NUNAVUT WILDLIFE MANAGEMENT BOARD
Agenda: Regular Meeting No. RM 004-2018
Wednesday, December 5, 2018
Iqaluit, Nunavut

	No:	Item:	Tab:	Presenter:	Time Limit
9:00 AM - 9:05 AM	1	Call to Order / Opening Prayer		Chairperson	5 minutes
9:05 AM - 9:10 AM	2	Opening Remarks and Introductions		Chairperson	5 minutes
9:10 AM - 9:15 AM	3	Approval of Agenda	1	Chairperson	5 minutes
		Government of Nunavut - Department of Environment			
9:15 AM - 10:00 AM	4	2015 Population Estimate and 2015-2017 Demographic Population Indicators of the Dolphin and Union Caribou herd (Rangifer tarandus groenlandicus x pearyi)	2	GN-DOE	45 minutes
		BREAK			15 minutes
		Fisheries and Oceans Canada (DFO): Issues/Decisions			
10:15 AM - 10:45 AM	5	Consultation regarding the possible addition of the Atlantic Walrus (High Arctic and Central/Low Arctic Populations) to the Species at Risk Act	3	DFO	30 minutes
10:45 AM - 11:15 AM	6	Fisheries and Oceans Canada Update - Marine Conservation Initiatives	4	DFO	30 minutes
11:15 AM - 11:45 AM	7	Development of Nunavut Fishery Regulations	5	DFO	30 minutes
		LUNCH			1 hr & 30 min.
1:15 PM - 1:45 PM	8	Fisheries and Oceans Canada Update - Arctic Char Science Program 2018-19	6	DFO	30 minutes
		Environment Canada (EC): Issues/Decisions			
1:45 PM - 2:15 PM	9	Consultation Plan for the proposed downlisting of Common Nighthawk and Olive-sided Flycatcher to Special Concern under the federal Species at Risk Act (SARA)	7	ECCC	30 minutes
2:15 PM - 2:45 PM	10	Consultation plan for the proposed change in status of Dolphin and Union Caribou from Special Concern to Endangered under the federal Species at Risk Act (SARA)	8	ECCC	30 minutes
2:45 PM - 3:15 PM	11	Consultation plan for the proposed change in status of Peregrine Falcon from Special Concern to Not at Risk under the federal Species at Risk Act (SARA)	9	ECCC	30 minutes
		BREAK			15 minutes
		Cumberland Sound Fisheries Ltd./Pangnirtung Fisheries Ltd.			
3:30 PM - 4:10 PM	12	Cumberland Sound Fisheries Ltd./Pangnirtung Fisheries Ltd. Request to Increase the Turbot Total Allowable Catch from 500 t to 800 t in the Cumberland Sound Turbot Management Area	10	CSFL/PFL	40 minutes
		Nunavut Wildlife Management Board			
4:10 PM - 4:30 PM	13	2019 Walrus Sport Hunt Applications	11	Wildlife Management Biologist	20 minutes
	14	Adjournment		Chairperson	

SUBMISSION TO THE

NUNAVUT WILDLIFE MANAGEMENT BOARD

FOR

Information: **Decision: X**

Issue: 2015 Population Estimate and 2015-2017 Demographic Population Indicators of the Dolphin and Union Caribou herd (*Rangifer tarandus groenlandicus x pearyi)*

