exceptionally restrictive. Those movements include crossing the sea ice to reach mainland winter ranges characterised by a higher amount of vegetation (Hughes 2006) and more varied terrain and snow conditions.

Dolphin and Union caribou have larger hind guts and stomachs than Norwegian reindeer which indicates a better ability to digest coarse forage (e.g., gramminoids), but they are less adapted to coarse forage than muskoxen (*Ovibos moschatus*; Stalaand *et al.* 1997).

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

Limited information is available on diet of Dolphin and Union caribou. Data on late winter diet based on collections of adult cows in late winters 1987-91 and fall 1992 suggest that the diet consisted of mostly evergreen shrub leaves (*Dryas*, *Ledum*), sedges (*Carex* spp.) and willow (*Salix* spp.) typically of upland plant communities (Gunn unpubl. data 1992). In November 1992, caribou were feeding more on sedges, but dwarf shrubs still dominated their diet with forbs, lichen and moss forming only a small fraction of the diet. The use of upland communities was also described by Schaefer *et al.* (1996) and Hughes (2006) based on the distribution of fecal pellets among vegetation classes on southeastern Victoria Island. In April – May 2004, Hughes (2006) compared the diet of Dolphin and Union caribou on Victoria Island and on the mainland during spring migration. Caribou on the island had higher proportions of *Dryas* spp, grasses and sedges compared to arctic heather (*Cassiope tetragonia*), lichen, shrub and twigs in their mainland diet.

Dolphin and Union caribou

Information on Dolphin and Union caribou interactions with each other is mostly based on information collected during aerial surveys. During summer surveys (June to August), caribou were found in small groups averaging 2-3 caribou (Table 5). Group size was larger during fall when caribou congregated on the south coast of Victoria Island, prior to crossing the sea ice to the mainland (Table 5). Average group size and the largest group size in the fall decreased from 1997 to 2018 coinciding with a decrease in population size (see *Population Trend*), although median group size varied between six and ten caribou during that period.

Table 5. Group size of Dolphin and Union caribou during fixed-wing aerial surveys.

Date	Area	Group size					Source[6]
		Range	Mean[1]	SD[2]	SE[2]	Median	
Summer							
1980 July/Aug	Victoria Island		3.5[3] (125)		0.41		Jackimchuk and Carruthers 1980
1987 June 8-21	West-central and northwest Victoria Island		2.1[4]		0.3		Gunn and Fournier 2000a
1994 June 5-17	Western Victoria Island	1-9	2.0 (939)	1.5		1	Nishi and Buckland 2000
2010 July 28 – Aug 15	Northwest Victoria Island	1-9	2.4				Davison and Williams 2013
Fall							
1997 Oct 19-22	South coast Victoria Island	1-477	15.8 (322)	34.4		8	Nishi and Gunn 2004[5]
2015 Nov 2-5	South coast Victoria Island	1-135	15.2 (210)	16.7		10	Leclerc and Boulanger 2018
2018 Oct 31-Nov 5	South coast Victoria Island	1-35	8.4 (91)	7.3		6	Leclerc and Boulanger 2020

[1] (N) = number of groups counted
[2] SD=Standard deviation; SE = Standard error
[3] Excludes singles (n=100 groups); includes some Peary caribou groups
[4] Includes some Peary caribou groups
[5] Typical group size (the size of group that the average animal found itself in [Jarman 1974]) was 90.5
[6] Group size data were not reported in Campbell *et al.* 2021

Interactions with other herbivores

Dolphin and Union caribou share their ranges with several smaller-bodied herbivores: Arctic hare (*Lepus arcticus*), ptarmigan (*Lagopus* spp.), and lemming (*Dicrostonyx groenlandicus, Lemmus trimucronatus*). Numbers of these smaller herbivores fluctuate on the Arctic Islands. In the mid-1990s, winter habitat use patterns of hares and ptarmigan in southeast Victoria Island were distinct from Dolphin and Union caribou, which were strongly correlated with upland vegetation (Schaefer *et al.* 1996). However, it is uncertain how or under what conditions the smaller-bodied

herbivores affect caribou foraging or, as alternative prey, sustain predation on Dolphin and Union caribou.

Lesser snow geese (*Anser caerulescens caerulescens*) have been increasing in the Central Arctic since the 1970s and are currently categorized as overabundant (CWSWC 2020). Although it is unclear how the increase in snow goose numbers may be affecting Dolphin and Union caribou, impacts will likely be localized near colonies, which are located primarily in the eastern portion of the Dolphin and Union caribou mainland winter range, and on southeastern Victoria Island (Kerbes *et al.* 2014).

Dolphin and Union caribou also share Victoria Island with Peary 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 collared Dolphin and Union female caribou overlapped with collared Peary caribou (see Davison and Williams 2013, Gunn and Fournier 2000a, Nagy *et al.* 2009a). 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 collaring the portion of the Dolphin and Union caribou population that migrates to the mainland, which would have a lower opportunity for overlapping with Peary caribou.

Dolphin and Union caribou range also overlaps with barren-ground caribou range on the mainland during winter. One satellite-collared female caribou, a presumed Dolphin and Union caribou, caught 100 km east of Kugluktuk in March 2001 and on the western portion of the Dolphin and Union mainland winter range, subsequently travelled within the range of the Bluenose East population for the next three years (until the collar dropped off on schedule in March 2004), including movements near Horton Lake and along the Great Bear River west of Délı̨nę (SARC 2013). That caribou did not travel to Victoria Island during the three-year period. During a helicopter survey in May 2003 on the mainland coast between Kugluktuk and east of Hope Bay, three mainland-looking cows were observed among 620 classified Dolphin and Union caribou cows (approx. 0.5%) (Dumond, unpubl. data 2012). During recent years, Dolphin and Union caribou have overlapped with Ahiak barren-ground caribou during winter on the east side of Bathurst Inlet and have been found together in mixed groups (Leclerc and Boulanger 2018). Dolphin and Union were also reported to have intermixed with barren-ground caribou in the area north of Contwoyto Lake by the Kugluktuk Angoniatit Association (Roberto-Charron 2021).

Across the Arctic, interactions between caribou and muskoxen are a controversial topic and opinions differ whether and under what conditions caribou and muskoxen compete for space and/or forage or influence each other's parasite and predator relationships (summarised in Larter *et al.* 2002, Gunn and Adamczewski 2003). Although assessing muskoxen population size and

trends across all of Victoria Island is challenging due to the large size of the island and differences in survey methods, overall, muskoxen numbers increased on Victoria Island between the early 1980s and late 1990s, but have decreased since then (Leclerc 2015). In northwestern Victoria Island, muskoxen numbers declined between 2001 and 2005 (Nagy *et al.* 2009b, c), stabilized between 2005 and 2015 at just over 11,000 animals (Davison and Williams 2019), and further declined between 2015 and 2019 (Davison and Williams 2022). In the Nunavut portion of Victoria Island, muskoxen decreased from about 19,000 animals in the late 1990s to about 10,000 animals in 2013 and 2014 (Leclerc 2015).

Muskoxen use of plant communities during the period of increasing abundance appears to have changed on southern Victoria Island. In the mid-1990s, muskoxen foraged more in the lower-lying sedge and willow communities and, during snowmelt, in the upland drier communities (Schaefer and Messier 1995, Schaefer *et al.* 1996). B By 2003, muskoxen appeared to be feeding in all communities (Hughes 2006). Both muskoxen and caribou forage on sedges, but overlap in diet and/or habitat use is not evidence for a competitive relationship. Overlap does increase the possibility. Dolphin and Union caribou and muskoxen may share several species of gastro-intestinal nematode worms, which suggests a potential for cross-transmission between the two (Hughes *et al.* 2009).

Predation

Arctic wolves[4] (*Canis lupus arctos*) prey on Dolphin and Union caribou, but there is no direct information on predation rates on Dolphin and Union caribou. One indicator that could be used to assess wolf predation pressure is sightings of wolves during aerial surveys for caribou and muskoxen (Table 6), and the wolf sightings from ground-based field researchers. Aerial survey sightings suggest wolf numbers have increased since the mid-1990s. Miller and Reintjes (1995) compiled wolf sightings from field researchers from across the Arctic. For Victoria Island, wolves were only seen during 5 of 101 weeks of fieldwork during 1987-90, which was lower than for Banks Island, where wolves were observed during 50 of 189 weeks of fieldwork from 1974-90. The greatest number of wolves seen during aerial surveys was during the most recent survey in fall 2020 (Table 6). On northwest Victoria Island, hunters reported seeing more wolves in the 1980s than before (C. Adjun *in* Gunn 2005). Of 27 wolf stomachs collected from northwest Victoria Island from 1998 to 2001, mostly from the Peary caribou range, 3 contained Peary caribou (Larter 2013).

[4] Hereinafter referred to as "wolves"

Seasonal survival of collared Dolphin and Union caribou cows from 1999-2006 indicated a lower survival rate during mid-to late winter on the mainland coast (Poole *et al.* 2010), which was likely associated with predation (Patterson unpubl. data 2002).

Table 6. Summary of wolf observations during aerial surveys for caribou and muskoxen, Victoria Island, 1959-2020.

Date	Location	Observation	Reference
1959	Tahoe Lake 9930 km^2 surveyed	Wolf heard howling No wolves sighted	Macpherson 1961
1987 June 1988 June	Western and central Victoria Is.	No wolves sighted	Gunn and Fournier 2000a
1994 June	Western Victoria Island	No wolves sighted	Nishi and Buckland 2000
1994 June, Oct 1995 June 1996 June 1997 June, Oct	Southern and central Victoria Island	No wolves sighted	Nishi 2000
1997 Oct 17-22	Southern Victoria Island	No wolves sighted	Nishi and Gunn 2004; Nishi pers. comm. 2012
1998 Jul 15 - Aug 15	Northwest Victoria Island.	1 pack of 5 wolves	Nagy *et al.* 2009a
2001 Jul 16-21	Northwest Victoria Island	11 wolves	Nagy *et al.* 2009b
2005 Jul 6-8	Northwest Victoria Island	12 wolves (10 on Peary caribou range)	Nagy *et al.* 2009c
2007 Oct 24-30	Southern Victoria Island	11 wolves in 2 packs	Dumond and Lee 2013
2010 Jul 28 - Aug 15	Northwest Victoria Island	19 wolves (13 on Peary caribou range)	ENR unpubl. data 2010
2015 May 8-1	Northwest Victoria Island	16 wolves	Davison and Williams 2019.
2019 May 8-24	Northwest Victoria Island	4 wolves	Davison and Williams 2022.
2020 Oct 23-Nov 3	Southern, western and southeastern Victoria Island	28 wolves in 10 groups	Campbell *et al.* 2021

Grizzly bears have expanded their range in the Canadian Arctic (Doupé *et al.* 2007), with increasing frequency of sightings on the NWT Arctic islands, including a sighting during a caribou and muskoxen survey on northwest Victoria Island in 2019 (1 bear, Davison and Williams 2022). Based on a number of anecdotal reports, grizzly bear numbers within the range of Dolphin and Union caribou appear to have increased. Dumond (2007) reported comments from two

Kugluktuk residents noting that grizzly bear numbers were increasing. N. Nasogaluak and P. Ekpakohak reported that more grizzly bears had been observed on Banks and Victoria islands than in the past (Slavik *et al.* 2009, Slavik 2011). During extensive fieldwork (both ground-based and with five days of helicopter surveys for raptors) in the Hope Bay area in 1984-86, averaging 3-3.5 months per summer, only one bear was observed annually (Poole, unpubl. data 1986). In 2009, seven individual bears were observed within 50 km of the Doris North mine site at Hope Bay during 2 days of helicopter surveys for raptors (Poole unpubl. data 2009). The apparent increase, at least in mainland Nunavut, may be related to fewer bears being harvested for food in recent years (Dumond 2007). Additional factors may be related to changes in abundance of large prey populations (muskoxen and caribou), or the progression of greater plant productivity northward as a result of climate change, resulting in higher quality forage and possibly increased small mammal populations (Dumond pers. comm. 2012b).

Given their known use of caribou as a dietary source (Gau *et al.* 2002), it is possible that grizzly bears are a predator of Dolphin and Union caribou. Although grizzly bear predation is likely, the contribution of grizzly bear predation to mortality of Dolphin and Union caribou is not known. Local knowledge holders from southern Victoria Island indicated an increase in the proportion of muskox predation mortalities attributed to grizzly bears (Tomaselli *et al.* 2018).

Parasites and disease

Although parasites and evidence of exposure to diseases have been documented in Dolphin and Union caribou (e.g., Aguilar and Kutz 2020, Carlsson *et al.* 2019, Gunn *et al.* 1991b, Hughes 2006; Hughes *et al.* 2009, Kutz *et al.* 2013, Nishi 2000;), little is known about the effects of parasites and diseases at the population level.

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; Aguilar and Kutz 2020, Carlsson *et al.* 2019). Of the seven pathogens tested, *Brucella suis* Biovar 4 and *Erysipelothrix rhusiopathiae* are of most concern to caribou. Exposure to *Brucella* was higher for Dolphin and Union caribou than for other Arctic caribou populations (Carlsson *et al.* 2019). Body condition and pregnancy rates 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*, *Brucella suis*) in Dolphin and Union caribou was detected when the population was declining (Carlsson *et al.* 2019). Dolphin and Union caribou 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).

Erysipelothrix rhusiopathiae was first detected on Victoria Island 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* had 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). For muskoxen, 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 (Mavrot *et al.* 2020). *E. rhusiopathiae* has also been linked to boreal caribou mortalities in northeastern British Columbia in 2013 (Bondo *et al.* 2018).

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 (n=37)	0[3]	0-9[3]
Neospora caninum	Protozoan	Unknown (but causes abortions, mummified foetuses and weak calves in domestic animals) (n=37)	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; sample sizes varied from 170 to 197 except for Herpesvirus which was 97)
[3] from Carlsson *et al.* 2019 (data from 2015 and 2016; sample size = 37)

The most prevalent pathogen, alphaherpes-virus (Table 7), was detected in 87% of Dolphin and Union caribou animals tested (n = 97; Aguilar and Kutz 2020), which was higher than in most other Arctic caribou populations, except for the Beverly and Ahiak barren-ground caribou herd and the Qamanirjuaq barren-ground caribou herd (Carlsson *et al.* 2019). Although Carlsson *et al.* (2019) did not find a relationship between exposure to alphaherpes-virus and body condition, they cautioned that their samples were not collected specifically to detect that relationship, and that further studies are needed to assess impacts of alphaherpes-virus on caribou health.

Only a few instances of parasites – *Besnoitia tarandi* and cystocercus (tissue infection after exposure to eggs of *Taenia* spp) – were detected during examination for parasites from 62

caribou collected during 1987-90 on southern Victoria Island (Gunn *et al.* 1991b). *Besnoitia tarandi* was detected in 44% of caribou tested from 2015 to 2019 (n=81); however, differing methods of detection between the two studies did not allow for a direct comparison of parasite levels between the two collection periods (Aguilar and Kutz 2020).

Warble fly levels were higher in Dolphin and Union caribou collected during spring (April) 2001 to 2003 (Hughes 2006) than for caribou collected during spring (March/April) from 1987 to 1990 (Gunn *et al.* 1991b). For Dolphin and Union caribou, higher abundance of warble larvae was associated with reduced spring (April) body condition of adult females and reduced probability of being pregnant. In addition, higher levels of abomasal nematode parasites in Dolphin and Union caribou were associated with reduced body weight (Hughes *et al.* 2009).

Climate change is expected to result in more favourable conditions for parasites and pathogens. Activity of some parasites, such as warble flies, and corresponding harassment increases with warmer temperatures (Hagemoen and Reimers 2002). Based on temperature and wind data, cumulative warble index and length of warble season increased on average 7% and 2% per decade, respectively, between 1979 and 2009, and within that period, peak values in warble index occurred in the last half of the 1990s and in 2006-07 (SARC 2013). Climate change also likely facilitated the range expansion of the lungworm *Varestrongylus eleguneniensis* to Victoria Island (Kafle *et al.* 2020, Kutz *et al.* 2013). *V. eleguneniensis* was first detected on southern Victoria Island in Dolphin and Union caribou in 2011 and in muskoxen in 2010 (Kutz *et al.* 2013). Since then, in muskoxen, it expanded further north as the zone of suitable climate expanded further north (Kafle *et al.* 2020).

Humans

Harvesting is part of Indigenous culture. Harvesters from Ulukhaktok and Cambridge Bay hunt Dolphin and Union caribou during their migrations nearer to those communities. The return of the migration of the Dolphin and Union caribou to the mainland after an absence from approximately the 1920s to 1980s meant that Inuit harvesters from the mainland communities were able to re-establish hunting patterns that had largely been absent for generations (Gunn *et al.* 1997). See also *Distribution Trends*.

In 2021, the Olokhaktomiut (Ulukhaktok) Harvesters and Trappers Committee (OHTC) initiated a voluntary annual harvest limit of 50 Dolphin and Union caribou and a spring hunting closure from April 15 to July 15, to protect caribou during spring migration and calving (GNWT and GN 2021). In addition, the OHTC has requested implementation of a by-law for mandatory sampling and reporting of all caribou on Victoria Island to better track harvests (GNWT and GN 2021).

Although the NWT summary of hunting regulations (ENR 2021b) includes hunting seasons for NWT resident hunters, and for non-resident and non-resident-alien hunters, there has been no resident, non-resident or non-resident-alien harvest for at least 15 years, and the resident, non-

resident and non-resident-alien seasons are in the process of being removed from the regulations based on recommendations from the OHTC, the Wildlife Management Advisory Committee (WMAC NWT) and the Inuvialuit Game Council (IGC) (R. Gau, pers. comm. 2021). Hunting of Dolphin and Union caribou for General Hunting License holders is open in Wildlife Management Area I/DU/04 (Figure 14; ENR 2021b).

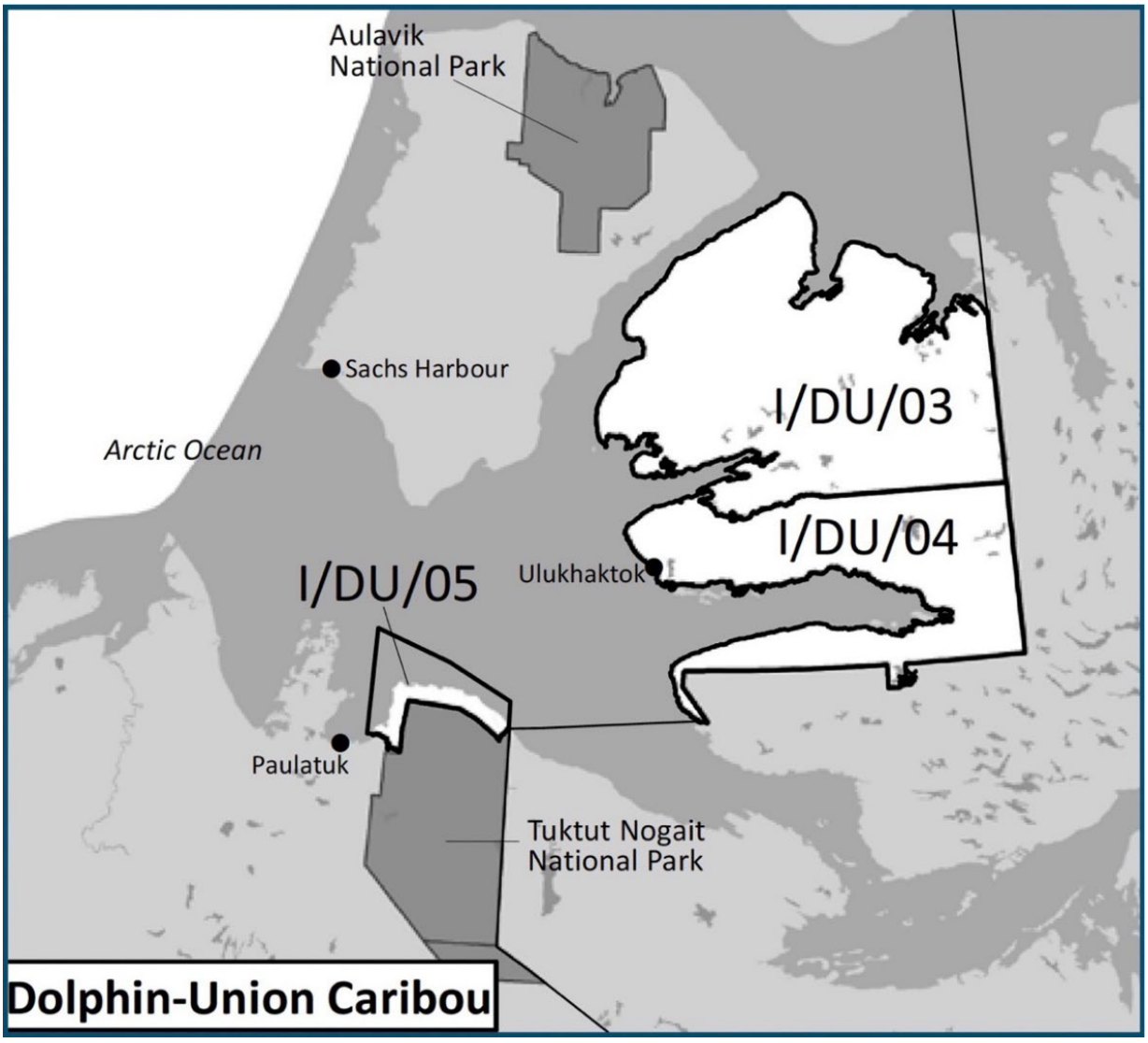


Figure 14. Government of the Northwest Territories Wildlife Management Areas for Dolphin and Union caribou (ENR 2021b).

In Nunavut, harvest is restricted to Inuit hunters only (GNWT and GN 2021) and in August 2020 the Government of Nunavut (GN) implemented an interim Total Allowable Harvest of 42 Dolphin and Union caribou in response to a decline in the population detected during the 2018 population survey (see *Population - Abundance*) (GN DOE 2021a). The Total Allowable Harvest of 42 represented a precautionary harvest level of 1% of the 2018 population estimate, which was consistent with harvest rates for neighbouring caribou populations (GN DOE 2021a). Following a

review by the Nunavut Wildlife Management Board (NWMB), the Total Allowable Harvest was adjusted to 105 Dolphin and Union caribou in January 2021, which represents 2.55% of the population estimate, and which was based on changes to the harvest limits recommended by co-management partners (GN DOE 2021a). In 2021, 30 caribou were allocated to the community of Kugluktuk and 75 were allocated to the community of Cambridge Bay; the allocation among the two communities will alternate each year (i.e., in 2022, 30 caribou were allocated to Cambridge Bay and 75 to Kugluktuk) (A. Roberto-Charron, pers. comm. 2021). In May 2021, after reaching the allocation of 75 caribou, the 2020-21 harvest in Cambridge Bay was closed (GN-DOE 2021b).

The current combined OHTC and GN allowable harvest of 155 Dolphin and Union caribou represents 4.1% of the 2020 population estimate (see *Population - Abundance*). A small opportunistic harvest sometimes takes place out of Paulatuk in I/DU/05.

Trends in Dolphin and Union caribou harvest are difficult to assess because efforts to collect information have varied over time and Dolphin and Union caribou were not always distinguished from other caribou when harvest was recorded. Overall, harvest levels of Dolphin and Union caribou appear to be related to trends in the abundance and distribution of neighbouring populations of Peary caribou and barren-ground caribou. In 1993, the OHTC passed a zero-harvest by-law to stop Peary caribou hunting in Northwestern Victoria Island (enforced by Government of the Northwest Territories (GNWT) legislation) in response to a decline in Peary caribou numbers. Concerns were raised about whether the harvest of Dolphin and Union caribou would increase as a result (Nishi and Buckland 2000). Based on available harvest information, Dolphin and Union caribou harvest by people from Ulukhaktok in Prince Albert Sound varied between 44 and 381 per year between 1987 and 1996, and between 32 and 360 per year from 1998 to 2010 (Table 8; ENR 2012, 2021a, Gunn 2005, Nagy unpubl. data 1998, RWED 1998).

Table 8. Available harvest information for Dolphin and Union caribou 1982/83 to 2020/21.

	Reported harvest: Dolphin and Union caribou[1,2]		Estimated harvest: All caribou[3,4,5]			
	Ulukhaktok	**Paulatuk**	**Bathurst Inlet**	**Cambridge Bay**	**Kugluktuk**	**Umingmaktok**
1982-83				2351 ± 59	2279 ± 117	479 ± 14
1983-84	172			1445 ± 24	2027 ± 69	298 ± 3
1984-85	134			±		
1985-86	154					
1986-87	76					
1987-88	44					
1988-89	110					
1989-90	189					
1990-91	222					
1991-92	308					
1992-93	202					
1993-94	351					
1994-95	277					
1995-96	381					
1996-97			117 ± 21	1653 ± 362	1561 ± 156	314 ± 28
1997-98	174		83 ± 31	359 ± 39	1462 ± 137	247 ± 17
1998-99	No data		98 ± 19	654 ± 63	1913 ± 155	155 ± 15
1999-00	>123		75 ± 17	715 ± 65	1584 ± 134	111 ± 11
2000-01	>254		94 ± 41	672 ± 429	1355 ± 125	52 ± 13
2001-02	>148					
2002-03	240					

	Reported harvest: Dolphin and Union caribou[1,2]		Estimated harvest: All caribou[3,4,5]			
	Ulukhaktok	**Paulatuk**	**Bathurst Inlet**	**Cambridge Bay**	**Kugluktuk**	**Umingmaktok**
2003-04	113					
2004-05	298					
2005-06	360					
2006-07	170					
2007-08	188					
2008-09	32					
2009-10	59					
2010-15	No data for 2010-11, 2011-12, 2012-13, 2013-14, 2014-15					
2015-16	No data		250-400 Dolphin and Union caribou			
2016-17						
2017-18						
2018-19	98[2]	11[2]				
2019-20	No data					
2020-21						

[1] Sources: Gunn (2005): 1983/84 - 1986/87; RWED (1998): 1987/88 - 1995/96; ENR (2012): 1997/98 - 2011/12; ENR (2021a): 2012/13 - 2017/18, 2019/20 - 2020/21; Joint Secretariat (2018): 2018/19

[2] Annual reporting periods: July 1 - June 30, except 2018/19 which is January 1 to December 31

[3] Sources: Jingfors (1986): 1982/83 - 1983/84; Priest and Usher (2004): 1996/97 - 2000/01; GN DOE (2021a): 2015-2017

[4] Annual reporting periods: Jingfors (1986): October - September; Priest and Usher (2004): June - May

[5] Dolphin and Union caribou were not distinguished from other caribou in the harvest estimates

By 2006, declines were being reported for the Bluenose-East, Bluenose-West and Bathurst barren-ground caribou populations (Adamczewski *et al.* 2009). Additionally, Dumond (2007) commented that the winter distribution of barren-ground caribou changed and access to them within the Kugluktuk hunting range was limited from fall 2006 to April 2007. Dumond (2007) reported that numbers of caribou (all subspecies) harvested by Kugluktuk hunters was similar between periods 1997-2001 and 2004-07; roughly 1,000-2,000 animals. However, the proportion of the harvest that was Dolphin and Union caribou increased from about 20–30% during 1997-2001 to about 75% in 2006-2007.

Prior to the start of the Nunavut Wildlife Harvest Study in June 1996 (Priest and Usher 2004), there were two smaller scale studies designed to estimate the harvest of Dolphin and Union caribou in the Nunavut Settlement Area. The first study was done by the Kitikmeot Hunters' and

Trappers' Association (KHTA) and ran from January 1994 to May 1995. Then the GNWT Department of Resources, Wildlife and Economic Development resumed the harvest study from October 1995 to June 1996. Average annual harvest of caribou from June 1996 to May 2001 were Kugluktuk (1,575), Umingmaktok (176), Bathurst Inlet (93), and Cambridge Bay (811) (Table 8; Priest and Usher 2004). These harvests came from a combination of populations including the Dolphin and Union population. For example, a portion of the Bathurst Inlet and Umingmaktok harvest occurred during summer when Dolphin and Union caribou were not near these communities. Most of the Kugluktuk harvest occurred in areas typically inhabited by Bluenose-East caribou (Priest and Usher 2004).

In addition to the subsistence harvest described above, Dolphin and Union caribou supported a sports harvest quota of about 40 tags in Cambridge Bay, with roughly 20-30 caribou harvested annually (SARC 2013). Between 1997/98 and 2006/07, about 15 Dolphin and Union caribou were harvested each year as part of sport hunt out of Kugluktuk (Dumond 2007). In 2007, the Kugluktuk Hunters and Trappers Organization (KHTO) stopped all commercial and sport hunting of caribou, only the subsistence harvest was permitted (GNWT and GN 2021). In 2017, the Ekaluktutiak Hunters and Trappers Organization (EHTO) reduced the sport hunt quotas before halting it in 2019 (GNWT and GN 2021). There are also no guided caribou hunts conducted out of Ulukhaktok in the NWT (GNWT and GN 2021).

Nishi and Gunn (2004) suggested that an extrapolated total harvest of 2,000 to 3,000 Dolphin and Union caribou per year, based on the reported caribou harvest from the Kitikmeot Harvest Study and the proportion of arctic island caribou reported in harvest studies, was high with respect to the October 1997 population estimate. While the numbers of Dolphin and Union caribou harvested for subsistence by communities were not known, the annual harvest rate in the years prior to 2011 was estimated to be between 2,000 and 3,000 animals from Nunavut communities and less than 200 from the NWT (Governments of Northwest Territories and Nunavut 2011), which represented about 7–11% of the 2007 corrected population estimate of roughly 27,800 caribou (Dumond and Lee 2013). Unless the caribou population is increasing rapidly and has strong calf recruitment, a 7-11% harvest rate is unsustainable (Boulanger and Adamczewski 2016).

Limited information is available about harvest of Dolphin and Union caribou since 2010. Annual harvest of Dolphin and Union caribou in Nunavut from 2015 to 2017 was estimated to be between 250 and 400 caribou per year (Table 8; GN DOE 2021a). In 2018, the estimated harvest of Dolphin and Union caribou by the community members of Ulukhaktok was 98, with most caribou harvested in August; however, three caribou were harvested in March (Joint Secretariat 2018). Community members in Paulatuk harvested 11 Dolphin and Union caribou in December 2018 because there were not very many other caribou around, so community members travelled further east for Dolphin and Union caribou (Joint Secretariat 2018). The 2021 allowable harvests

represent 4.1% of the 2020 population estimate but does not include potential harvest by Paulatuk community members. Population modelling has been used to estimate and assess the likely effects of harvest varying in scale (% of group) and sex ratio for groups varying in population size and trend (Boulanger and Adamczewski 2016). A harvest rate of 3-5% of the population is likely low risk; however other factors such as weather, predation and cumulative effects have an affect to the population (Boulanger and Adamczewski 2016).

PLACE

Distribution

World, Continental, or Canadian Distribution

Dolphin and Union caribou only occur in Canada (Figure 15) and are restricted to Victoria Island and the mainland coast opposite Victoria Island. In Canada, Dolphin and Union caribou only occur in Nunavut (NU) and Northwest Territories (NWT).

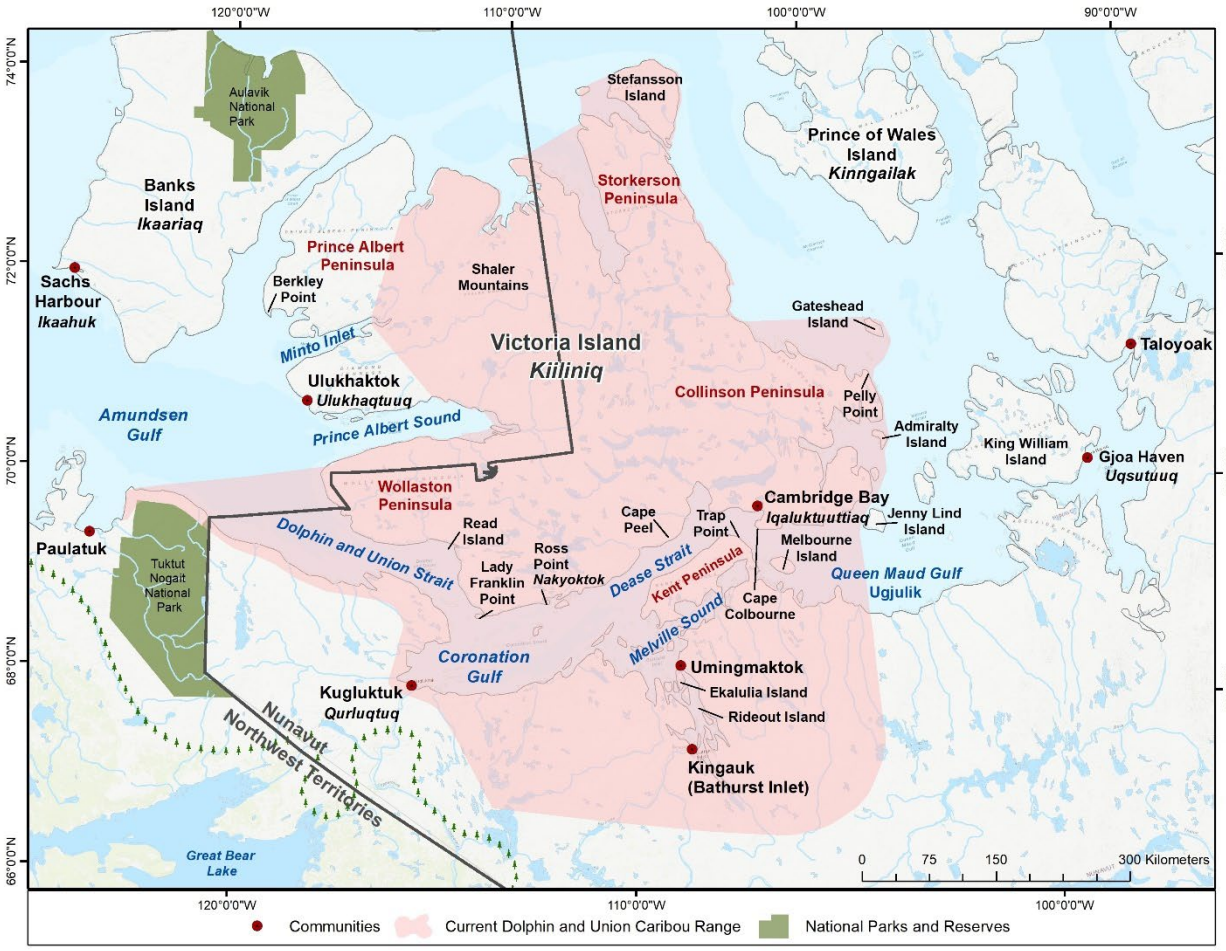


Figure 15. Current range of Dolphin and Union caribou based on Scientific knowledge (Environment and Natural Resources, unpubl. data 2012).

NWT distribution

The distribution of Dolphin and Union caribou within the NWT is limited to Victoria Island, but excludes Prince Albert Peninsula in the northwestern portion of the island (Figure 15). Most of the Dolphin and Union caribou range is located in Nunavut and includes the remainder of Victoria Island including the Wynniatt Bay area, Shaler Mountains and the northern extent of Storkerson Peninsula, as well as the islands off the east coast (Stefansson, Gateshead, Admiralty and Jenny Lind), islands in Coronation Gulf and Dolphin and Union Strait, and the adjacent mainland coast (Figure 15). Distribution and habitat described in this report includes the entire range of the Dolphin and Union caribou population. The current distribution is naturally continuous (unfragmented) and there is a single geographical population.

Currently, Dolphin and Union caribou use the NWT portion of their range primarily during summer (Campbell *et al.* 2021, Gunn 2005, Gunn and Fournier 2000a, Leclerc and Boulanger 2020, Roberto-Charron 2021), although increasing evidence indicates that some caribou are also using the NWT during winter (see *Distribution Trends*). During calving and summer, Dolphin and Union caribou are distributed throughout their range on Victoria Island, but in fall most caribou move to the southern portion of the island, where they are found during the rut, prior to crossing the sea ice to the mainland (Campbell *et al.* 2021, Gunn 2005, Gunn and Fournier 2000a, Leclerc and Boulanger 2020, Nishi 2000, Poole *et al.* 2010, Roberto-Charron 2021). Current winter distribution is concentrated on the mainland in Nunavut (Campbell *et al.* 2021); however, caribou were wintering on Victoria Island up to the mid 1990s (Gunn and Fournier 2000a, Nishi 2000; see *Distribution Trends*).

The historic distribution (prior to commencement of aerial surveys in 1980) is summarised in Manning (1960). Archaeological evidence associated with caribou hunting includes caribou hunting sites on southern Victoria Island, such as stone hunting structures for caribou (cairns, shooting pits, and stone fences and funnels) near Wellington Bay (Brink 2005, Savelle and Dyke 2002), and a Thule site with thousands of caribou bones at Lady Franklin Point in southwestern Victoria Island, (Taylor 1965 *in* Brink 2005). The Wellington Bay site is currently used by caribou during fall and spring movements between Victoria Island and the mainland. The archaeological sites suggest that caribou have likely been on the coast and crossing the sea ice for hundreds or possibly even thousands of years.

Extent of Occurrence

The NWT 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 Dolphin and Union caribou was estimated by applying a polygon without concave angles to the range shown in Figure 15 and was 499,449 km^2 for the entire geographical population and 116,841 km^2 for the NWT only.

The range includes the areas where Dolphin and Union caribou have been recorded since aerial surveys began in 1980. It encompasses both known terrestrial sites of use, and water bodies between islands and the mainland, which are used for travel over the sea ice.

Area of occupancy

'Area of occupancy' is defined as 'the area within the extent of occurrence that is occupied by a species, excluding cases of vagrancy' (SARC 2020). The biological area of occupancy for Dolphin and Union caribou was calculated as the range of Dolphin and Union caribou for both the NWT and total distribution and including or excluding sea ice (Table 9). '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).

Table 9. Area of Occupancy and Index of Area of Occupancy for Dolphin and Union caribou.

Distribution	Area included	Area of Occupancy (km^2)	Index of Area of Occupancy (IAO) (km^2)
NWT	Terrestrial + Sea Ice	61,248	64,168
	Terrestrial Only	53,211	54,784
Total	Terrestrial + Sea Ice	386,586	391,292
	Terrestrial Only	300,401	286,336

Location(s)

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). Using this definition, Victoria Island (except Prince Albert Peninsula and the northwest corner of Victoria Island) and the adjacent mainland coast is described as a single extant location based on the threats of climate warming and its effect on sea ice formation, and hunting (see *Threats and Limiting Factors* and *Interactions - Humans*).

Search effort

Distribution of Dolphin and Union caribou in the NWT (on Victoria Island) is based on sightings during systematic aerial caribou surveys conducted since 1980 (Table 10) and on locations of collared caribou, almost all of which were adult females (Figure 16; Campbell *et al.* 2021, Dumond and Lee 2013, Gunn 2005, Gunn and Fournier 2000a, Leclerc and Boulanger 2018, 2020, Nishi 2000, Poole *et al.* 2010, Roberto-Charron 2021). The sheer size of Victoria Island (217,291 km^2) makes it difficult to survey the entire island. The only systematic aerial survey for almost the

entire island (except Storkerson Peninsula and Stefansson Island) was flown in August 1980 using strip transects 1,000 m wide and flown at 120 m above ground level (agl), although the 4-6% coverage was low (Jakimchuk and Carruthers 1980). The three western strata of the 1980 survey contained 92% of the caribou sightings.

The next and last extensive aerial survey covered western Victoria Island (about 63% of the total land mass) in June 1994 and was designed to map calving distribution (Nishi and Buckland 2000). Previous surveys in 1987 and 1988 were unsuccessful in defining the full extent of the calving distribution due to inadequate coverage and poor weather (Gunn and Fournier 2000a). The June 1994 survey was flown at a uniform 10% coverage, 120 m agl flight height, and a 1,000 m strip width (Nishi and Buckland 2000). After 1994, the emphasis for aerial surveys for Dolphin and Union caribou shifted to measuring abundance during fall staging along the south coast of Victoria Island, with surveys conducted in 1997, 2007, 2015, 2018 and 2020 (Table 10). During those surveys, coverage ranged from 10% in low density strata to 29% in high density strata.

In addition, six aerial surveys were conducted on Peary caribou in northwest Victoria Island from 1998 to 2019, which also included a portion of the northwestern summer ranges of the Dolphin and Union population (Davison and Williams 2013, 2019, 2022, Nagy *et al.* 2009a, b, c).

Other information on search effort to map distribution is based on unsystematic aerial and ground observations, and on locations of radio and satellite-collared cows during 1987-89 (*n* = 9), 1994-2006 (*n* = 60), and 2015-2021 (Campbell *et al.* 2021, Dumond and Lee 2013, ENR WMIS unpubl. data 2011, Gunn and Fournier 2000a, Nishi 2000, Leclerc and Boulanger 2018, 2020; Poole *et al.* 2010, Roberto-Charron 2021). The ground surveys included observations of caribou during late winter snow machine surveys for polar bear dens on the islands off the east coast of Victoria Island in the mid-1980s (Gunn *et al.*1991a). Systematic aerial surveys were conducted near the proposed High Lake base metals mining development on the mainland west of Bathurst Inlet during late winter and spring 2005-06, 2008, and 2012 (Poole unpubl. data 2012, Wolfden Resources 2006). Those surveys documented Dolphin and Union caribou as far south as 20-25 km south of the James River in late March, closer to the coast in late April, and within 20 km of the coast and on coastal islands in late May.

A limited amount of information on the distribution of Dolphin and Union caribou was recorded during a muskoxen aerial survey in August 1990 (flown at 300m agl), which included Stefansson Island, Storkerson Peninsula and northeast Victoria Island as far south as Washburn Lake (Gunn and Lee 2000). Four caribou were seen on the south end of Stefansson Island, and 13 caribou were seen on the north end of Storkerson Peninsula and scattered southwest to Washburn Lake. Muskoxen surveys of northwest Victoria Island (Jingfors 1985), and of the Nunavut portion of Victoria Island in August 2013 and 2014 (Leclerc 2015) did not report caribou sightings.

Table 10. Years and survey coverage for Dolphin and Union caribou aerial surveys on Victoria Island, 1980-2020. Muskox surveys with caribou sightings recorded are also included.

Date	Survey coverage within study area (%)	Survey area	Reference
1980 Aug	3-6	Entire island (except Storkerson Pen. and Stefansson Is.)	Jakimchuk and Carruthers 1980
1983 Mar	19.5	Southern Wollaston Peninsula as far east as Richardson Island	Poole 1985 (muskox survey)
1990 Aug	10	NE Victoria Island	Gunn and Lee 2000 (muskox survey)
1994 Jun	10	Western Victoria Island	Nishi and Buckland 2000
1997 Oct	10-20	South coast Victoria Island	Nishi and Gunn 2004
1998 Jul	20	NW Victoria Island	Nagy *et al.* 2009a
2001 Jul	20	NW Victoria Island	Nagy *et al.* 2009b
2005 Jul	10-20	NW Victoria Island	Nagy *et al.* 2009c
2007 Oct	11-20	South coast Victoria Island	Dumond and Lee 2013
2010 Jul-Aug	20	NW Victoria Island	Davison and Williams 2013
2015 Apr-May	20	NW Victoria Island	Davison and Williams 2019
2015 Nov	14-28	South coast Victoria Island	Leclerc and Boulanger 2018
2018 Oct-Nov	10-29	South coast Victoria Island	Leclerc and Boulanger 2020
2019 May	17	NW Victoria Island	Davison and Williams 2022.
2020 Oct-Nov	-	South coast + western + southeastern Victoria Island; northern mainland	Campbell *et al.* 2021

In the NWT, the systematic effort and extent of coverage make it unlikely that there are unexplored areas (at the scale of tens of km) that could harbour Dolphin and Union caribou. The negative data (areas that were searched, and Dolphin and Union caribou were not found) are available in individual survey reports (see *Information Sources*). The scale of daily movements relative to the frequency of surveys makes it unlikely that any areas can be assumed to not be potential habitat.