Background

- The Dolphin and Union caribou herd was assessed as a Species of Special Concern by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2004, up-listed under the federal *Species at Risk Act* in 2011 (SARA) and listed on the Northwest Territories list of Species at Risk as a species of "special concern" in 2014.
- The Dolphin and Union caribou herd plays an essential role in the lives of Inuit and Inuvialuit people. They are highly valued from a spiritual, economic, cultural, and harvest perspective.
- Concerns from the west Kitikmeot communities have put an emphasis on increasing monitoring efforts on the Dolphin and Union caribou herd.
- The Government of Nunavut, Department of Environment (DOE) worked with the Federal Government to develop the Dolphin and Union Management Plan. DOE provided technical information and expertise during the process. This plan was approved in 2017.
- The Dolphin and Union caribou herd has undergone a decline from the extrapolated population estimate of 27,787 ± 7,537 (95% CI) animals in 2007 to 18,413 ± 6,795 (95% CI) caribou in 2015. This decline is statistically significant and puts the herd in a "Declining Status" based on the management status defined in the Dolphin and Union management plan.
- 2015-2017 demographic indicators show no sign of a recovery in the population:
    - cow survival rate is 0.70
    - pregnancy rates of female collared caribou were 88% in 2015 and 2016
    - the fall composition survey showed a low calf to cow ratio of 0.25
    - the spring composition survey showed a low calf to cow ratio (recruitment) of 0.11
    - the sex ratio (bull:cow ratio) of 0.15 shows an imbalance in the sex composition

Current Status

- In December 2017, the Dolphin and Union caribou herd was assessed as Endangered by COSEWIC. There status of the species under the federal *Species at Risk Act* (SARA) has not yet been changed in response to the new COSEWIC assessment.

- The DOE does not recommend a Total Allowable Harvest (TAH) on this herd at this time. The Hunters and Trappers Organizations (HTOs) and the communities do not support a TAH.
- Community-based management initiatives have been implemented with the intent to promote the recovery of this herd.
- DOE has engaged with affected communities and respective co-management partners (Nunavut Tunngavik Inc., HTOs, Kitikmeot Regional Wildlife Board) on the monitoring of the Dolphin and Union caribou herd.
- In 2018, DOE deployed 50 female collars on the Dolphin and Union caribou herd. The movement monitoring will be paired with an additional population survey in October 2018, to monitor the declining trend in the population.

Engagement, meetings, and consultations:

- KRWB AGM, 2015: Progress report on fall population surveys
- January 11-13, 2016: Second Joint Meeting in Cambridge Bay (NU), progress report on fall population surveys.
- April 19, 2016: Draft Consultation with the Cambridge Bay HTO and Community of Cambridge Bay, progress report on fall population surveys.
- April 28, 2016: Draft Consultation with the Kugluktuk HTO and Community of Kugluktuk, progress report on fall population surveys.
- KRWB AGM, 2016: Final result on fall 2015 population survey and progress report on the fall 2016 composition survey
- May 25, 2017: Consultation with the Cambridge Bay HTO. Final result on fall 2015 population survey and final results on the fall 2016 composition survey and progress report on the spring composition surveys
- KRWB AGM, 2017: Final results on the demographics indicators: pregnancy rate, fall and spring composition surveys, and sex ratio.
- January 24, 2018: Consultation with the Kugluktuk HTO, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring programs.
- February 1, 2018: Consultation with the Cambridge Bay HTO, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring program.
- February 22, 2018: Consultation with the Cambridge Bay Community, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring program.
- July 18, 2018: Consultation with the Kugluktuk HTO, Dolphin and Union caribou herd management recommendations base on the report finding.
- September 28, 2018: Consultation with the co-management partners on the report, bring additional clarification, and discuss the management recommendations.

Recommendation

- The DOE does not recommend a TAH at this time but due to the declining status of the herd, it is recommended that the DOE follow the approved Dolphin and Union Caribou Management Plan.

Date: November 3, 2018

REPORT SUMMARY ON DOLPHIN AND UNION CARIBOU HERD 2015-2017 RESEARCH PROGRAM, IN NUNAVUT

Summary

This document is a summary of the information provided in the report entitled: “Fall Population Estimate of the Dolphin and Union caribou herd (*Rangifer tarandus groenlandicus x pearyi*), Victoria Island, October 2015 and Demographics Population Indicators 2015-2017.”