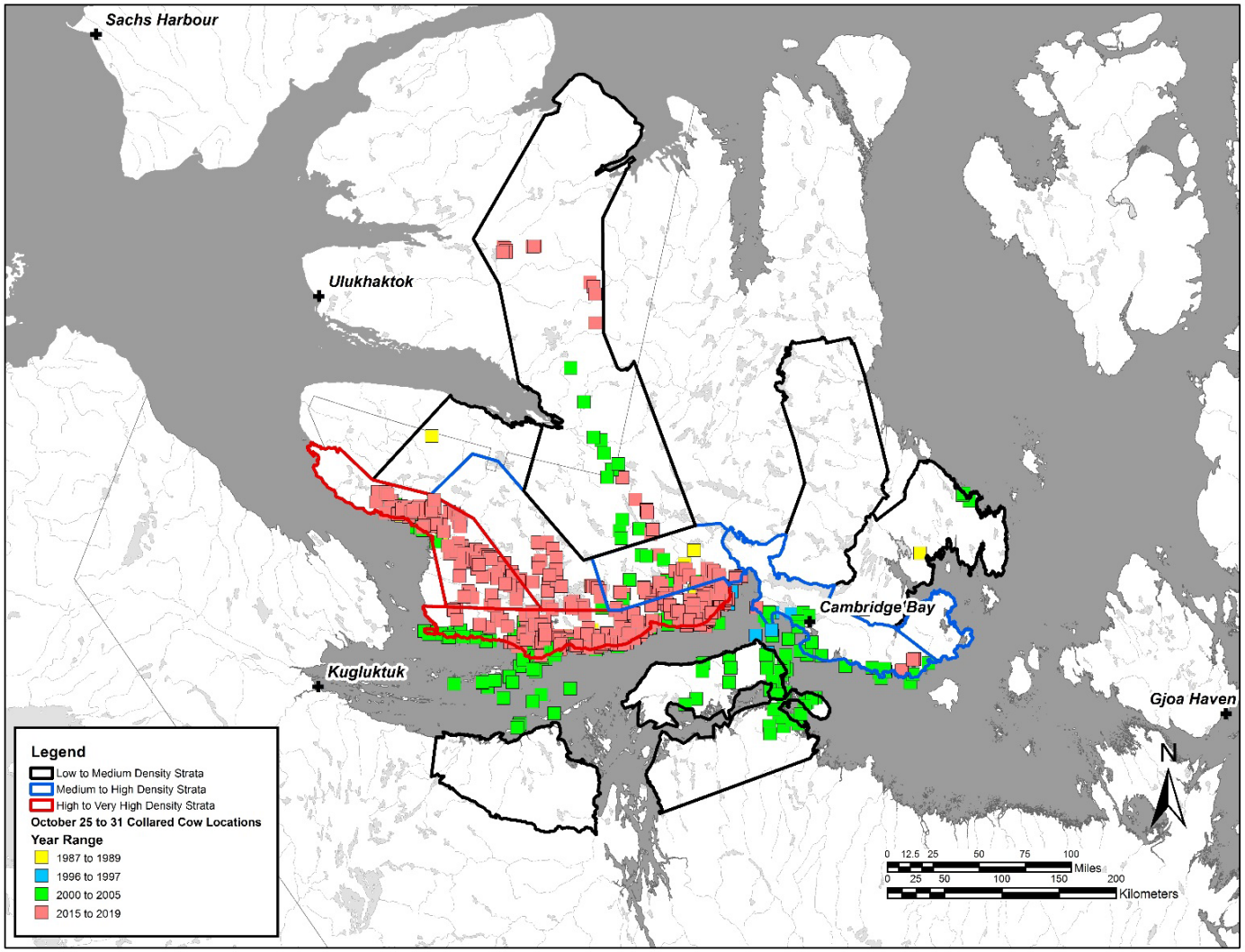


Figure 16. Collared cow locations for Dolphin and Union caribou in late October (1987-2019) based on Nunavut's fall telemetry data, and Nunavut's 2018 abundance fall survey strata (Campbell et al. 2021, with permission).

Distribution Trends

Trends in Dolphin and Union caribou distribution are difficult to assess due to the limited number of aerial surveys conducted and limited number of collared caribou available to base trends on, and changes in abundance (see *Population*). Since the first systematic aerial survey in 1980, surveys have been conducted infrequently, seasonal timing of surveys has changed from early or mid-summer to late fall, and surveys do not always cover the entire seasonal range (Table 10). Measuring trends in distribution based on collared caribou is limited due to small samples and possible unrepresentative distribution of collared animals. Most collared animals are adult females so distribution may not include the full range of adult male distribution. Also, changes in distribution, especially winter distribution, may be linked to changes in abundance, similar to what has been observed for barren-ground caribou (Bergerud *et al.* 2008, Schmelzer and Otto 2003, Taillon *et al.* 2012).

Prior to the 1920s (summarized in Manning 1960), large numbers of caribou migrated in fall and early winter after rutting and staging along the south coast of Victoria Island, and crossed the sea ice to the mainland. Some caribou remained and wintered on Victoria Island (the 'resident' population). As the migrants returned in spring to Victoria Island, they apparently rapidly migrated north and spread over the island. By the early 1920s, the Dolphin and Union caribou population declined, and the winter range contracted such that caribou stopped crossing the sea ice to the mainland coastal areas and wintered on Victoria Island (Gunn 2008, Manning 1960).

Although Banfield (1950) shows a small zone of fall migration crossing from the vicinity of Cambridge Bay to Kent Peninsula and the north coast of Elu Inlet, Manning (1960) suggests that those were barren-ground caribou, and that they were few in number and soon harvested. Banfield (1950) also maps a small patch of caribou summer range at the head of Prince Albert Sound and a narrow arrow representing spring migration from a winter range north of the Richardson Islands.

Corresponding with an increase in abundance of Dolphin and Union caribou between the 1970s and 1997 (see *Population*), the winter range expanded from central Victoria Island to the south coast and then sea ice crossings and wintering on the mainland resumed. This is based upon observations by hunters in the mid-1970s and satellite-collared adult female caribou from 1987 to 1989 and 1996 to 1997 (Gunn *et al.* 1997, Gunn and Fournier 2000a, Poole *et al.* 2010). Fall migration to the mainland by at least some Dolphin and Union caribou had resumed at least by 1976, with sightings on islands at the mouth of Bathurst Inlet (Gunn *et al.* 1997). In 1982, caribou were reported near Umingmaktok well into Bathurst Inlet and on islands within the Coronation Gulf (Gunn *et al.* 1997). In March 1983, Poole (1985) reported relatively high numbers of caribou on the southwest coast of Victoria Island and estimated 1,290 ± 228 SD caribou. Based on unsystematic flights to locate caribou for collaring, in 1987-88, the winter distribution of caribou

included the length of the south coast (Gunn and Fournier 2000a). In 1989, a satellite-collared cow crossed the sea ice to the Jameson Islands at the opening of Bathurst Inlet (Poole *et al.* 2010). In June 1989, sightings on sea ice during a single flight in this area revealed 46 caribou, mostly bulls and juveniles, and about 500 tracks (Gunn *et al.* 1997). By April 1994, caribou were still wintering on the coast south of Cambridge Bay but were also wintering on the mainland coast (Kent Peninsula and Melbourne Island), based on unsystematic flights to locate caribou for collaring (Nishi 2000).

Although some Dolphin and Union caribou were recorded on the small islands in Victoria Strait in the 1980s, there is insufficient information to determine if the use of the eastern islands was a shift in winter and summer distribution or whether it has persisted. In April 1984, 13 caribou were seen on Admiralty Island during a snowmobile survey for polar bears (Gunn *et al.* 1991a). This was the first recorded observation of caribou on Admiralty Island (Gunn *et al.* 1991a). In the following year, only tracks and feeding craters were seen on Admiralty Island (Gunn *et al.* 1991a). Inuit reported that caribou wintered on Jenny Lind Island at least during the 1980s. In April 1986, Gunn *et al.* (1991a) counted 85 caribou on Gateshead Island, which she considered an increase compared to previous years. In July 1986, 33 caribou including six calves were seen as well as the shed antlers of bulls. No collared Dolphin and Union caribou (primarily adult females) used these eastern islands from 1996-2006 and 2015-2020 (Campbell *et al.* 2021).

Based on collar data of primarily adult female caribou, the winter distribution of Dolphin and Union caribou changed between the late 1980s, when wintering was restricted to the southern portion of Victoria Island and a few islands near the mouth of Bathurst Inlet, and the mid-1990s to mid-2000s, when wintering occurred only on the mainland (Figure 17). Data from 1996 to 2006 and from 2015 to 2020 indicate that caribou were distributed almost exclusively on the mainland during winter, with some evidence of winter use on Victoria Island (Campbell *et al.* 2021, Leclerc and Boulanger 2020). Two of 35 caribou monitored in winter 2016/17 remained in northern Victoria Island until they died in February 2017, suggesting that they likely would have spent the entire winter on Victoria Island (Leclerc and Boulanger 2020). Genetic testing of three caribou that were harvested in northwestern Victoria Island by Ulukhaktok harvesters during winter 2018/19 confirmed them as Dolphin and Union caribou (OHTC, unpublished data, 2021). At low population numbers, some Dolphin and Union caribou stop migrating. Data generated from 35 and 49 collared Dolphin and Union caribou from the 2015/2016 and 2018 collaring programs indicated that during the winter of 2016/2017 there were two instances of caribou not crossing to the mainland (Leclerc and Boulanger 2020). Ulukhaktok hunters have also reported observing more Dolphin and Union caribou remain on Victoria Island year-round (Leclerc and Boulanger 2020); these observations are also consistent with observations by Inuit Elders in the 1920s (Campbell *et al.* 2021).

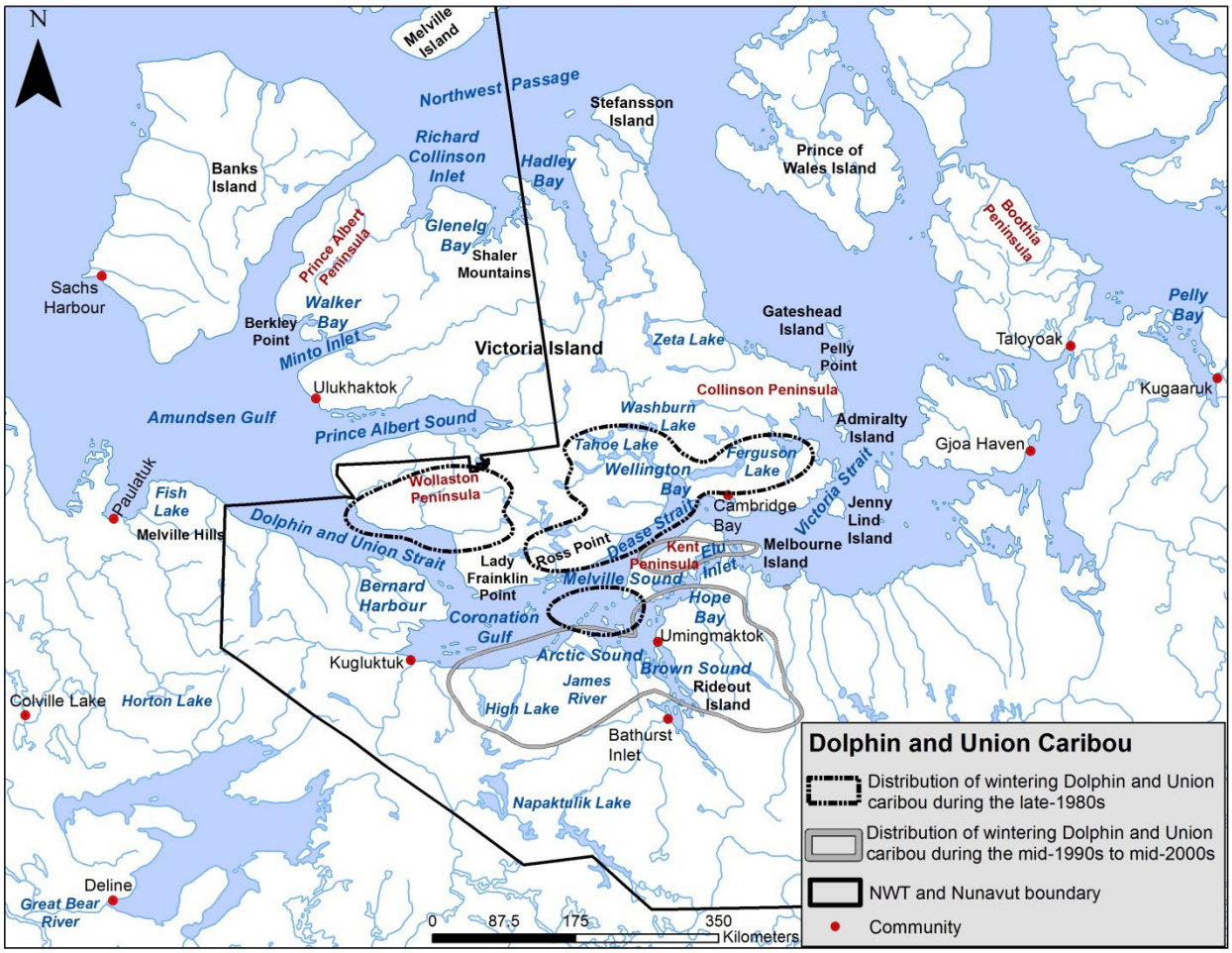


Figure 17. Distribution of wintering Dolphin and Union caribou during the late 1980s (dashed black line 90% fixed kernel polygons) and the mid-1990s to mid-2000s (dark grey polygon). Data from Poole *et al.* (2010).

Trends in calving and summer distributions are less clear and may be influenced by collared caribou sample sizes and caribou capture locations. In the late 1980s, collared adult female caribou captured along the length of the southern coast (n=9) migrated to a calving area on the Wollaston Peninsula (west central Victoria Island) with one cow calving on Collinson Peninsula (eastern Victoria Island); during summer caribou either remained on the Wollaston Peninsula or moved further north across central Victoria Island (Gunn and Fournier 2000a). From 1994 to 1997 (n=8-12), adult female caribou captured and collared in the Cambridge Bay and Kent Peninsula area displayed a more widespread calving distribution that overlapped slightly with the 1987-89 calving on Wollaston Peninsula and was continuous across central Victoria Island including Collinson Peninsula and north to the Storkerson Peninsula and Stefansson Island (Nishi 2000). Satellite-collared adult female caribou on northwest Victoria Island in 1996 (n=3) and 2003 (n=10), tended to calve further north on the island. Caribou captured along the south coast of Victoria Island in October 1999 (n=27) calved across the island closer to the southern coast (Poole *et al.* 2010, SARC 2013). Based on satellite collar location data of primarily adult female caribou

from 1996-2006 and 2015-2020, the highest use areas during calving were in the southwest and south-central portions of the island with less use in the north-central portion of the island, around Cambridge Bay, and on the Kent Peninsula (Campbell *et al.* 2021).

Based on satellite-collared caribou location data of primarily adult female caribou from 2015 to 2020, Leclerc and Boulanger (2020) suggested that the annual range of Dolphin and Union caribou had contracted and shifted to the western part of the historic range, with the portion of the 2015/16 and 2016/17 annual ranges in north-central Victoria Island no longer used by 2017/18, and the portion of the 2015/16 to 2017/18 annual ranges east of Cambridge Bay no longer used by 2018/19. However, this contraction may have been influenced by the sample of collared caribou available each year. By the end of 2016/17, of the 16 collared caribou that used the north-central portion of Victoria Island in 2015/16 and 2016/17, 14 had died and the collars stopped transmitting for the other two (Leclerc and Boulanger 2020). All of the six caribou that used north-central Victoria Island and provided two consecutive summers of data, used north-central Victoria Island for both summers (Leclerc and Boulanger 2020), suggesting no shift in their range use. Hence, the contraction may have resulted from caribou that used the north-central portion of Victoria Island being absent in the sample of caribou collared from 2017/18 to 2019/20, not from a reduction or shift in the range used by individual collared animals. Additionally, use of Dolphin and Union caribou historic range from 2015/16 to 2017/18 in the area east of Cambridge Bay was based on a single caribou that used the area during those three consecutive years, and whose collar stopped transmitting by 2018/19; a second caribou used the area from about November 2015 to January 2016 and then died on the mainland in April 2016 (Leclerc and Boulanger 2020). Two of 36 adult female caribou collared in April 2021 had moved to north-central Victoria Island and to the Storkerson Peninsula in northeastern Victoria Island by mid-July 2021 (Roberto-Charron 2021), suggesting that caribou continue to occupy those portions of their range on Victoria Island.

Movements

Annual movement patterns for Dolphin and Union caribou are broadly similar to barren-ground caribou in that they make pre-calving and fall migrations between Victoria Island and the mainland coasts of Nunavut and NWT. Ungulates are thought to undertake seasonal migration as a strategy to access higher abundance or quality of forage (McCullough 1985; Hughes 2006), or to reduce risk of predation (Fryxell and Sinclair 1988) or parasitism (Folstad *et al.* 1991; Hughes 2006). Trade-offs between predation risk, parasitism risks and forage availability may also be occurring.

Prior to the 1920s, caribou crossed the sea ice in the Dolphin and Union Strait, the Coronation Gulf and the Dease Strait (Freeman 1976, Manning 1960). Caribou were rarely seen on Victoria Island from the 1920s into the 1970s; during this time, there were no reported observations of

caribou migrating across the sea ice and Dolphin and Union caribou numbers were in decline (Manning 1960, Poole *et al.* 2010). And, although some collared caribou over-winter on Victoria Island (see *Distribution Trends*), most have been migrating across the sea ice in the Coronation Gulf and Dease Strait to access winter range on the mainland since the 1970s (Campbell *et al.* 2021, Leclerc and Boulanger 2020, Nishi 2000, Poole *et al.* 2010, Roberto-Charron 2021). Dolphin and Union caribou continue to migrate to the mainland, despite the recent population decline (Leclerc and Boulanger 2000). The migratory behaviour of Dolphin and Union caribou is depended on abundance; at low abundance Dolphin and Union caribou may halt migration across the sea ice and overwinter on Victoria Island (Campbell *et al.* 2021, Hanke and Kutz 2020, Roberto Charron, 2020).

Based on information from satellite-collared caribou (primarily adult females) and aerial surveys (Dumond and Lee 2013, Leclerc and Boulanger 2018, Nishi and Gunn 2004, Poole *et al.* 2010, 2020), Dolphin and Union caribou reach the south coast of Victoria Island in the fall and stage there waiting for freeze-up. The duration of staging is shorter when the caribou have travelled further from their summer ranges on northern Victoria Island (Poole *et al.* 2010). The timing of fall migration and staging in mid-October suggests the rut occurs during either migration or staging.

Hughes (2006) documented that Dolphin and Union caribou migrated in the fall to mainland winter ranges where plant biomass was higher. Forage availability on mainland winter ranges also likely differs from Victoria Island due to differences in snow conditions: Cambridge Bay tends to be windier (mean average wind 19.6 km/hr versus 15.4 km/hr), drier (mean annual precipitation 141.7 mm versus 247.2 mm) and colder (mean annual temperature –-13.9°C versus –10.3°C) than Kugluktuk (ECCC 2021).

Dolphin and Union caribou migration to winter ranges on the mainland ceased following a population decline in the 1920s (Manning 1960). By the 1980s, Dolphin and Union caribou were reported on islands south and east of Victoria Island during winter and by the late 1980s and early 1990s increasing numbers of Dolphin and Union caribou were migrating to winter ranges on the mainland (Gunn *et al.* 1997, Gunn and Fournier 2000a, Nishi 2000). As winter distribution shifted further south to the mainland, the length of pre-calving migration became longer and more caribou were crossing the sea ice. During a helicopter survey in May 1993, over 7,000 caribou had crossed or were crossing Coronation Gulf and Dease Strait (Gunn *et al.* 1997). In 1993, caribou distribution ranged from Bernard Harbour on the mainland east to Cambridge Bay, and aerial systematic surveys estimated 2545 ± 142 SE caribou on Kent Peninsula in March 1993 and 719 ± 83 SE caribou on Melbourne Island in March 1994. Observations suggested that the pre-calving migration started in April and continued to early June. In May 1993, most of the caribou seen were cows, yearlings and a few young bulls. Observations in May 1994 also

suggested that cows and yearlings preceded bulls in the spring migration. Those results fit with the historic observations reported by Manning (1960) before the migrations ceased in the 1920s.

Little is known about dispersal in Dolphin and Union caribou. 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. No information is available for Dolphin and Union caribou dispersal at high densities, but there is evidence suggesting environmentally forced dispersal during severe winters, such as the 1984 shift from eastern areas including Collinson Peninsula to central wintering areas (Gunn *et al.* 1991a). Dolphin and Union caribou could also potentially disperse over sea ice to neighbouring islands such as Banks, Melville or Prince of Wales islands, which are currently within the range of Peary caribou.

Habitat Requirements

Habitat includes specific resources needed such as forage, and habitat attributes that reduce the risk of predation and parasitism. Limited information is available about habitat requirements for Dolphin and Union caribou, especially about reducing risks of predation and parasitism; however, some inferences could be drawn from Peary caribou on neighbouring Banks Island. Willows (*Salix* spp) comprise almost half the summer diet of Peary caribou on Banks Island (Larter and Nagy 2004) and in Aulavik National Park, Peary caribou selected *Dryas* snowbanks during summer (Frandsen and Leblond 2021). During winter, key habitat requirements are 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 for Peary caribou was upland habitats with a shallow snow-cover, even though vegetation was sparse (Larter and Nagy 2001a). During winter, legumes (*Astragalus* spp. and *Oxytropis* spp.) are important dietary items for Peary caribou that are 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).

The range of Dolphin and Union caribou within the NWT is located within the Northern Arctic Level II Ecoregion, with most of Northwest Victoria Island in the Mid-Arctic Level III Ecoregion, except for the portions of the western coastline, which are in the Low Arctic-*north* Level III Ecoregion (Ecosystem Classification Group 2013).

Based on nationally defined ecozones and ecoregions (ESWG 1995), Victoria Island is located in the Northern Arctic Ecozone with the mainland portion of the Dolphin and Union caribou range found within the Southern Arctic Ecozone. The calving, summer and fall ranges on the northern two-thirds of Victoria Island fall mostly within the Victoria Island Lowlands ecoregion. The upland vegetative cover is discontinuous, varies between 5-80% coverage and is dominated by creeping dwarf shrubs including purple saxifrage (*Saxifraga oppositifolia*), *Dryas* spp., and arctic willow,

along with alpine foxtail, wood rush, and other saxifrages (ESWG 1995). Poorly drained areas have a more continuous cover of sedge, cotton-grass, saxifrage, and moss. The terrain consists of undulating lowlands (<200 m elevation) underlain by carbonate rocks. Wetlands are found mostly along the east coast and are dominated by sedge-moss tundra with higher average biomass than most of Victoria Island (ESWG 1995, Gould *et al.* 2003). Dolphin and Union caribou use the Shaler Mountains ecoregion (ESWG 1995), with its relatively rugged, steep-sided flat-topped hills of 750 m elevation as post-calving and summer range. If Dolphin and Union caribou are similar to Peary caribou, calving sites likely provide snow-free or shallow snow-covered sites, at least shortly before and during calving each year (Miller *et al.* 1977, Urquhart 1973).

Unlike barren-ground caribou, Dolphin and Union caribou calving is less gregarious; cows disperse over a relatively large area to calve (Nishi 2000). This calving behaviour may be related to a relatively low density of predators and/or a low vegetation biomass. Aboveground plant biomass in central Victoria Island calving areas is lower (100-500 g/m^2) than aboveground plant biomass on calving ranges of larger barren-ground populations (1,000-4,000 g/m^2) (Gould *et al.* 2003).

The fall range along the south coast of Victoria Island lies within the Amundsen Gulf Lowlands ecoregion (ESWG 1995). The cover of dwarf tundra vegetation tends to be more continuous than that of central and northern Victoria Island and includes erect shrub vegetation, dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp.; willow and sedges dominate moist sites (ESWG 1995). Schaefer and Messier (1994) describe eight vegetation communities in the Cambridge Bay area.

The current winter range on the mainland in Nunavut lies primarily within the Takijuq Lake Upland on the east side of Bathurst Inlet and in the Queen Maud Gulf Lowland on the east side of Bathurst Inlet (ESWG 1995). The area around Bathurst Inlet including nearby islands, islands in the Coronation Gulf and the eastern portion of the Kent Peninsula are located in the Bathurst Hills ecoregion (ESWG 1995). Vegetative cover is more continuous than on Victoria Island and is characterized as shrub tundra (ESWG 1995). Warm, dry sites contain dwarf birch, willow and alder and wetter sites are dominated by sphagnum moss and sedge tussocks (ESWG 1995). Overall, plant productivity and biomass are greater on the mainland than on Victoria Island (Gould *et al.* 2003, Hughes 2006, Raynolds *et al.* 2012). Using NDVI satellite imagery, Hughes (2006) found productivity of vegetation on southern Victoria Island during summer to be annually variable and consistently lower than for the mainland coastal winter ranges.

On Victoria Island, throughout the year, collared Dolphin and Union caribou, primarily adult females, (1996-2006, 2015-2020) were found most frequently in the graminoid land cover class except during calving when heath upland was most frequently used (Campbell *et al.* 2021). Use of the graminoid land cover class was most pronounced during winter, with 60% of locations in

that cover class for the relatively small number of caribou that remained on the island (Campbell *et al.* 2021).

Based on collared female Dolphin and Union caribou from 1999-2004, high suitability habitats on the mainland winter range included: non-tussock sedge, tussock sedge, riparian tall shrub, and low shrub (Wolfden Resources 2006). Heath bedrock/boulders and lichen veneer were rated as moderate suitability, and heath tundra and bedrock/boulders were rated as low suitability.

Climate is generally warmer and wetter on the mainland portion of the Dolphin and Union caribou range than on Victoria Island (Table 11). Maxwell (1981) reported three climate regions cover Victoria Island: northern Victoria Island is influenced by the Arctic Ocean but modified by the effect of multi-year ice to be cold with a relatively short season of annual plant growing degree days; central and eastern Victoria Island has a continental climate similar to the adjacent mainland and is relatively dry and has highly variable seasonal temperatures; and western Victoria Island is influenced by maritime air masses from the northern Pacific and southern Beaufort Sea resulting in more precipitation and cloudiness.

In addition to terrestrial habitat requirements, Dolphin and Union caribou require reliable sea ice for moving between Victoria Island and the mainland (Poole *et al.* 2010).

Table 11. Mean temperature and precipitation of dominant Ecoregions within the Dolphin and Union caribou range (from EWSG 1995).

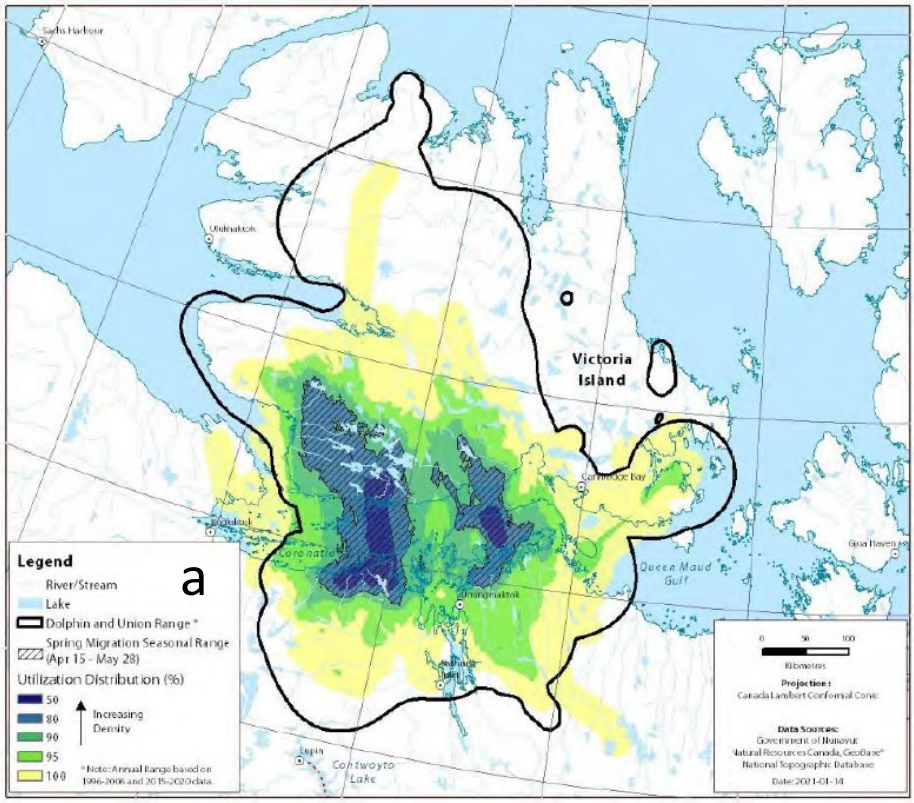
Area	Ecozone	Ecoregion	Annual mean temperature (°C)	Mean summer temperature (°C)	Mean winter temperature (°C)	Mean annual precipitation (mm)
Mainland	Southern Arctic	Bathurst Hills	-12.5	4.0	-28.0	125-200
		Queen Maud Gulf Lowlands	-11.0	5.5	-27.0	125-200
		Takijuq Lake Upland	-10.5	6.0	-26.5	200-300
Victoria Island	Northern Arctic	Amundsen Gulf Lowlands	-14.0	2.0	-28.5	100-200
		Shaler Mountains	-15.5	1.0	-29.5	100-200
		Victoria Island Lowlands	-14.0	1.5	-29.0	100-150

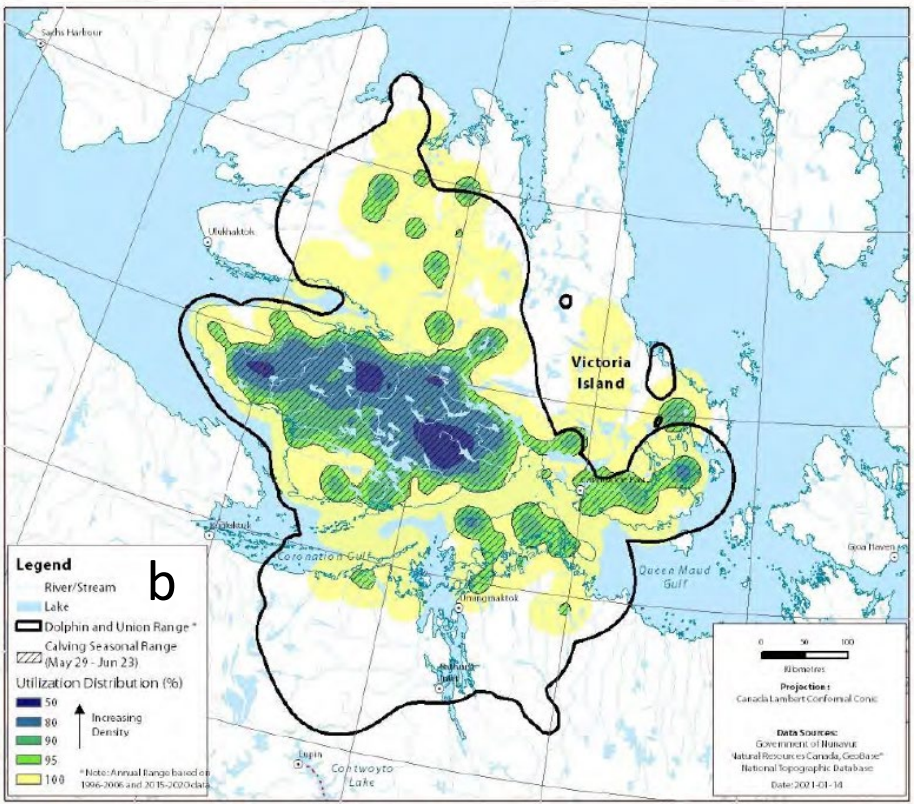
Habitat Availability

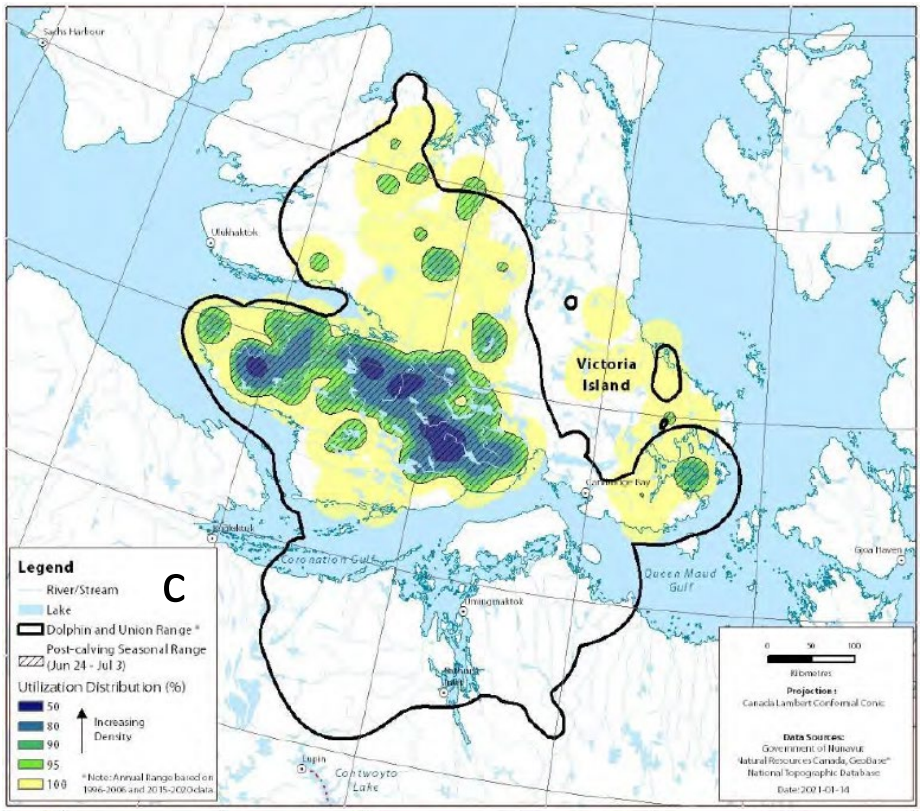
Information on habitat availability for Dolphin and Union caribou is lacking. Habitat availability for 8-9 months of the year is strongly influenced by snow conditions, which is discussed in *Threats and Limiting Factors*. Based on aerial surveys conducted and collared caribou (primarily adult females) tracked since the 1980s, Dolphin and Union caribou have been found to occupy most parts of Victoria Island except for the northwestern-most portion. Limited information on habitat preference and availability, and the large size of the island makes it difficult to assess whether or not suitable habitat is occupied by Dolphin and Union caribou, especially during seasons when caribou are highly dispersed (see *Distribution trends*).

Figure 18 shows seasonal ranges based on collared caribou locations from 1987-1989 and 1996 to 2020 (from Campbell *et al.* 2021). Because seasonal ranges are based on primarily adult female collared caribou locations, they may not represent the full extent of areas used by all caribou during each season.

Two calving areas were identified as Important Wildlife Areas for Dolphin and Union caribou in the NWT (Figure 19; Wilson and Haas 2012) based on information in the Olokhaktomiut Community Conservation Plan (Community of Holman *et al.* 2000) as well as Gunn and Fournier (2000b). The Nigiyok Naghak and Kugaluk River Calving Areas are important calving habitat for caribou (Wilson and Haas 2012).


Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Spring Migration Seasonal Range (Apr 15 - May 28)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
a


Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Calving Seasonal Range (May 29 - Jun 23)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
b


Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Post-calving Seasonal Range (Jun 24 - Jul 3)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
* Note: Annual Range based on 1996-2006 and 2015-2020 data
Kilometres
Projection:
Canada Lambert Conformal Conic
Data Sources:
Government of Nunavut
Natural Resources Canada, GeoBase® National Topographic Database
Date: 2021-01-14
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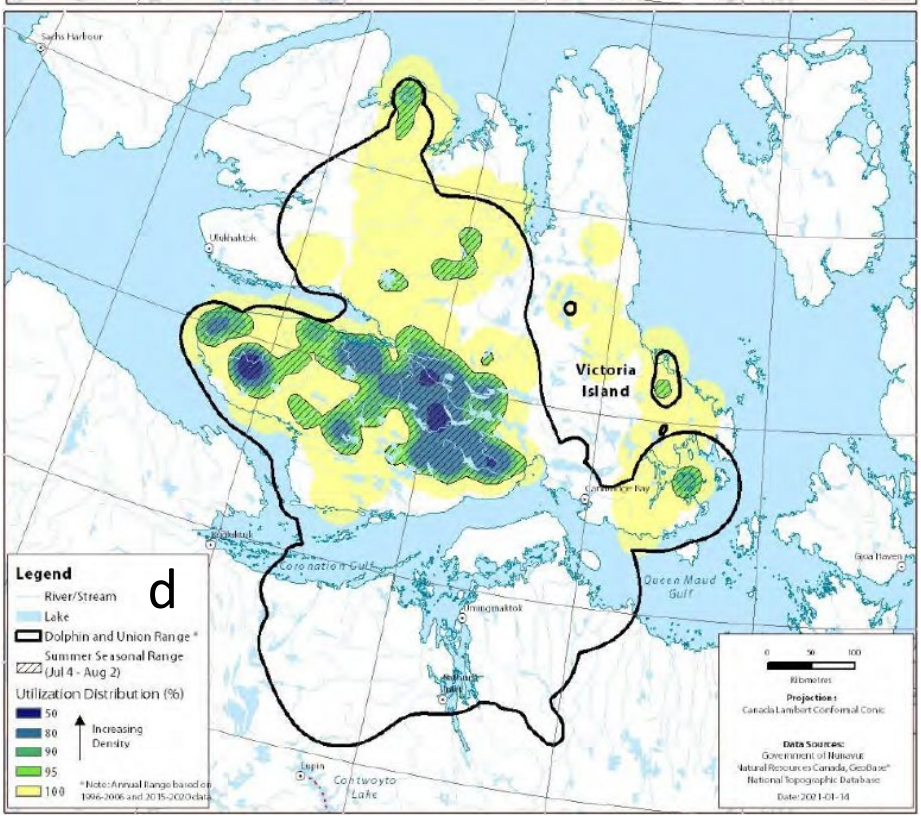
Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Summer Seasonal Range (Jul 4 - Aug 2)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
* Note: Annual Range based on 1996-2006 and 2015-2020 data
Kilometres
Projection:
Canada Lambert Conformal Conic
Data Sources:
Government of Nunavut
Natural Resources Canada, GeoBase® National Topographic Database
Date: 2021-01-14
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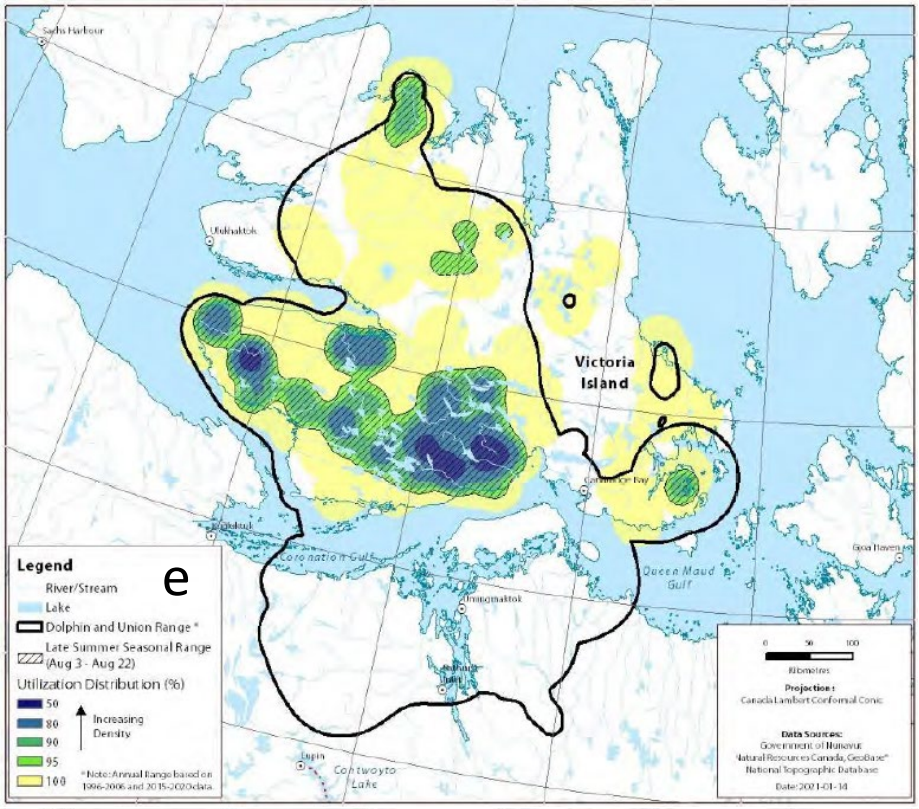
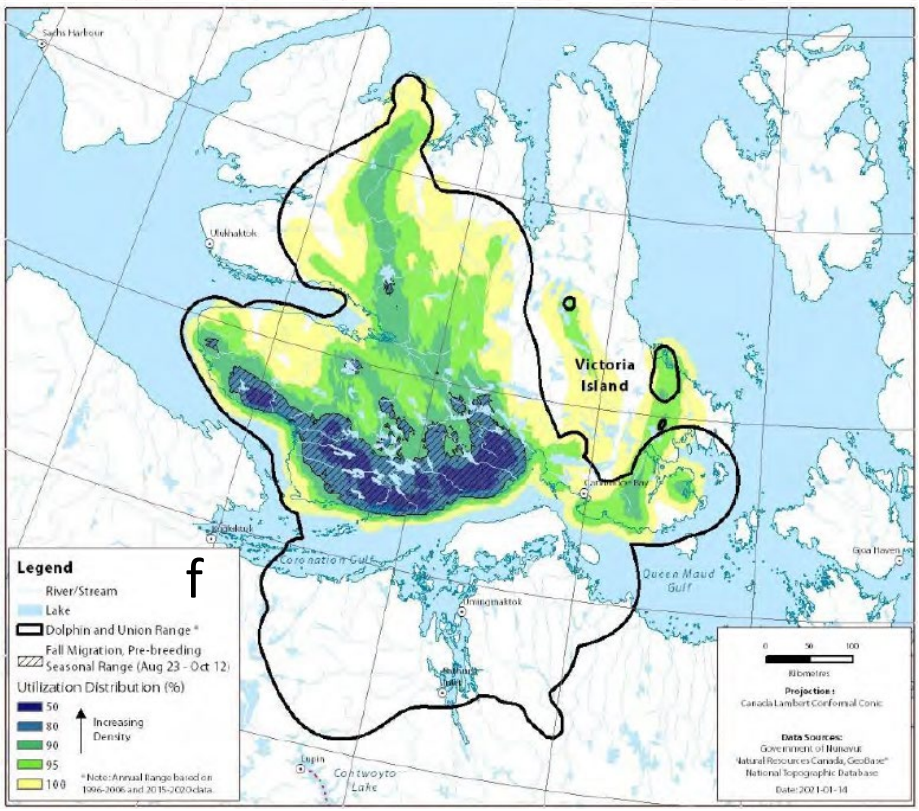

Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Late Summer Seasonal Range (Aug 3 - Aug 22)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
* Note: Annual Range based on 1996-2006 and 2015-2020 data.
e
Kilometres
Projection:
Canada Lambert Conformal Conic
Data Sources:
Government of Nunavut
Natural Resources Canada, GeoBase® National Topographic Database
Date: 2021-01-14


Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Fall Migration, Pre-breeding Seasonal Range (Aug 23 - Oct 12)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
* Note: Annual Range based on 1996-2006 and 2015-2020 data.
f
Kilometres
Projection:
Canada Lambert Conformal Conic
Data Sources:
Government of Nunavut
Natural Resources Canada, GeoBase® National Topographic Database
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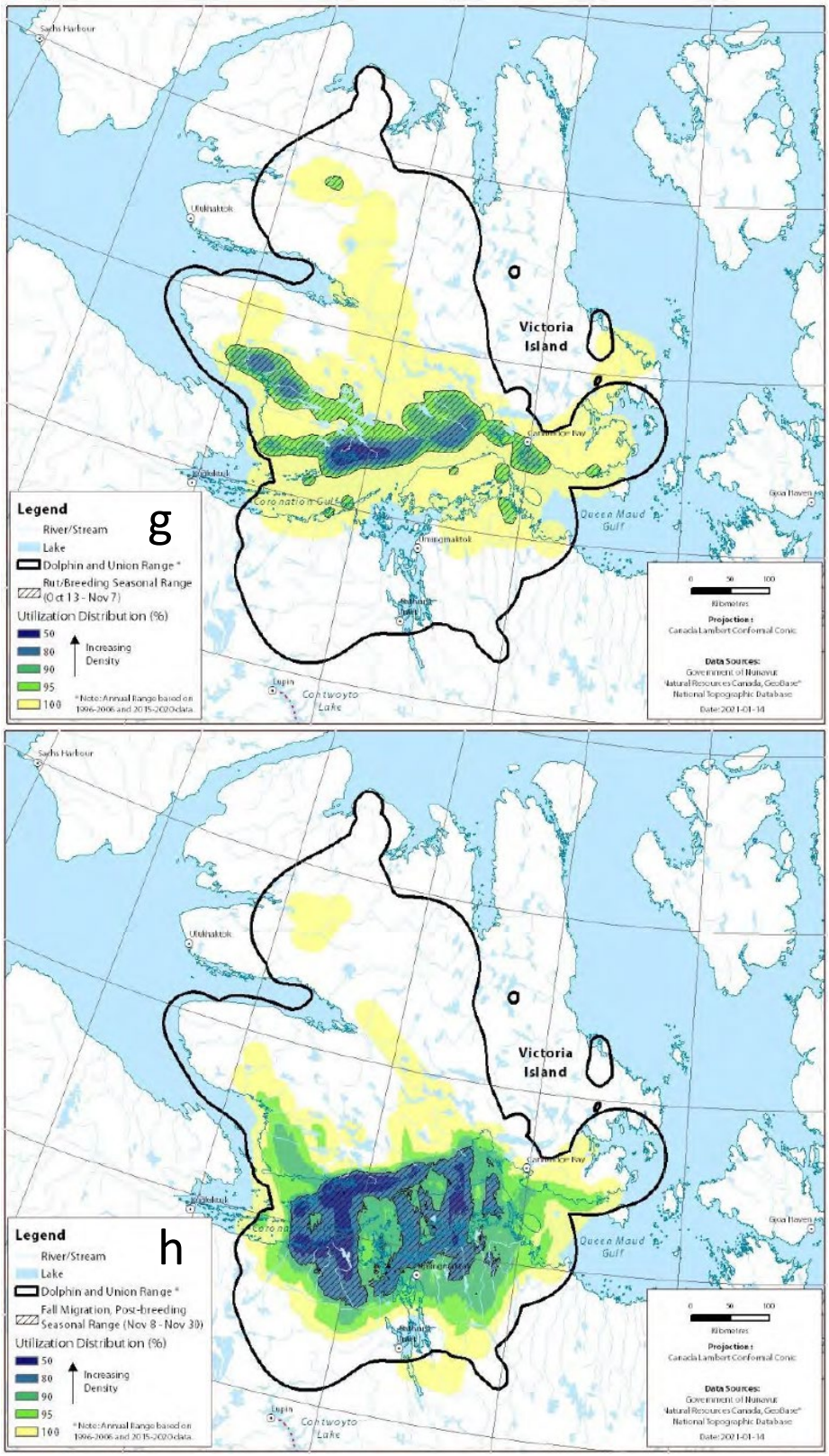
Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Rut/Breeding Seasonal Range (Oct 13 - Nov 7)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
* Note: Annual Range based on 1996-2006 and 2015-2020 data.
g
Victoria Island
Legend
River/Stream
Lake
Dolphin and Union Range *
Fall Migration, Post-breeding Seasonal Range (Nov 8 - Nov 30)
Utilization Distribution (%)
50
80
90
95
100
Increasing Density
* Note: Annual Range based on 1996-2006 and 2015-2020 data.
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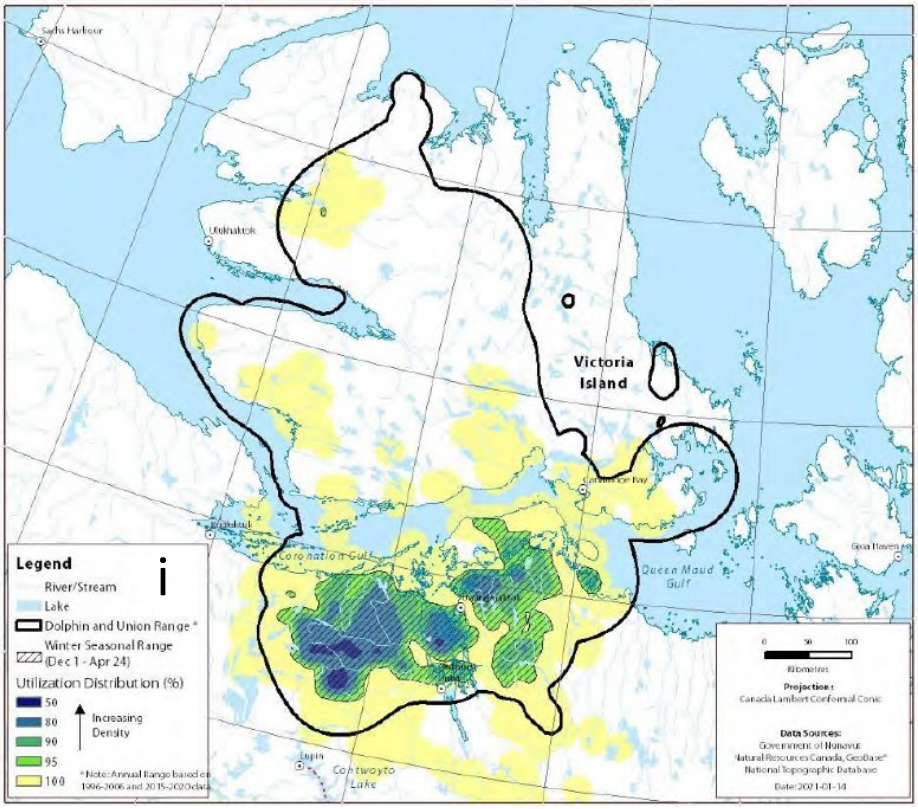

Figure 18. Dolphin and Union caribou seasonal ranges in the Northwest Territories and Nunavut 1987-2020. (a) annual range and spring migration seasonal range, (b) annual range and calving seasonal range, (c) annual range and post-calving seasonal range, (d) annual range and summer seasonal range, (e) annual range and late summer seasonal range, (f) annual range and fall migration, pre-breeding seasonal range, (g) annual range and rut/breeding seasonal range, (h) annual range and fall migration, post-breeding seasonal range, and (i) annual range and winter seasonal range. (Maps reproduced with permission from Campbell *et al.* 2021. Data from collared female caribou Telemetry points were collected from three telemetry programs, the first deployed between 1987 and 1989 maintaining a mean of 6 collars annually, the second between 1996 and 2006 maintaining a mean of 11 collars annually, and the third between 2015 and 2020, maintaining a mean of 27 collars annually. Annual range is a 95% utilization distribution.)

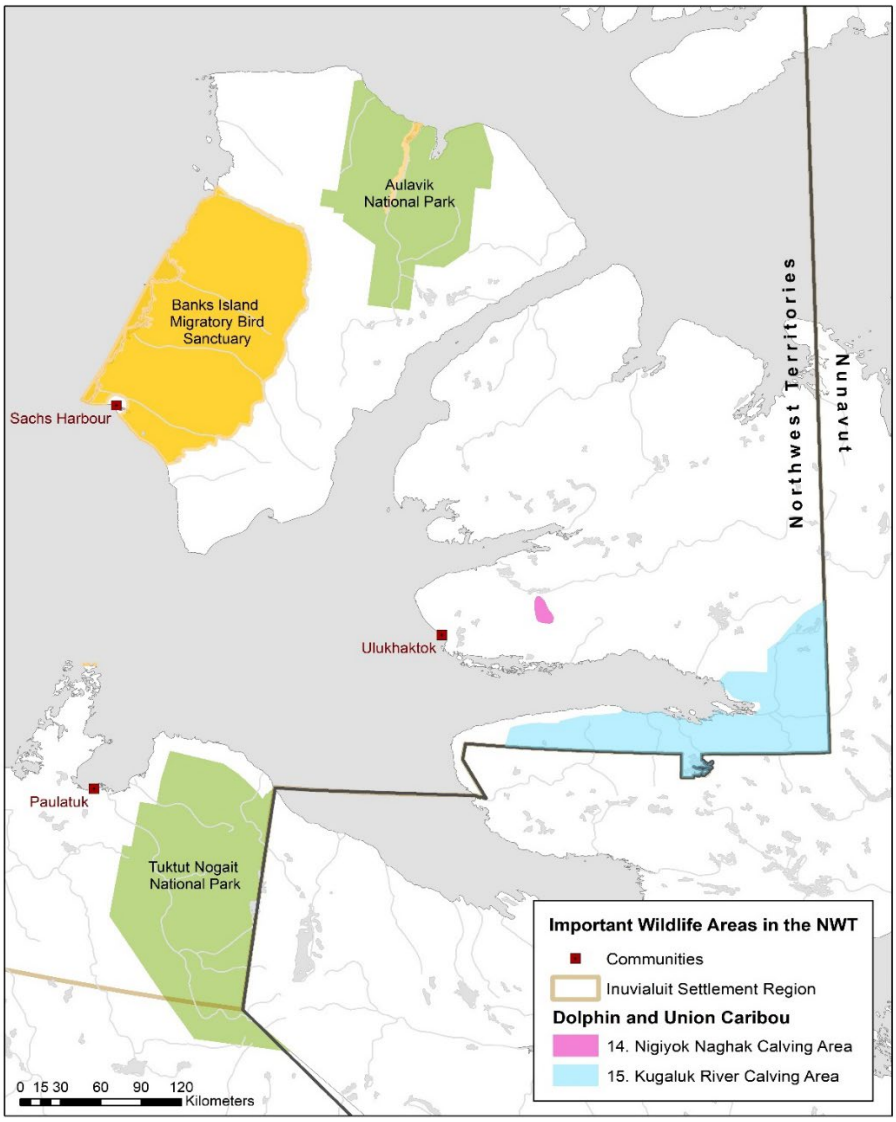

Figure 19. Important Wildlife Areas identified for Dolphin and Union caribou in the Northwest Territories (reproduced from Wilson and Haas 2012 with permission). Map courtesy of M. Routh, ECC-GNWT.

Habitat Trends

Information on habitat trends specifically within the Dolphin and Union caribou range is limited. Currently there are no major industrial projects on Victoria Island that could result in habitat loss. Hope Bay Mine on the east side of Bathurst Inlet on the Nunavut mainland is the only mine operating within the Dolphin and Union caribou range, although mineral exploration activities are occurring in other areas (see *Threats and Limiting Factors*).

In the Arctic, climate change is already affecting habitat through changes in vegetation productivity and shrub growth (Buchwal *et al.* 2020, Myers-Smith *et al.* 2019, 2020), and impacts on sea ice extent, thickness and duration (Dauginis and Brown 2021, Derksen *et al.* 2019, Poole *et al.* 2010). In general, Arctic ecosystems have experienced increased productivity and shrub

growth, although to a lesser extent some areas have experienced a decrease in productivity (Buchwal *et al.* 2020, Myers-Smith *et al.* 2019, 2020). Currently there is no technical information available on changes in vegetation productivity and structure that is specific to Victoria Island.

The timing of seasonal sea ice formation and melt is changing, and both the extent and thickness of sea ice has decreased in the Canadian Arctic from 1968 to 2021 (ENR 2022, Derksen *et al.* 2019). Between 1982 and 2008 sea ice formed an average 10 days later (Poole *et al.* 2010). The onset of sea ice melt in the Arctic from 1979 to 2017 is occurring three days earlier per decade, and freeze-up is happening seven days later per decade (Stroeve and Notz 2018). Over the 40 year long record, this amounts to a 12 day earlier melt onset and a 28 day later freeze-up (Stroeve and Notz 2018). These trends toward later sea ice formation affects sea ice habitat for fall migration and may result in a longer duration of staging along the south coast as caribou wait for sea ice to form (Poole *et al.* 2010). Effects of longer staging on forage availability are unknown. Effects of climate change on habitat are further discussed in *Threats and Limiting Factors*.

Habitat Fragmentation

On Victoria Island, there are no habitat disturbances due to human activities that have resulted in habitat fragmentation at a scale that could alter Dolphin and Union caribou dispersal or movements. There are currently no active mineral claims, mineral leases or prospecting permits on Victoria Island in either NWT (GNWT Centre for Geomatics 2021) or Nunavut (CIRNAC 2021). Mining activity on the Nunavut mainland within the Dolphin and Union caribou range includes the Doris Mine (Hope Bay) east of Bathurst Inlet and several mineral exploration sites both east and west of Bathurst Inlet (CIRNAC, GN, NTI and CNGO 2020; see *Threats and Limiting Factors*). Currently, there are a number of mineral claims, mineral leases and prospecting permits within the Dolphin and Union caribou winter range on the mainland (CIRNAC 2021). A number of roads have been proposed that would connect to the Yellowknife-Contwoyto Winter Road: Grays Bay Road on the west side of Bathurst Inlet terminating at Grays Bay, and Bathurst Inlet Road and Port, terminating near the south end of Bathurst Inlet (CIRNAC, GN, NTI and CNGO 2020). Currently, there is no technical information available on whether mining and mining exploration activities have already resulted in or will lead to habitat fragmentation or effects on movement for Dolphin and Union caribou.

Fragmentation of sea ice habitat could result from climate change and/or ship traffic. Ice-breaking delayed Dolphin and Union caribou fall movements by a few days in October 2007 until the ice froze over again (Dumont *et al.* 2013). Increased ship traffic and a lengthened shipping season supported by icebreaking could therefore result in impacts on fall migration of Dolphin and Union caribou (Dumont *et al.* 2013). Additional information on effects of shipping and climate change on sea ice is included in *Threats and Limiting Factors*.

POPULATION

Abundance

The most recent survey (October 22 to November 2, 2020) estimated the Dolphin and Union population at 3,815 ±514 (SE) (Campbell *et al.* 2021). Caribou were not classified by age or sex; therefore, an estimate of mature individuals from that survey (or from other recent surveys: see *Trends and Fluctuations*) is not possible. The proportion of the Dolphin and Union caribou population that uses the NWT portion of their range varies by time of year; therefore, a population estimate for the NWT portion of their range is not feasible.

The 2020 population estimate was based on a stratified fixed-wing aerial survey using distance sampling and double observer pair techniques (Campbell *et al.* 2021). Survey blocks were delineated and stratified into low, medium, high and very high-density strata based on results from the previous survey, collared caribou location data, Indigenous and community knowledge and Inuit Quajimajatuqangit (IQ) (Campbell *et al.* 2021). Higher density strata were concentrated along the south coast of Victoria Island where caribou were congregating prior to crossing the sea ice to winter range on the mainland (Figure 20). Transect spacing varied by strata density with wider spacing in lower density strata.

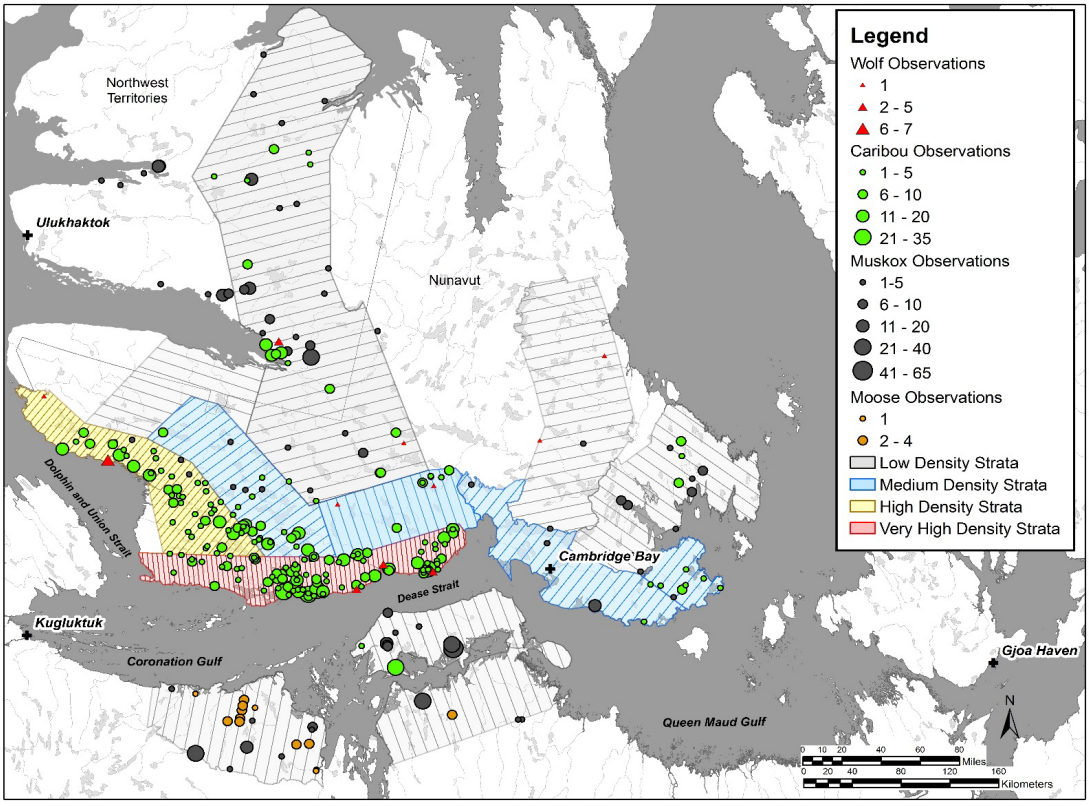

Figure 20. Strata used and wildlife observations recorded during the Dolphin and Union population survey, October 22 to November 2, 2020 (Campbell *et al.* 2021).

Population dynamics

Factors contributing to population change include calf recruitment, adult mortality, emigration and immigration. Recruitment is broadly defined as the point at which the young of a species survives long enough to become part of the population. Recruitment rate 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. For Dolphin and Union caribou, collared individuals, composition and population surveys have provided data on adult female survival, calf survival, and pregnancy rate.

Pregnancy rates for Dolphin and Union caribou were highest during the most recent sampling session (2015-2021) with an overall pregnancy rate of 90% (Table 12). The high recent pregnancy rates may be influenced by focussing captures on fatter, healthier looking animals (Leclerc and Boulanger 2020). In 2018, pregnancy rate from 29 caribou harvest sample kits was 69% (Fernandez, pers. comm. in Leclerc and Boulanger 2020), which potentially may be more representative (Leclerc and Boulanger 2020). Annual pregnancy rates were more variable from 1987 to 1990, but the overall rate of 86% was still high. The lowest pregnancy rates ranged from 43% to 71% between 2001 and 2003, with an overall rate of 56%. Pregnancy rates in caribou are typically high.

Table 12. Pregnancy rates for Dolphin and Union caribou collected (1987-2003) or captured and collared (2015-2021).

Year	Number of cows	Pregnancy rate (%)	Area	Sampling date	Source
1987	17	100	<100 km from Cambridge Bay	April	CARMA 2012[1]
1988	18	78	<100 km from Cambridge Bay	April	CARMA 2012[1]
1989	17	94	<100 km from Cambridge Bay	April	CARMA 2012[1]
1990	20	75	<100 km from Cambridge Bay	April	CARMA 2012[1]
2001	30	43	Nunavut mainland	April 14-16	Hughes *et al.* 2009
2002	22	55	Nunavut mainland	April 16-19	Hughes *et al.* 2009
2003	30	71	Nunavut mainland	April 11-12	Hughes *et al.* 2009
2015	17	88	Nunavut mainland	April 6-8	Leclerc and Boulanger 2018
2016	16	88	Nunavut mainland	April 11-17	Leclerc and Boulanger 2018
2018	47	94	Nunavut mainland	April 15-24	Leclerc and Boulanger 2020
2021	38	87	Nunavut mainland	April 14-26	Roberto-Charron 2021

[1] Area and sampling date from Gunn and Fournier (1996)

Limited information is available on calf production and survival for Dolphin and Union caribou, most of which was collected during the 1980s and 1990s (Tables 13 and 14). The number of calves/100 cows and % calves determined from surveys are indirect measures of calf production and survival. Since most surveys did not distinguish between adult male and adult female caribou, % calves is most used. Because most surveys included only a portion of Victoria Island, they may not represent calf composition across the entire range. Between 1987 and 2005, percent calves varied between 11.5% and 27.0% for all but the June 1994 composition survey conducted on Western Victoria Island (Table 13). The early part of the June 1994 composition survey of Western Victoria Island was conducted prior to the peak of calving, which was estimated as June 11 to 17 in 1994 (Nishi and Buckland 2000), and which may have contributed to the low % calves during the survey (3.1%). Spring calf/100 cows ratios for collared caribou cows were highly variable, ranging from 17 to 82 between 1987 and 1997, which may have been partially due to the low sample sizes most years (Table 14).

Because most surveys were conducted in June or July, they provide a poor indication of calf recruitment since mortality continues during fall and winter. The ratio of 11 calves/100 cows during the late winter survey in 2017 was low (Leclerc and Boulanger 2018), and at a level characteristic of a declining population (Bergerud *et al.* 2008). Leclerc and Boulanger (2018) caution that the ratio may have been influenced by the difficulty in distinguishing between barren-ground and Dolphin and Union caribou in groups on the east side of Bathurst Inlet.

Survival rates are based on collared caribou (Table 15). Except for 1995/96 and 1996/97, annual survival rates were low and less than 80% for collared adult female caribou (Table 15). The lowest annual survival rates were recorded during the three most recent years (2016, 2017, 2018), and ranged from 58% to 61% (Table 15).

Seasonal survival rates from October 1999 to June 2004 for 25 adult cows collared with satellite collars in 1999 and 2001 were lowest during fall migration and mid-winter (Poole *et al.* 2010). Highest survival was during calving/summer with only one of 19 mortalities occurring during that season. Seasonal survival rate was also highest during calving/summer months (June to September) from April 2015 to April 2019, with only four of 43 adult mortalities occurring during that period (Leclerc and Boulanger 2020). The lowest seasonal survival rates from 2015 to 2019 were during fall and spring when caribou were more accessible to harvesters and closer to communities (Leclerc and Boulanger 2020).

Table 13. Calf composition during surveys conducted for the Dolphin and Union caribou population.

Year	Timing	Survey type[1]	Air-craft[2]	Area[3]	Total caribou counted	% calves	calves/ 100 cows	Reference
Spring/Summer								
1980	July 30-31	C	H	VI - mostly Prince Albert Sound[4]	NA		84.0	Jackimchuk and Carruthers 1980
1987	June 8-19	D	FW	Central and western VI	746	12.6		Gunn and Fournier 2000a
1988	June 12-17	D	FW	Central and western VI	997	19.3		Gunn and Fournier 2000a
1994	June 5-16	P/D	FW	Western VI	1631	3.1[5]		Nishi and Buckland 2000
1994	June 17	C	FW	Eastern VI	382[6]	21.2	39.4	Nishi and Buckland 2000
1998	July early	P	FW	Northwest VI (DU only)	119	19.3		Nagy *et al.* 2009a
2001	July 16-21	P	FW	Northwest VI (DU only)	468	20.5		Nagy *et al.* 2009b
2005	July 6-8	P	FW	Northwest VI (DU only)	113	11.5		Nagy *et al.* 2009c
Fall								
2016	Oct 26-29	C	FW	Southern VI	1225	25.0		Leclerc and Boulanger 2018
Late winter								
2017	Mar 23-28	C	H	Nunavut mainland	229		11.0	Leclerc and Boulanger 2018

[1] C = Composition survey; D = Distribution survey; P = Population survey
[2] FW = Fixed-wing; H = helicopter
[3] VI = Victoria Island; DU = Dolphin and Union caribou
[4] Most caribou seen during the helicopter flight were in the Prince Albert Sound/Kagloryuak River area; sample size of classified animals was not provided
[5] Newborn calves were first observed on June 9, with the highest proportions seen on June 15 and 16 (Nishi and Buckland 2000)
[6] Includes 24 not classified

Table 14. Calves/100 cow ratios for Dolphin and Union caribou.

Year	Timing	Aircraft	No. of collared cows seen	Calves/100 cows	Reference
Spring					
1987	June 3-21	Fixed Wing	6	50	Gunn and Fournier 2000a
1988	June 13-18	Fixed Wing	6	17	Gunn and Fournier 2000a
1994	June 10-18	Fixed Wing	10	70	Nishi 2000
1995	June 6-18	Fixed Wing	12	25	Nishi 2000
1996	June 1-16	Fixed Wing	11	82	Nishi 2000
1997	June 10-18	Fixed Wing	7	43[1]	Nishi 2000
Fall					
1997	Oct 8-17	Fixed Wing	9	33	Nishi 2000

[1] Although only 3 of 7 cows were seen with calves in June, two additional caribou (one caribou not seen in June and one caribou that was not seen with a calf in June) were seen with calves in October. Therefore, at least 5 of 9 cows (56%) produced calves in 1997.

Causes of mortalities of collared caribou (primarily adult females) are mostly categorized as either harvest or natural causes. Causes of most natural mortalities were undetermined due to the remoteness of Victoria Island and the adjacent mainland, which contributed to difficulty in accessing and investigating mortalities in a timely manner. However, reported causes of natural mortality included: starvation resulting from icing events that make forage inaccessible, drowning while crossing newly formed sea ice, and wolf predation.

Of nine Dolphin and Union caribou cows collared with satellite collars in March 1987 or March 1988 and tracked from March 1987 to May/June 1989, two died, both in February 1988 and both were intact and emaciated (Gunn and Fournier 2000a). During winter 1987/88, Cambridge Bay hunters reported freezing rain in early winter and caribou dying along the coast. Gunn and Fournier (2000) followed up on the reports in August 1988 and found 28 caribou carcasses west of Cambridge Bay judged to be from the preceding winter, 23 of which appeared to have been malnourished. A third caribou that died in May 1987 was old, or at least had heavily worn teeth (Gunn and Fournier 2000a).

Table 15. Dolphin and Union annual adult female caribou survival rates based on adult female collared caribou.

Year	Period covered	Sample size		Annual survival rate (%)	Standard Error (SE)	Reference
		Number of cows	Number of Animal months			
1994/95	June 1994 to May 1995	20	-	70[1,2]	-	Nishi 2000
1995/96	June 1995 to May 1996	13	-	100[1,2]	-	Nishi 2000
1996/97	June 1996 to May 1997	11	-	82[1,2]	-	Nishi 2000
1999 - 2004	Oct 1999 to June 2004	27	-	76[1]	4.9	Poole *et al.* 2010
2015 - 2016	April 2015 to Dec 2016	14-30	-	70	7.1	Leclerc and Boulanger 2018
2016	Jan to Dec 2016	-	278	61	9	Leclerc and Boulanger 2020
2017	Jan to Dec 2017	-	135	58	12	Leclerc and Boulanger 2020
2018	Jan to Dec 2018	-	356	61	7	Leclerc and Boulanger 2020

[1] Annual survival rates based on VHF collared adult female caribou.
[2] Caribou were located twice in June each year; only caribou that were contacted that year or in a subsequent year were included in the sample. Mortalities that were detected in June of one year were assumed to have occurred the previous year.

Of eight mortalities detected between June 1994 and June 1997, seven were due to unknown natural causes with five located on the mainland (on or near the Kent Peninsula) or nearby sea ice, one on Stefansson Island, and one on southern Victoria Island (Nishi 2000). The eighth was shot by a hunter in October 1996, but no location was provided.

Of 19 mortalities detected between October 1999 and June 2004, one was harvested and the other 18 died from natural causes (Poole *et al.* 2010). Half of the natural mortalities (9/18) occurred between October 20 and December 8 and were associated with fall sea ice crossing, and another 39% (7/18) occurred during late winter from February 9 to April 21 (Poole *et al.* 2010). The harvested caribou was shot during winter 1999-2000, and another four that died that winter were possible wolf predation. In fall 2000, one collared cow may have died breaking

through the ice and in fall 2001, five collared cows died while crossing the newly formed sea ice (Patterson unpubl. data 2002).

Causes of natural mortalities for most caribou collared from April 2015 to April 2018 (primarily adult females) were not assessed (Leclerc and Boulanger 2020). Most natural/unknown mortalities occurred further inland while mortalities due to harvest occurred along coastlines in areas that were closer to communities and that were more accessible to harvesters (Leclerc and Boulanger 2020). One natural mortality between April 2015 and December 2016 was attributed to drowning during fall migration (Leclerc and Boulanger 2018). From April 2015 to April 2018 mortality patterns appeared to differ between caribou that used the northern part of Victoria Island during summer and caribou that used only the southern part of the island (West + East) (Table 16). The mortality rate over the three years was higher (88%) for caribou that used the northern portion of the island during summer than for caribou that used the southern portion (25%). All mortalities of caribou that used northern Victoria Island during summer occurred between October and April (Table 16). All harvested caribou with known summer ranges had summered in the northern part of the island, and most of them (4/5) were harvested in western Victoria Island. Although mortality over the three years was high for caribou that used northern Victoria Island during summer, most mortalities (71%) occurred while caribou were in the southern portion of Victoria Island, on the mainland or on the sea ice (Table 16). However, both adult female caribou that were collared on the mainland in April 2016, but remained in northern Victoria Island until February 2017, died (Leclerc and Boulanger 2020). Although no information is available on why mortality patterns differed between the two summering strategies, timing of migration could have potentially contributed.

Table 16. Mortality timing, type and location for caribou collared in April 2015 and April 2016 (primarily adult females), grouped by location of summer range on Victoria Island (VI) (adapted from Leclerc and Boulanger 2020).

Summer range[1]	No. Collars	Total No. Mortalities	Mortalities (timing, type, location)						
			Oct - Apr						May-Sep
			Harvest		Natural				Natural
			Mainland	West VI	Mainland	Ocean	North VI	West VI	West VI
West or East VI	16	4				2	NA	1	1
North VI	16	14	1	4	4	1	4		
Unknown	3	3	3						

[1] Areas (West Victoria Island, East Victoria Island, North Victoria Island, Mainland) defined in Leclerc and Boulanger 2020. Three caribou were harvested shortly after they were collared on the mainland in April 2016 and therefore summer ranges for those three could not be determined.

Additional information on mortality was collected during the late October 2007 systematic aerial survey on the south coast of Victoria Island. Surveyors observed three drowned caribou, 15 kill sites and two caribou dead from unknown causes (Dumond pers. comm. 2012a). No dead caribou were documented during the October surveys in 1997, 2015, 2018 or 2020 (Campbell *et al.* 2021, Leclerc and Boulanger 2018, 2020, Nishi and Gunn 2004).

Reports of body condition of Dolphin and Union caribou varied by methods used and years sampled. All eight collared caribou cows collected in May or June 1989 were described as thin with heavily worn teeth, while two collared caribou cow mortalities examined in March 1988 were described as emaciated with red-jellied bone marrow which suggests malnutrition (Gunn and Fournier 2000a). Four of the six collected in May 1989 were pregnant (Gunn and Fournier 2000a). Only the collared caribou cow collected in August 1990 was not described as thin and had 2.8 cm of backfat (Gunn and Fournier 2000a). Nine collared caribou cows collected in October 1997 with back fat averaging 2.3 cm and percent bone marrow fat averaging 91% (Nishi 2000); with these measurements these caribou are considered to have been in good condition (Adamczewski pers. comm. 2023). Health indices based on palpation of animals during collaring sessions in 2018 and 2020 suggested that health index of captured animals was high, which may have reflected sampling protocols that targeted healthier animals (Leclerc and Boulanger 2020, Roberto-Charron 2021). Local knowledge holders from southern Victoria Island reported poorer body condition of Dolphin and Union caribou while the population was declining than prior to the decline (Tomaselli *et al.* 2018).

Trends and fluctuations

Population trend for the Dolphin and Union caribou population is based on changes in population size estimated from aerial surveys. The first aerial survey for Dolphin and Union caribou was conducted in 1980 (Jakimchuk and Carruthers 1980). Since then, a number of surveys have been conducted, but area covered, and survey methods varied. In 1997, fall surveys were initiated where caribou congregate on southern Victoria Island prior to crossing the sea ice. Although population trend can only be quantified since 1997, relative trend can be inferred from information available prior to 1997. In 2020, the Dolphin and Union survey used a different methodology without relying on collared caribou and it arrived at a similar estimate validating the abundance estimate concluded from the2018 survey (Campbell *et al.* 2021).

The first estimates of abundance for Dolphin and Union caribou ranged from 100,000 and 200,000 animals. These were based on estimates of the number of caribou crossing the Dolphin and Union Strait early in the 20th century (Anderson 1922, Manning 1960). An estimate of 100,000 caribou across all of Victoria Island (217,291 km^2), translated to about one caribou per square mile (0.40 caribou/km^2), which Manning (1960) felt was a reasonable density when compared to the estimated mainland density of 2.2 caribou per square mile. However, the

estimate of 100,000 included caribou that wintered on Victoria Island, which were not thought to be numerous, as well as the migrant caribou. Therefore, the estimate of 100,000 animals is likely unrealistically high.

By the early 1920s, numbers declined and migration across the Dolphin and Union Strait ceased. The cause of the decline was possibly a combination of icing storms and the introduction of rifles (Gunn 1990, Manning 1960). Banfield's (1950) population estimate of 1,000 for a 'Victoria Island herd' is associated with a summer distribution around Prince Albert Sound, which suggests that the estimate largely consisted of Dolphin and Union caribou. Macpherson (1961) compiled sightings by geologists during unsystematic flights on Victoria Island in 1958 and 1959 and estimated 671 caribou based on observed densities during 18,500 km of transects. These animals were considered part of the relict migratory group identified by Manning (1960) as Dolphin and Union caribou.

Subsequent estimates of Dolphin and Union caribou abundance were based on caribou counted on strip transects during systematic aerial surveys. In 1980, most of the island was surveyed (Jackimchuk and Carruthers 1980) and 7,936 ± 1,118 caribou were estimated (estimate likely included calves), which also included Peary caribou in northwest Victoria Island. Based on current understanding of Dolphin and Union caribou distribution on Victoria Island, the Dolphin and Union portion of the estimate was likely around 3,500 caribou.

The next systematic survey covered western and central Victoria Island in June 1994 and estimated 14,539 ± 1,015 (SE) non-calf caribou, of which 39 ± 28 (SE) were estimated within a survey block that overlapped the Peary caribou range (Nishi and Buckland 2000). The total estimate for the survey area within the Dolphin and Union caribou range was an under-estimate since the survey area did not include eastern Victoria Island where six of the 20 collared cows were found immediately after the survey (Nishi 2000, Nishi and Buckland 2000). The authors used a basic correction factor to get a total population estimate of 20,700 non-calf caribou.

A series of systematic aerial surveys during July in 1998, 2001, 2005 and 2010 covered northwest Victoria Island and led to estimates for portions of the Dolphin and Union population based on the adult female satellite collar locations (Davison and Williams 2013, Nagy *et al.* 2009a, b, c). Although the estimates for 1998–2010 varied between 400 and 1,000 caribou and declined from 2001, it is uncertain if this indicates annual variation in summer distribution or a trend in reduced abundance.

By the late 1990s, collar studies of adult female caribou indicated that a large proportion of the Dolphin and Union population were staging along the south coast of Victoria Island in October, which led to changing the timing of aerial surveys to the fall to take advantage of a much smaller survey area focussed on the staging area (Nishi and Gunn 2004). Since the late 1990s, five population surveys have been conducted: 1997, 2007, 2015, 2018 and 2020 (Table 17, Figure 21).

For each survey, the survey area and stratification were based on reconnaissance flights, and when available, distribution of collared caribou (primarily adult females). Distribution of collared caribou was also used to correct for caribou that were outside of the study area. For the 2020 survey, the survey area was expanded using technical information and Inuit Qaujimajatuqangit (IQ).

Table 17. Population estimates for the Dolphin and Union caribou population based on fall aerial surveys conducted when caribou congregate along the south coast of Victoria Island (VI) prior to crossing the sea ice to the mainland.

Year	Population estimate	Standard Error (SE)	95% Confidence interval		Source
			Lower	Upper	
1997	34,558	4,283	27,757	41,359	Dumond and Lee 2013[1]
2007	27,787	3,613	20,250	35,324	Dumond and Lee 2013
2015	18,413	3,134	11,644	25,182	Leclerc and Boulanger 2018
2018	4,105	695	2,931	5,750	Leclerc and Boulanger 2020
2020 (VI+mainland)[2]	3,815	514	2,930	4,966	Campbell *et al.* 2021
2020 (VI only)[2]	3,579	477	2,758	4,644	

[1] Population survey and initial population estimate summarized in Nishi and Gunn (2004); extrapolated population estimate (reported here) from Dumond and Lee (2013).

[2] Campbell *et al.* (2021) provide two estimates: one for the entire survey area including Victoria Island and the mainland, and one for Victoria Island only.

In October 1997, Nishi and Gunn (2004) estimated 27,948 ± 3,367 (SE) caribou within the census zone. The survey area likely included most caribou based on adult female collared caribou locations (N=9) immediately prior to the survey. In October 2007, Dumond and Lee (2013) estimated 21,753 ± 2,343 (SE) caribou within the census zone along the south coast of Victoria Island. Dumond and Lee (2013) assumed that not all caribou had migrated to the coast and derived a correction factor based on distribution of satellite-collared cows during late October from 2000 to 2002. The probability that caribou were in the survey area (0.81) was used to correct the 2007 survey estimate to 27,787 ± 3,613 (SE) and the 1997 estimate to 34,558 ± 4,283 (SE) (Dumond and Lee 2013). Using collared caribou distribution from years other than the year of the survey could introduce some uncertainty to the estimate due to among-year differences in arrival times and movement rates.

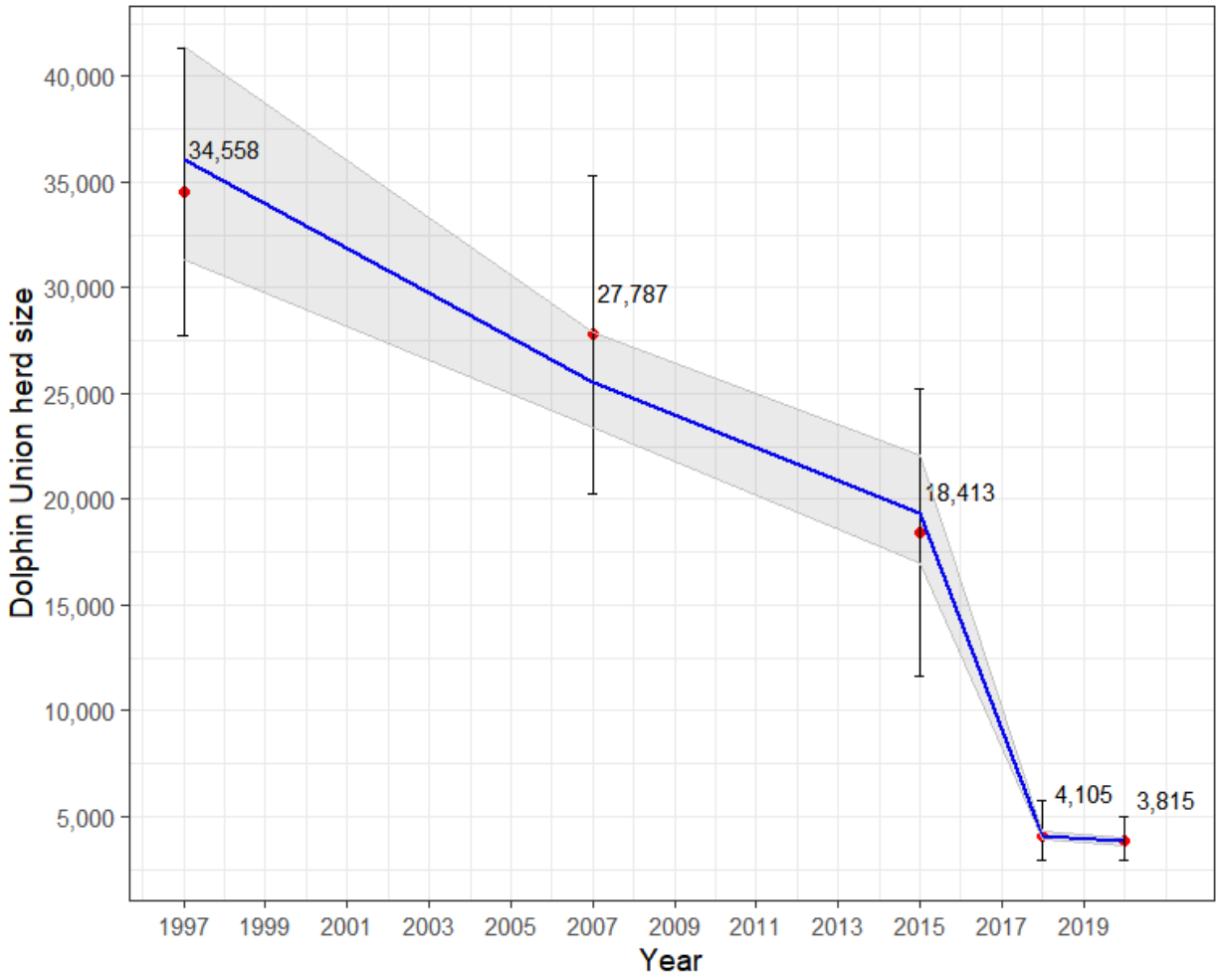

Figure 21. Dolphin and Union caribou abundance estimates, 1997 to 2020 with the 2020 Victoria Island + mainland estimate (Campbell *et al.* 2021). Error bars show the 95% Confidence Interval.

Surveys conducted in 2015, 2018 and 2020 indicate further decline in the Dolphin and Union population (Table 17, Figure 21). In 2020, the survey area was expanded to include areas in central and northern Victoria Island where caribou may be wintering, and the mainland coast to include caribou that had already crossed the sea ice (Campbell *et al.* 2021). Despite expanding the survey area, the 2020 population estimate was lower than the 2018 estimate but the difference between estimates was not statistically significant (Campbell *et al.* 2021). The rate of decline was greatest between 2015 and 2018. The rate of decline between 2018 and 2020 was similar to that between 2007 and 2015 (Campbell *et al.* 2021). The decline in abundance of the Dolphin and Union caribou population is consistent with low adult female survival rates and the low recruitment rate reported (see *Population dynamics*).

Overall, early observations suggest that Dolphin and Union caribou numbers were high in the early 1900s, followed by about 50-60 years of low numbers (Gunn *et al.* 1997, Manning 1960). The population then increased until the late 1990s (Nishi and Gunn 2004). From 1997 to 2020,

which roughly corresponds to three Dolphin and Union caribou generations (24-27 years; see *Life cycle and reproduction*), the population declined by 89% to about 3,815 caribou (Table 17).

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". Although the steepest decline in Dolphin and Union caribou numbers occurred between 2015 and 2018, the current rate of decline between 2018 and 2020 is similar to the rate of decline between 2007 and 2015 (Campbell *et al.* 2021), suggesting that the Dolphin and Union caribou population is experiencing a continuing decline.

Possibility of rescue

The Dolphin and Union caribou population is genetically distinct and consists of only one subpopulation; consequently, immigration and emigration are not possible and rescue by genetically similar caribou may not be possible. However, their range overlaps with Peary caribou in northwestern Victoria Island and with barren-ground caribou on the Nunavut mainland. Dolphin and Union caribou and barren-ground caribou have sometimes been found together in groups on their winter range (see *Interactions*). Recent genetic information suggests that Dolphin and Union caribou may be interbreeding with both Peary caribou and barren-ground caribou, but those results have not yet been finalized (L. Leclerc, pers. comm. 2021). Dolphin and Union caribou interbreeding with Peary caribou and/or barren-ground caribou may have a role in rescue.

THREATS AND LIMITING FACTORS

Important threats to Dolphin and Union caribou include climate change (including changes to sea ice and icing events), predation, harvest, and disturbance and habitat alteration due to human activities. Warmer temperatures are already manifested as trends in the mean fall temperatures which delay fall sea ice crossings (Poole *et al.* 2010; see *Distribution*). Other potential threats include competition for forage and contaminants.

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). Since 1948, average October and November temperatures at Cambridge Bay have increased 0.35 to 0.39°C per decade, with a greater rate of increase since 1980 (Poole *et al.* 2010). Similarly, at Lady Franklin Point between 1958 and 1992 mean October and November temperatures rose by 4.5 and 4.0°C, respectively (Poole *et al.* 2010). Between 1971 and 2019, surface air temperature in the Arctic has increased three times faster than the global average (AMAP 2021).

Predicted effects of climate change on caribou include 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 Dolphin and Union caribou, the two primary threats of climate change are impacts on distribution and migrations due to changes in sea ice extent, thickness and duration, and decreased forage accessibility in winter due to increased intensity and frequency of severe weather events. However, a potential positive effect may be increased summer forage availability and quantity.

Changes in sea ice

Both extent and thickness of sea ice decreased in the Canadian Arctic from 1968 to 2016 (Derksen *et al.* 2019). Between Victoria Island and the mainland, total sea ice decreased at a rate of 6-10% per decade while there was no significant change in multi-year ice (Derksen *et al.* 2019). Overall, ice thickness in the Arctic has also decreased.

The increase in mean fall temperatures along the south coast of Victoria Island between 1948 and 2008 corresponds to a trend between 1982 and 2008 for sea ice to form an average 10 days later (Poole *et al.* 2010). In the Coronation Gulf, sea ice formed later in the fall and melted earlier in the spring between 2004 and 2018 (Dauginis and Brown 2021). The trend toward later sea ice formation not only affects sea ice habitat for fall migration, but the longer duration of staging along the south coast as the caribou wait for sea ice to form could have impacts on coastal plant communities resulting from increased foraging by caribou (Poole *et al.* 2010).

Over the short-term (decades), Dolphin and Union caribou may be especially vulnerable to the effects of a warmer climate if the current trend toward later formation of sea ice in fall and earlier ice melt continues and leads to increased risk of drowning deaths. Changes in sea ice could also result in increased shipping traffic (see *Human activities - disturbance and habitat alteration*).

Icing events

Icing events have been linked to both Peary caribou and Dolphin and Union caribou mortalities. An icing event occurs when freezing rain or partial melting occurs forming an ice crust over the vegetation or snow. This causes difficulties for caribou trying to 'dig' through ice crusts to forage. During winter 1987/88, Cambridge Bay hunters reported freezing rain in early winter and caribou dying along the coast, which coincided with two of 9 collared adult female caribou dying of malnutrition in February 1988, and an additional 28 uncollared caribou mortalities exhibiting evidence of malnutrition (Gunn and Fournier 2000a). From the late 1970s to 2007, rain was recorded in Kugluktuk during winter in only 3 years; 2000, 2003 and 2004 (Dumont 2007).

Both rain-on-snow and icing events tripled in the Canadian Arctic Islands from 1979-1995 to 1996-2011 (Langlois *et al.* 2017). Rain-on-snow events followed by subsequent freezing and the creation of ice layers prevents caribou from accessing forage (Langlois *et al.* 2017). From 1979-

1995 there were 102 observed rain-on-snow events comparted to 284 rain-on-snow events observed during 1996-2011 (Langlois *et al.* 2017). This suggests a significant increase in rain-on-snow occurrence, with the most active years being 1993–1994, 1998–1999, 2008–2009 and 2002–2003 (Langlois *et al.* 2017). Northwest Victoria Island was one of five areas with the most combined occurrences of these two types of events. In this study, Peary 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).

Snow cover

The extent and availability of snow cover is important to the water balance of soil and access to moisture for vegetation (Callaghan *et al.* 2012). Changing snow conditions, particularly reduced summer soil moisture, winter thaw events and rain-on-snow conditions may negatively affect vegetation, plant productivity and community structure (Callaghan *et al.* 2012). These changes have implications for caribou forage availability.

From 1981 to 2015, the extent of snow cover on western Victoria Island and portions of the mainland winter range decreased during spring (April-June), summer (July-September) and fall/early winter (October-December) but increased in southeastern Victoria Island from October to December (Derksen *et al.* 2019). Although spring precipitation has increased by 42% between 1948 and 2016 (Zhang *et al.* 2019), snow cover in the Arctic during the months of May through June has declined by 17% between 1971 and 2019 (AMAP 2021). The combination of surface and blowing snow sublimation contribute to an accelerated depletion of snow cover (Chung *et al.* 2010).

In addition to decreases in snow cover extent, snow melt is also occurring earlier. The mean date of snow melt on Banks Island was 7.5 days earlier for 1987-2004 compared to 1967-86 although melt occurred later from 2000-2004 than in the 1990s (Foster *et al.* 2008).

Effects on vegetation

Changes in habitat are expected to occur as a result of climate change. Across the Arctic, results from a wide range of studies indicate recent increases in plant productivity and shrub growth (Myers-Smith *et al.* 2011). In the Canadian Arctic, between 1982 and 2002, plant productivity based on the normalized difference vegetation index (NDVI) derived from satellite imagery, generally increased and there was a slightly earlier onset to the growing season (Jia *et al.* 2009). Although shrub growth has generally increased, to a lesser extent decreases have also been documented (Buchwal *et al.* 2020; Myers-Smith *et al.* 2020). Response of shrubs has been linked to sea ice decline with increased growth associated with moister areas and rising air temperature and precipitation, while growth decline was associated with areas with lower summer precipitation and increasingly dry conditions (Buchwal *et al.* 2020). Although there is no technical information currently available on changes in vegetation productivity and structure that is

specific to Victoria Island, the mainland winter range, where plant productivity and biomass are greater than on Victoria Island (Gould *et al.* 2003, Hughes 2006; Raynolds *et al.* 2012), is more likely to experience increased productivity and shrub growth than Victoria Island. Because terrestrial lichens are poor competitors against vascular vegetation, increased vegetation productivity could result in a reduction in availability of caribou winter forage. However, little is known about the importance of terrestrial lichens in the winter diet of Dolphin and Union caribou on the mainland (see Forage), and increased productivity could result in increased winter forage if caribou rely more on shrubs and other vegetation during winter.

Increased forage productivity and extended periods of greenness could increase the availability of quality forage during the growing season, which may result in improved condition of animals prior to the winter, and which in turn may have a positive impact on calf survival and possibly adult survival.

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, for barren-ground caribou, Mallory *et al.* (2020) found no evidence of a trophic mismatch since both migration and peak of calving in barren-ground caribou occurred earlier.

Health

Climate change could also influence conditions for parasites and diseases although the effects will be complex and could include altered transmission of endemic parasites and northward expansion of novel species (Davidson *et al.* 2011, Kutz *et al.* 2009). The warmer and longer summer weather could also increase the amount of harassment by oestrid flies, which might be already happening on Victoria Island. It is unknown whether potential increases in plant productivity (and forage) could offset increased negative effects of parasites, diseases and biting insects.

For a comprehensive information on Health see *Indigenous and Community Knowledge Component – Threats and Limiting Factors – Health and Disease* as well as *Scientific Knowledge Component – Interactions – Parasites and Disease.*

Predation

Although wolf sightings during aerial surveys on Victoria Island have increased since the 1990s there have been no studies assessing the effects of predation on Dolphin and Union caribou. An increase in wolf numbers was reported in Dumond (2007) by Colin Adjun, a conservation officer with the Government of Nunavut at the time, but the number of wolves on Victoria Island is likely still lower than on the mainland based on predators sighted during aerial surveys of the mainland populations (Poole *et al.* 2011). Muskoxen abundance has declined since the late 1990s (see

Interactions), which may have resulted in increased predation risk for Dolphin and Union caribou as the primary food source for wolves declined. Alternatively, wolf numbers could have decreased in response to a decreased prey availability.

Although the relative contribution of wolf predation to Dolphin and Union caribou mortality is not known, it is a likely a threat to Dolphin and Union caribou when their abundance is low.

While Dolphin and Union caribou and muskoxen may not necessarily compete directly for forage, muskoxen could affect Dolphin and Union 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 Dolphin and Union caribou are a secondary prey species, increasing muskoxen numbers could result in increased wolf numbers, which in turn could exert greater predation pressure on Dolphin and Union caribou.

Reports by local knowledge holders of recent increases in muskoxen mortalities due to grizzly bear predation suggests that grizzly bear numbers may be increasing within Dolphin and Union caribou range on Victoria Island (see *Interactions – Predation*); however, there is no technical information on the impacts of grizzly bear predation on Dolphin and Union caribou.

Harvesting

Although past information on harvests is limited, available information suggests that estimated harvests in the past were high compared to the 1997 and 2007 population estimates (see *Interactions - humans*). The current allowable harvests in the NWT (50) and Nunavut (105) represent 4.1% of the 2020 population estimate but does not include potential harvest by Paulatuk community members. With recent low adult female survival and calf recruitment rates (see *Population dynamics*; Leclerc and Boulanger 2018, 2020) and a declining population trend (Campbell *et al.* 2021), it is uncertain for how long or whether the current allowable harvest will be sustainable.

Human activities - disturbance and habitat alteration

Data are lacking to assess the level of threats from human activities on Dolphin and Union caribou. 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). Development which includes seasonal or all-season roads is a greater concern because roads increase access for hunting, tend to facilitate more development, and could affect caribou movements. For Dolphin and Union caribou, human activities that result in disturbance and habitat alteration are primarily associated with mineral development and shipping (Figure 22 and 23).

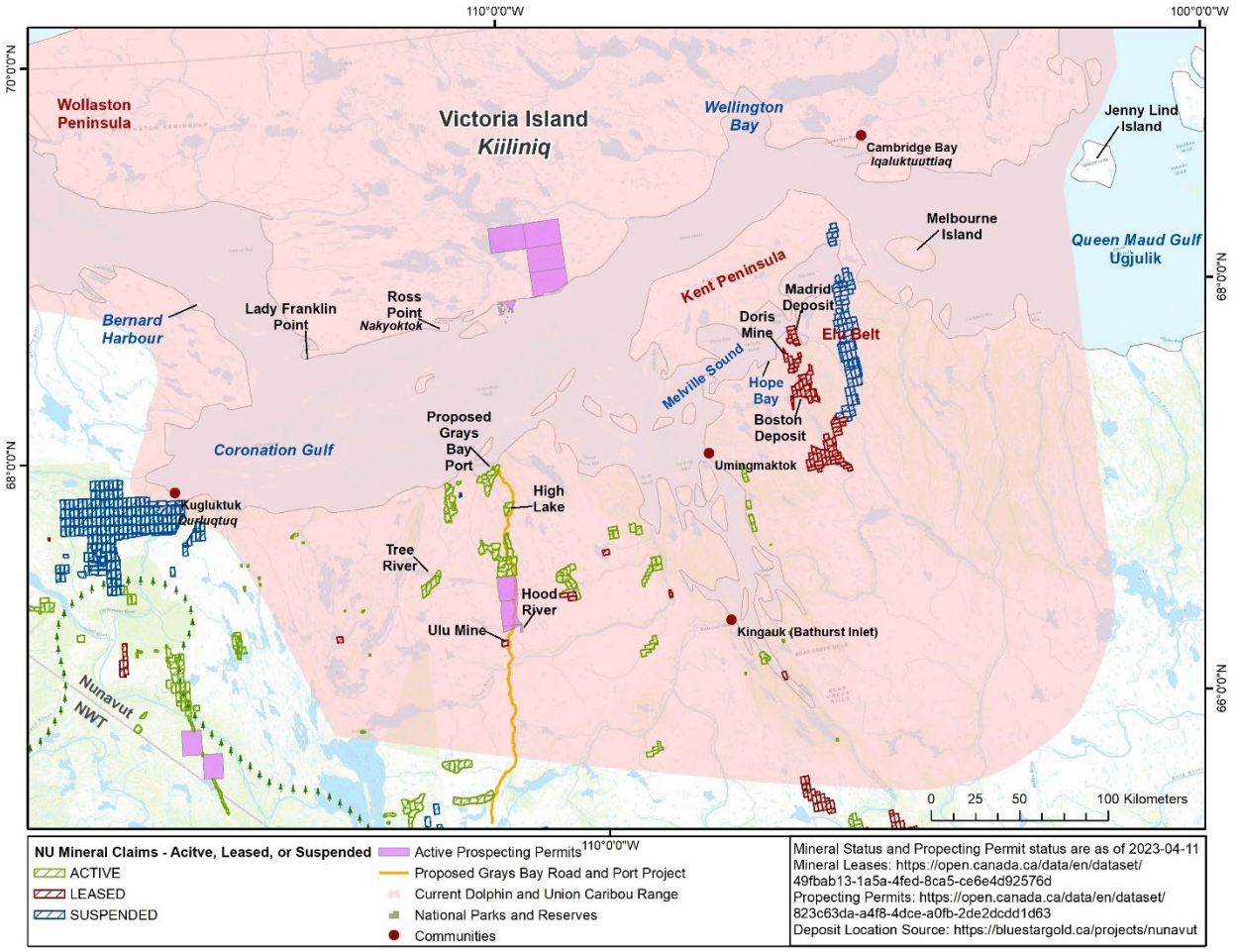

Figure 22. Map of the mineral tenure (active, leased or suspended), prospecting permits and the proposed Grays Bay Road in Nunavut. Data from Open Government Licence – Canada, Mineral Tenure in Nunavut: Mining Leases and Prospecting Permits (CIRNAC 2023a, b). Map courtesy N. Wilson, ECC-GNWT.

Mineral exploration occurred in the Shaler Mountains of northwest Victoria Island in the 1990s (CEAA 2010) but has not led to development. There are currently no active mineral claims, mineral leases or prospecting permits on Victoria Island in either NWT (GNWT Centre for Geomatics 2021) or Nunavut (CIRNAC 2021). A group of 32 prospecting permits on south-central Victoria Island are currently listed as suspended (CIRNAC 2021).

Mining activity on the Nunavut mainland within the Dolphin and Union caribou range include the Doris Mine (Hope Bay) east of Bathurst Inlet and several mineral exploration sites both east and west of Bathurst Inlet (CIRNAC, GN, NTI and CNGO 2020). The Doris Mine was recently acquired by Agnico Eagle Mines Limited and is an underground gold mine, which includes a mill, camp, airstrip, and 15-20 km of road between Roberts Bay and mineral exploration at Madrid North (Agnico Eagle Mines Limited 2021). Additional associated mineral exploration activity is located south of the mine along the Hope Bay belt at the Madrid (accessed by road from Doris Mine) and

Boston (accessed by air) deposits. Infrastructure at the Boston deposit include a camp, airstrip, offices and other associated buildings and storage (Agnico Eagle Mines Limited 2021).

Four other mineral exploration sites are located within the Dolphin and Union caribou mainland winter range (CIRNAC, GN, NTI and CNGO 2020). The Elu belt gold project is located northeast of the Doris Mine, but no work was conducted in 2020. The other three sites are gold projects located west of Bathurst Inlet: Tree River, Ulu Mine and Hood River. Work was conducted in at all three projects in 2020 (CIRNAC, GN, NTI and CNGO 2020). Blue Star Gold Corp. operates the Ulu and Hood River properties and in 2021 acquired the High Lake property, which is a proposed underground copper-zinc mine at High Lake. Additional mineral claims, mineral leases and prospecting permits are scattered throughout the mainland winter range (CIRNAC, GN, NTI and CNGO 2020).

Two roads have been proposed to connect mineral properties to proposed ports on the coast and that could also connect to the Yellowknife-Contwoyto Winter Road: Grays Bay Road on the west side of Bathurst Inlet, which terminates at Grays Bay; and Bathurst Inlet Road and Port, which terminates near the south end of Bathurst Inlet (CIRNAC, GN, NTI and CNGO 2020). The Bathurst Inlet Road and Port project has been dormant for several years after the proponents determined that the project was not feasible (CBC 2013). The proponent/s of the proposed Grays Bay road did not submit a revised proposal to the Nunavut Impact Review Board by the January 2021 deadline and as of March 2023 both proponents had pulled out of the project (Nunatsiaq News 2023). Although there is no technical information available on how roads may affect Dolphin and Union caribou, recent research on barren-ground caribou indicates that some caribou are reluctant to cross roads, resulting in disruption to their movements (Wilson *et al.* 2016).

Increased human activity at exploration sites or mines and on associated roads have the potential to increase disturbance to Dolphin and Union caribou during winter, and to their winter range.

Increased ship traffic and an increased shipping season supported by icebreaking would result in impacts on fall migration of Dolphin and Union caribou (Dumond *et al.* 2013). Most shipping through the Northwest Passage takes the southern route, which includes the Coronation Gulf and Dolphin and Union Strait. Reductions in perennial ice (Overland and Wang 2005; Serreze *et al.* 2007; Barber *et al.* 2008) as well as increased industrial development are likely to lead to increased shipping through the Northwest Passage as the sea ice season is reduced, the extent of Arctic sea ice decreases, and the ice thins (Smith and Stephenson 2013). How a longer shipping season and more frequent ship passages will affect fall migration will depend on the timing of the passages. Dolphin and Union caribou migration movements were delayed as a result of the artificial maintenance of an open water channel in the sea ice near Cambridge Bay in October 2007 (Dumond *et al.* 2013).

Shipping in the Canadian Arctic has increased from four transits per year in the 1980s to 20-30 transits per year from 2014 to 2019 (Figure 22; 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 through the Northwest Passage in 2013 and 2019 exclusively used the southern route through the Coronation Gulf and Dolphin and Union Strait, with a 44% increase in the number of unique ships (a ship that is only counted once, but may enter an area multiple times) and a 107% increase in the distance travelled by all ships combined from 2013 to 2019 (PAME 2021). Traffic from tankers, general cargo vessels, 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). It is unclear what influence increasing shipping will have on Dolphin and Union caribou, but any transit that results in open leads may delay or impede caribou movement between Victoria Island and the mainland or increase the risk of drowning if caribou attempt to cross thin ice (Dumond *et al.* 2013). At the Ice Breaking Workshop in Cambridge Bay in October 2019 (*See Positive Influences*) numerous comments were made about dissuading ships from travelling at the time of gray ice (unstable) and caribou migration (EHTO 2019). The threat to caribou is expected to increase if pressure grows to extend duration of vessel access in the area, such as for supporting industrial activities (EHTO 2019).

The level of access on Victoria Island is 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).

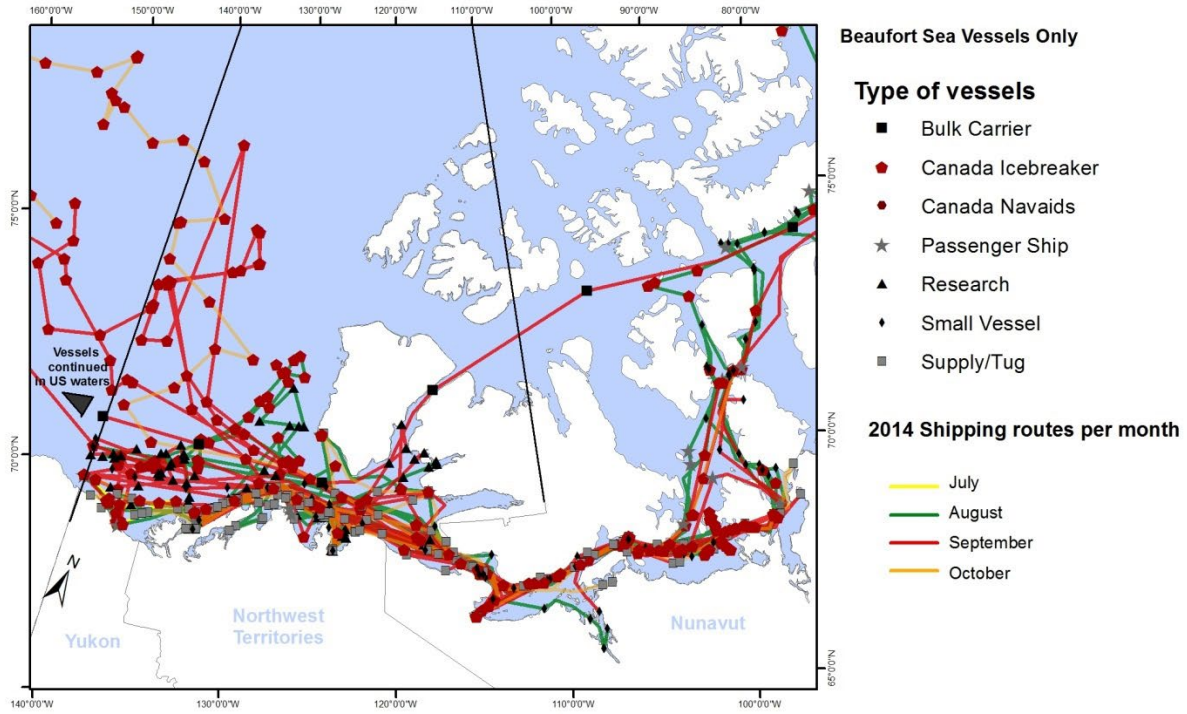

Figure 23. Vessel transit through the Beaufort Sea by type of ship and month from ENR 2022. Data derived from NORDREG 2015.

Intra- and inter-specific forage competition

Intra-specific competition has not been examined in detail for Dolphin and Union caribou. The shift to wintering on the mainland has been suggested as evidence for competition among Dolphin and Union caribou (Hughes 2006). If the trend is for the Dolphin and Union caribou to stage for a longer time while waiting for the sea ice to freeze, or to abandon migrating to winter ranges on the mainland, then intra-specific competition becomes more likely.

Potential for intra-specific competition could also occur on the mainland winter range where Dolphin and Union caribou have overlapped with Ahiak barren-ground caribou in the eastern portion of their winter range, and where there has been occasional overlap in late winter and spring east of Kugluktuk between primarily male Bluenose-East caribou and wintering Dolphin and Union caribou (Dumond pers. comm. 2012b). However, there is no technical information about whether Dolphin and Union caribou compete with barren-ground caribou for forage or other resources during winter.

There is also uncertainty about the existence and extent of inter-specific forage competition between caribou and other herbivores (arctic hare, ptarmigan, lemmings, geese, and muskoxen). Both Schaefer *et al.* (1996) and Hughes (2006) examined distribution of herbivores relative to plant communities on southeastern Victoria Island. While Schaefer *et al.* (1996) did not find overlap, Hughes (2006) reported that muskoxen were foraging on the upland ridges where

typically caribou feed (at least at one site in 2004-05). This led Hughes (2006) to suggest that inter-specific competition between Dolphin and Union caribou and muskoxen was a factor in caribou fall migration to the mainland. However, it may be more complicated as the migration began while caribou and muskoxen abundance were still relatively low (Gunn *et al.* 1997, Gunn and Patterson 2012). On southern coastal Victoria Island, there is at least one site with some evidence for overlap in diet between Dolphin and Union caribou and muskoxen (Hughes 2006), but the spatial extent and consequences of that overlap are unknown. Hughes (2006) suggested that shared species of gastro-intestinal nematodes between caribou and muskoxen may also be a factor in caribou migration to the mainland, if caribou try to avoid the infested ranges. Muskoxen abundance has recently declined on Victoria Island (Leclerc 2015), and it is unknown how this has affected Dolphin and Union caribou behaviour.

Overabundant snow geese numbers may have localized effects on habitat, with a reduction in the availability of sedge meadow habitat as influenced by geese increases (Fleming *et al.* 2019). Intensive use by snow geese has also been found to further exacerbate reduction of surface water of ponds associated with climate change (Campbell *et al.* 2018).

Contaminants

In Dolphin and Union caribou collected from the Kent Peninsula in November 1993, researchers found relatively low levels of organochlorine, heavy metal and radionuclide contaminants resulting from long-distant atmospheric transportation (Macdonald *et al.* 1996). Heavy metal concentrations from sampling in fall and early winter 2006 were also low and showed no trend over time (Gamberg 2008). Evidence based on sampling in the 1990s and 2006 suggest that contaminants do not appear to be current threats to Dolphin and Union caribou health. Likewise, contaminants in muskoxen on southern Victoria Island were low except for a finding of elevated hexachlorobenzene levels in muskox calves (Salisbury *et al.* 1992). Dolphin and Union caribou sampled on Victoria Island in 2015 had contaminant levels that were similar to other Arctic caribou (Gamberg 2019).

Small population size

The Dolphin and Union caribou population is currently estimated at about 3,815 caribou and has experienced a continued decline since the late 1990s (see *Population*). If the population continues to decline, at some point there may be potential for a genetic bottleneck. McFarlane *et al.* (2016) were not able to detect evidence of a past bottleneck for Dolphin and Union caribou despite the apparent near absence of the population between the 1920s and 1970s but did detect some gene flow between Dolphin and Union and barren-ground caribou.

POSITIVE INFLUENCES

Positive influences for Dolphin and Union caribou include community involvement, limits on caribou harvest, species at risk listing, recent land use and caribou management planning, shipping guidelines, potential increased availability of summer forage due to climate change, and to a lesser extent, protected areas.

Community meetings in Nunavut about the decline of Peary caribou on northwest Victoria Island in the early 1990s included concerns for Dolphin and Union caribou because of increased harvesting and risks from crossing the sea ice (summarised in Nishi and Buckland 2000 and Dumond 2007). The community meetings led to the aerial surveys in 1994, 1997 and 2007. More recently, the 2020 population survey benefitted by incorporating Indigenous and community knowledge and IQ into its design. In addition to IQ improving survey design and successful completion of the survey, Campbell *et al.* (2021) stressed that working collaboratively would improve the scientific, political and public confidence in research results, as well as improve effectiveness and stakeholder acceptance of management actions that are developed based on the research results.

The recent restrictions on harvest of Dolphin and Union caribou by the OHTC (voluntary annual harvest of 50) and Nunavut (total allowable harvest of 105), and proposed implementation of mandatory sampling and reporting will reduce uncertainty in the level of harvest and its contribution to Dolphin and Union caribou mortality and population dynamics. Nishi and Buckland (2000) also describe reductions to commercial use of Dolphin and Union caribou in the late 1990s.

The Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study documents Dolphin and Union caribou harvest (Joint Secretariat 2018) and provides reliable harvest data for Dolphin and Union caribou by NWT communities over time. The study has been paused and under review since 2020 but will continue to provide information when it is resumed.

In response to concerns about wolf predation, WMAC (NWT) and ENR implemented a program in 2021 to increase financial incentives for wolf harvesting in the Inuvialuit Settlement Region.

Dolphin and Union caribou in Canada were assessed by COSEWIC (2004) as Special Concern and were designated as Special Concern in Schedule 1 of the federal *Species at Risk Act* in February 2011. The listing required a management plan to be completed within three years of designation. The Government of the Northwest Territories and Government of Nunavut developed a management plan for Dolphin and Union caribou, which was adopted by Environment and Climate Change Canada (ECCC 2018). In addition to management direction provided in the plan, a positive influence included collaborative planning between NWT and Nunavut for the

transboundary Dolphin and Union caribou population. In 2017, Dolphin and Union caribou were re-assessed as Endangered by COSEWIC (COSEWIC 2017), and the status under the *Species at Risk Act* would be changed only if the Governor in Council decides to accept the assessment as proposed by COSEWIC. For species designated as Endangered in Schedule 1 of the *Species at Risk Act*, a recovery strategy must be completed within three years of designation, which includes identification of critical habitat, which was not required in the management plan. Currently, an addendum to the 2017 COSEWIC status report is being prepared by co-management partners and the HTCs and HTOs in the Dolphin and Union range. Dolphin and Union caribou were assessed by the NWT Species at Risk Committee (SARC) as Special Concern in 2013 (SARC 2013) and then listed as Special Concern under the *Species at Risk (NWT) Act* in 2015.

The draft Nunavut Land Use Plan recommends protection measures for sea ice crossings and calving areas for Dolphin and Union caribou (Nunavut Planning Commission 2021). The draft plan calls for no icebreaking between Victoria Island and the Mainland from October 15 and April 1 to May 31, although an exception is made for vessels engaged in community resupply or emergency response. Eliminating ice-breaking vessels during fall and spring migration would reduce risks associated with thin ice or delayed crossings. A large area on central-eastern Victoria Island has been identified as a calving area. For calving areas, the draft plan proposes restricting industrial resource extraction and power generation operations from conducting activities during the calving season, although calving season dates for Dolphin and Union caribou were not specified. Some identified calving, post-calving and key access areas for barren-ground populations overlap the Dolphin and Union caribou range, but restrictions would only apply during those seasons (i.e., when Dolphin and Union caribou are typically not present). No special land use management has been recommended for the Dolphin and Union caribou winter range on the mainland, or for calving, fall staging or other seasonal ranges on Victoria Island other than the calving range in central-eastern portion of the island.

In the NWT, conservation priorities for the area have been formalized in the Inuvialuit Community Conservation Plans (CCPs). The Olokhaktomiut CCP identified a calving area for Dolphin and Union caribou in the Colville Mountains as a Wildlife Area of Special Interest (approximately 3,200 km^2; OCCP 2016). The area is included in Category D "lands and waters where cultural or renewable resources are of particular significance and sensitivity throughout the year". Category D areas are managed to eliminate, to the greatest extent possible, potential damage and disruption.

A workshop was held in Cambridge Bay in October 2019 to develop a solution to proactively mitigate the risks of icebreaking activities. The workshop resulted in the development of a *Notice to Mariners (*NOTMAR*) for Vessels Intending to Navigate the Kitikmeot Region in Canada's Northern Waters,* to mitigate the risks of icebreaking to people traveling on ice and wildlife (DFO-CCG 2022, Transport Canada 2022). The NOTMAR has been in place since 2020. The NOTMAR

provides information to mariners about the time (seasonal) and area (location of caribou and people on the ice) considerations that operators traveling through the region should be made aware of. In the NOTMAR, from October 15 to June 30 the vessels are required to provide one week's notice over the phone and/or email to the hamlet of Cambridge Bay and EHTO and to follow-up in advance of their passage (DFO-CCG 2022, Transport Canada 2022). The NOTMAR includes voluntary measures for vessels to slow down to minimum safe speeds if caribou or people are encountered, use local information to avoid passing in front of caribou or people, and avoid opening multiple leads in the ice (DFO-CCG 2022, Transport Canada 2022). In these ways, the NOTMAR is a communications and awareness tool to help avoid a conflict between vessels and caribou migration, as well as people.

Also, 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* includes: a wildlife viewing guideline for caribou that directs visitors to leave the area immediately if caribou are seen; permit, license and permission requirements for shore visits; and, strongly discouraging use of helicopters and drones (IRC 2022).

Although there is no technical information currently available on changes in vegetation productivity and structure resulting from climate change that is specific to Victoria Island, increased plant productivity and extended periods of greenness could increase the availability of forage (see *Threats and Limiting Factors - Climate Change - Effects on vegetation*). These changes could increase the availability of quality forage during the growing season, which may result in improved condition of animals prior to the winter, and which in turn may have a positive impact on calf survival and possibly adult survival. Increased vegetation productivity could also result in increased winter forage if caribou rely more on shrubs and other vegetation during winter.

The Queen Maud Gulf Migratory Bird Sanctuary overlaps the eastern portion of the Dolphin and Union caribou winter range on the Nunavut mainland. In Migratory Bird Sanctuaries, lands are protected for migratory birds. Migratory Bird Sanctuaries are managed by Environment and Climate Change Canada and co-management partners under the *Migratory Birds Convention Act*. Dolphin and Union 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. Ovayok Territorial Park is located 16 km northeast of Cambridge Bay, but its small size limits the conservation benefit to Dolphin and Union caribou.

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2023 Update

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STATUS AND RANKS

Region	Coarse Filter (Ranks)[5] To prioritize	Fine Filter (Status) To provide advice	Legal Listings (Status) To protect under species at risk legislation
Global	G5T2Q - Species secure, subspecies Imperilled, taxonomic question (NatureServe 2021 pop.16)	Vulnerable (at species level IUCN 2015), Not Evaluated at lower levels	Not applicable
Canada	N2 – Imperilled (NatureServe Canada 2021)	Endangered (COSEWIC – 2017)	Special Concern *(Species at Risk Act* 2011)
Northwest Territories	At Risk (NWT General Status Ranking Program 2021) S2 (NatureServe Canada – NT CDC 2021)	Special Concern (SARC 2013)	Special Concern (*Species at Risk (NWT) Act* 2015)
Adjacent Jurisdictions			
Nunavut	S2 – (NatureServe Canada – NU CDC 2021)		

[5] 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[6]

Threats have been classified for Dolphin and Union 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 28, 2022. 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		

[6] 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.

Certainty	Indicates the confidence that the threat will have an impact on the population.	High Medium Low
MAGNITUDE		
Extent (scope)	Indicates the spatial extent of the threat (based on percentage of population or 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 Dolphin and Union caribou are noted below. Please note that combinations of individual threats could result in cumulative impacts to Dolphin and Union caribou in the NWT. Details be found in the *Detailed Threats Assessment*.

Overall level of concern:

- **Threat 1 – Climate change – changes in sea ice conditions** **High**
- **Threat 2 – Disturbance – industrial activity and habitat alteration** **High-Medium**
- **Threat 3 – Climate change – icing/heavy precipitation events** **Medium**
- **Threat 4 – Increase in shipping traffic** **Medium**
- **Threat 5 – Predation** **Medium**
- **Threat 6 – Disrespectful Harvesting/Over-harvesting** **Medium**
- **Threat 7 – Health** **Medium-Low**
- **Threat 8 – Climate change – impacts of warmer temperatures** **Low**

Detailed Threats Assessment

Threat #1. Climate change – changes in sea ice conditions	
Specific threat	Dolphin and Union caribou rely on sea ice crossings to migrate between their summer and winter ranges. However, increasing average annual temperatures are decreasing the extent and thickness of sea ice in the Canadian Arctic. Increases in mean fall temperatures corresponds to sea ice forming an average 10 days later between 1982 and 2008, and from 2004 to 2018, and total sea ice decreasing at a rate of 6-10% per decade. The onset of sea ice melt in the Arctic from 1979 to 2017 is occurring three days earlier per decade, and freeze-up is happening seven days later per decade. Over the 40 year long record, this amounts to a 12 day earlier melt onset and a 28 day later freeze-up. With later ice freeze-up and earlier spring thaw happening more frequently, migration routes across sea ice are becoming unstable. As a result, Dolphin and Union caribou habitat is becoming fragmented and individuals are drowning or unable to reach wintering grounds for quality forage.
Stress	Unstable ice conditions cause caribou to fall through sea ice resulting in drowning. Unstable ice conditions have also resulted in individual caribou becoming stranded on the ice and drifting out to sea where they die from exhaustion, starvation, or hypothermia. In the spring, caribou may swim through channels of water in the ice and not be able to get out where the edges of the ice are too slippery, or where fresh snow covers the leads, or where there are fast-flowing currents, leading to drowning. Caribou that fall through sea ice but manage to get out of the water may have a build-up of ice on their fur causing them stress and/or loss of fur – later exposing them to hypothermia. Later sea ice formation not only affects sea ice habitat required for fall migration, but causes a longer staging time along the south coast as the caribou wait for sea ice to form. This could impact coastal plant communities because of increased foraging by caribou. Trends toward later sea ice formation affects sea ice habitat for fall migration and may result in a longer duration of staging along the south coast as caribou wait for sea ice to form. Effects of longer staging on forage availability are unknown. Over the short-term (decades), Dolphin and Union caribou may be especially vulnerable to the effects of a warmer climate if the current trend toward later formation of sea ice in fall and earlier ice melt continues and leads to increased risk of drowning deaths, impacts to forage, and changes to distributions and migration.
Extent	Widespread (>50%)
Severity	High

Temporality	Seasonal
Timing	Happening now
Probability	High
Causal certainty	High-Medium
Overall level of concern	**High**

Threat #2. Disturbance – industrial activity and habitat alteration	
Specific threat	Human disturbance including industrial activity, air traffic, roads and road construction, as well as water and dust pollution can change caribou habitat and forage and affect the seasonal caribou movements.
Stress	Human activities that result in disturbance and habitat alteration are primarily associated with mineral development and shipping as well as seasonal or all-season roads. Roads are a concern because they increase access for hunting, facilitate further development, and affect caribou movements. Residents have concerns regarding the impacts of future mining projects and possible expansion of current mining activities to caribou migration routes and winter-feeding grounds. Communities have suggested that air traffic be restricted to higher altitudes over calving areas or they should not fly over calving areas at all. Mining activity on the Nunavut mainland within the Dolphin and Union caribou range include the Doris Mine (Hope Bay) east of Bathurst Inlet and several mineral exploration sites both east and west of Bathurst Inlet. Four other mineral exploration sites are located within the Dolphin and Union caribou mainland winter range. Two roads have also been proposed to connect mineral properties to proposed ports on the coast and that could also connect to the Yellowknife-Contwoyto Winter Road: Grays Bay Road on the west side of Bathurst Inlet, which terminates at Grays Bay; and Bathurst Inlet Road and Port, which terminates near the south end of Bathurst Inlet. Data are lacking to assess the level of threats from human activities on Dolphin and Union caribou. Based on experience elsewhere, disturbances such as low-level aircraft flights, people on foot and vehicles increase caribou energetic costs if those activities interrupt caribou foraging or cause caribou to move away in response.
Extent	Localized (<50%)

Severity	Unknown
Temporality	Continuous
Timing	Short-term future
Probability	Low
Causal certainty	Low
Overall level of concern	**High-Medium**

Threat #3. Climate change – icing/heavy precipitation events	
Specific threat	Both rain-on-snow and icing events tripled in the Canadian Arctic Islands from 1979-1995 to 1996-2011. Rain-on-snow events followed by subsequent freezing and the creation of ice layers prevents caribou from accessing forage (Langlois *et al.* 2017). From 1979-1995 there were 102 observed rain-on-snow events comparted to 284 rain-on-snow events observed during 1996-2011 (Langlois *et al.* 2017). This suggests a significant increase in rain-on-snow occurrence, with the most active years being 1993–1994, 1998–1999, 2008–2009 and 2002–2003. Northwest Victoria Island is one of five areas with the most combined occurrences of these two types of events. Variable freeze/thaw cycles in the spring and fall may cover vegetation with ice and starve caribou. Caribou numbers are lower when 1 to 2 icing events, or 3-4 rain-on-snow events are detected over a winter. Ice-covered snow and/or tundra vegetation prevent caribou from feeding as they cannot 'dig' through ice crusts.
Stress	Years with increased freeze-thaw cycles during spring and/or fall have been associated with decreases in caribou populations. During these cycles, lichen and other plants are covered in ice making them unavailable to caribou as forage, which can result in starvation. Ice crusts also make the terrain difficult for caribou to walk on and freezing temperatures during calving may also result in the death of calves. During freezing rain events caribou may also move away in search of ice-free vegetation, especially on large islands like Victoria Island. However, icing and crusting events could have potentially greater effects on Dolphin and Union caribou if climate change increases the frequency or severity of these events. Over the last 20 years, there have been more cases of freezing rain and sporadic freeze-thaw cycles. Knowledge holders suggest that freezing rain is also happening more frequently now than in the past.

Extent	Localized (<50%)
Severity	Medium
Temporality	Seasonal
Timing	Happening now
Probability	High
Causal certainty	Medium
Overall level of concern	**Medium**

Threat #4. Increase in shipping traffic (disrupting sea ice cover and formation)	
Specific threat	Historically, Dolphin and Union caribou crossed the sea ice on Dolphin and Union Strait twice a year during their northward spring migration to Victoria Island and southward fall migration to the mainland Nunavut and NWT. The main migratory route has since shifted east, and the caribou now migrate across Coronation Gulf, Dease Strait, and Queen Maud Gulf. Shipping in the Canadian Arctic has increased from four transits per year in the 1980s to 20-30 transits per year from 2014-2019, including an increase in traffic through the southern route of the Northwest Passage. Traffic through the Northwest Passage in 2013 and 2019 exclusively used the southern route through the Coronation Gulf and Dolphin and Union Strait, with a 44% increase in the number of unique ships (a ship that is only counted once, but may enter an area multiple times) and a 107% increase in the distance travelled by all ships combined from 2013 to 2019.
Stress	Dolphin and Union caribou seasonal movements can be disrupted by ship traffic. Ship traffic, particularly during sea ice formation, causes unstable or thin ice which may lead to drowning events. Artificial maintenance of open water channels in the sea ice may also delay or impede Dolphin and Union caribou seasonal movements. It is unclear what influence increased shipping will have on Dolphin and Union caribou, but any transit that results in open leads may delay or impede caribou movement between Victoria Island and the mainland or increase the risk of drowning if caribou attempt to cross thin ice. The threat of shipping traffic on caribou is expected to increase if pressure grows to extend the duration of vessel access in the area, such as for supporting industrial activities. A *Notice to Mariners (NOTMAR) for Vessels Intending to Navigate the Kitikmeot Region in Canada's Northern Waters* was put into place in 2020 based on outcomes from

	community workshops. The NOTMAR provides information to mariners about the time (seasonal) and area (location of caribou and people on the ice) considerations that operators traveling through the region should be made aware of.
Extent	Localized (<50%)
Severity	Medium
Temporality	Seasonal
Timing	Happening now
Probability	High
Causal certainty	Medium
Overall level of concern	**Medium**

Threat #5. Predation	
Specific threat	Wolves, wolverines and grizzly bears are known predators within the range of Dolphin and Union caribou. Harvesters report increased wolf abundance in the 1970s and 1980s, possibly in response to increases in caribou and muskoxen abundance during the 1970s. Communities have expressed concerns about increasing wolf population numbers and the negative effects on caribou cycles. Community members are also very concerned about grizzly bears as a new predator establishing itself on Victoria Island, and more information is needed to understand grizzly bear diet and the impacts grizzly bears have on the ecosystem.
Stress	Wolf numbers are reported to have increased in the 1970s and 1980s, possibly in response to increases in caribou and muskoxen abundance during the 1970s. Grizzly bears were first reported on Victoria Island in the mid-1990s. Communities (Ulukhaktok and Kugluktuk) have been concerned about the increasing number of grizzly bears and wolves and how their predation affects caribou since the mid-2000s. By 2021, residents of Ulukhaktok began observing grizzly bear dens along with grizzly bear mothers and cubs north of the community – indicating for the first time that a grizzly bear population is being established on Victoria Island. There is little information to indicate the magnitude or imminence of predation as a threat to Dolphin and Union caribou. However, as a step towards predator management, ENR implemented a program in 2021 to increase financial incentives for wolf harvesting in the Inuvialuit Settlement Region. Efforts to

	reduce the grizzly bear population on Victoria Island are supported by Ulukhaktok residents and are currently being pursued with the OHTC.
Extent	Widespread (>50%)
Severity	Unknown
Temporality	Continuous
Timing	Happening now
Probability	High-Medium
Causal certainty	Medium
Overall level of concern	**Medium**

Threat #6. Disrespectful Harvesting and/or Over-harvesting	
Specific threat	Over-harvesting contributed to past declines, and current disrespectful harvest and wounding loss are threats to Dolphin and Union caribou populations. In the late 1990s, Kugluktuk residents suggested that the harvest of Dolphin and Union caribou might be too high, and that they might have to stop hunting during migrations, as well as stop hunting pregnant cows. Cambridge Bay residents also suggested that there was the possibility of high wounding loss impacting Dolphin and Union caribou. In 2007, there were additional concerns that there may be some over-harvesting and wasting of meat in the community, particularly during years when the caribou migrate close to the community. Inadequate hunting practices by inexperienced Inuit and non-Inuit hunters were noted in the 2018-2020 Kitikmeot Traditional Knowledge Study as one of the main issues facing Dolphin and Union caribou, and participants expressed a desire for more educational opportunities for hunters as a potential solution. In 2021, the smaller spring harvest for Dolphin and Union caribou in Ulukhaktok was voluntarily closed from April 15 to July 15, and a voluntary community maximum harvest of 50 caribou per year was established. A recommendation was made by WMAC (NWT) with support from the OHTC to ENR in 2021 to implement mandatory sampling and reporting for all caribou harvested on Victoria Island through the OHTC by-laws in the *Wildlife Act*. These changes were made by ENR following consultations with the OHTC by WMAC-NWT, a review of the most recent population estimate, and review of the 2018 Dolphin and Union Management Plan. When this is implemented, exact harvest information will be known throughout the Dolphin and Union range, with the exception of the opportunistic harvest from Paulatuk.

Stress	Harvest levels and the overall harvest rate for Dolphin and Union caribou were unknown until recent years. Currently, Resident and guided harvest for Dolphin and Union caribou are currently closed and Dolphin and Union caribou are harvested exclusively by Indigenous groups and residents. The Inuvialuit Settlement Region – Community-Based Monitoring Program: Inuvialuit Harvest Study was launched in 2020 and provides annual information on the caribou harvest of Inuvialuit communities and reports harvest data specifically for Dolphin and Union caribou. Limited information on harvests rates suggests that estimated annual harvests of 2,000-3,000 caribou prior to 2011, represented 7-11% of the population size estimated in 2007. The current allowable harvests in the NWT (50) and Nunavut (105) represent 4.1% of the 2020 population estimate but does not include potential harvest by Paulatuk community members. With recent low adult female survival and calf recruitment rates and a declining population trend, it is uncertain for how long or whether the current allowable harvest will be sustainable.
Extent	Widespread (>50%)
Severity	Medium
Temporality	Continuous
Timing	Happening now
Probability	High
Causal certainty	Medium
Overall level of concern	**Medium**

Threat #7. Threats to Health	
Specific threat	A range of diseases and parasites have been identified as impacting the Dolphin and Union caribou health, with local communities reporting more observations of diseased caribou since the 1980s.
Stress	Kugluktuk harvesters interviewed in 2003 said that they encountered caribou with rashes, green meat, spleen abnormalities and other indications of disease while Ekaluktutiak interviewees described sick caribou with big stomachs, green meat, irritated spleens, and hoof problems. Harvesters from Kugluktuk and Cambridge Bay have also reported observations associated with brucellosis,

	Taenia cysts and/or Besnoitia tarandus infection. The potential impacts of these diseases and infections to caribou populations is concerning for residents. Exposure to α-herpesvirus, pestivirus, *Toxoplasma gondii*, *Neospora caninum* and the presence of diverse internal and external macroparasites have been documented in Dolphin and Union caribou. These pathogens are less likely to cause significant mortality and are mostly associated with reproductive loss or other type of syndromes. Their effects, however, may affect the resilience of Dolphin and Union caribou to other stressors. A recent study also found high exposure to California serogroup of viruses in Dolphin and Union caribou. This group of viruses is vector-transmitted and occasionally associated with disease in infected hosts; however, its effects on caribou health are still unknown.
Extent	Widespread (>50%)
Severity	Unknown
Temporality	Continuous
Timing	Happening now
Probability	High
Causal certainty	Low
Overall level of concern	**Medium-Low**

Threat #8. Climate change – impacts of warmer temperatures	
Specific threat	Declining sea ice along with rising air temperatures and precipitation are linked to increased plant productivity and shrub growth as well as an earlier onset to the growing season. Increased vegetation productivity could reduce the availability of winter forage for caribou as terrestrial lichen are poor competitors against vascular vegetation. 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. Warm air temperatures during the summer are changing insect intensity and diversity. Insect harassment on caribou has increased since the 1970s. To avoid mosquitoes caribou will gather, move in circles and shake. Insect-induced avoidance behaviour takes up energy and prevents feeding. Heat-related stress may also cause caribou to overheat, which can be exacerbated while escaping insects.
Stress	Warmer air temperatures as a result of climate change are increasing plant productivity and shrub growth, and increasing insect intensity and diversity.

	These changes have the potential to impact Dolphin and Union caribou body condition and survivability during migration, water crossings and winters.
Extent	Widespread (>50%)
Severity	Low-Unknown
Temporality	Continuous
Timing	Happening now
Probability	High
Causal certainty	Low
Overall level of concern	**Low**