The Government of Nunavut has jurisdiction for managing the harvest of the caribou in Nunavut and needs to conduct research and monitoring (population surveys) to inform the management process. This report provides scientific information to help decision-makers in managing the Dolphin and Union caribou herd.

Information

This section of the report put the research program into context. It provides a description of the species, and some historical information, such as the previous population number.

The Dolphin and Union caribou herd (DUC) are recognized as a distinct species as they are genetically different from Peary and Barren-ground caribou. One of its particular behaviors is its seasonal migration pattern from Victoria Island to the mainland across the sea- ice.

This herd plays an essential role in the lives of Inuit people and it is highly valued from a spiritual, economic, cultural, and harvest perspective. All the western Kitikmeot communities (Kugluktuk, Cambridge Bay, Bay Chimo and Bathurst Inlet) subsist on this herd.

The first population census for the DUC herd was completed in 1997 by surveying the southern coast of Victoria Island during the fall aggregation. This effort resulted in an estimate of 34,558 ± CI 4,283 caribou. The following survey, in 2007, estimated of 27,787 ± CI 3,613 caribou by extrapolating latent caribou that had not yet reached the coast at the time of the survey. Based on these 1997 and 2007 survey results, the conclusion made was that the population remained at best stable over that decade.

Hunters have noticed a decrease in the number around Cambridge Bay, a decrease in the young age class, and have observed poorer caribou body conditions. These concerns from the western Kitikmeot communities have put an emphasis on monitoring efforts for the Dolphin and Union caribou herd.

Objectives

This project aims to address concerns of Inuit, as well as to provide new scientific information, by establishing a new 2015 population estimate, and baseline on demographic indicators such as:

- Determine cow survival rate
- Determine the pregnancy rate among collared female caribou
- Determine the calf:cow ratio in fall
- Determine the calf:cow ratio in spring
- Determine the sex:ratio of the herd

Methods

Collaring, 2015-216

At the end of March and early April, between Kugluktuk and the western fringe of the Queen Maud Migratory Bird Sanctuary, 25 female Dolphin and Union caribou were collared in 2015 and 19 in 2016. The caribou were collared with Lotek GPS Globalstar Lifecycle satellite collars according to the capture methods involving tangle net and net gunning teams from a helicopter. Feces samples were collected and shipped to a laboratory to determine the pregnancy rate.

Population estimate, 2015

This project followed the 1997 and 2007 methodology, but used 2015 collared caribou locations. By using *in situ* collar data during the survey, this real-time information aimed to increase the precision of the final Dolphin and Union population estimate.

The study area extended from Read Island to Parker Bay. The surveys were divided into an initial reconnaissance survey (October 25, 26, 27 and 31st, Figure 1a) that was used to delineate the extent of caribou on the coast followed by a visual systematic survey (October 29, 31st; November 2nd, 3rd, and 5th, Figure 1b) that was used for the estimates. Effort for survey strata was allocated using a proportional allocation methodology similar to calving ground surveys of other Barren-ground caribou herds. All transects were surveyed at a speed of 160 km/hr and at an altitude of about 150 meters. All caribou within the pre-determined transect width of 800 meters were recorded. Sixteen radio collared Dolphin and Union caribou were tracked daily to index the distribution of the caribou

Demographic indicators

The Dolphin and Union fall composition survey was performed on October 26 to 29, 2016. The survey area covered from west of Ross Point to Cape Peel and a fixed-wing followed systematic 2 km apart transect lines running perpendicular to the shore line.

The following spring, March 2017, the spring composition survey took place to identify the recruitment of calves by re-assessing the number of calves per 100 cows. The area surveyed by helicopter was based on the most recent caribou collar locations.

For the fall and spring composition work, each caribou seen was classified under pre-determined criteria: yearlings, calves, bulls, and cows. Sex determination was based on the presence or absence of the vulva patch; females had darker coloration at this body location. Yearlings were characterized by their intermediate-size and straight face profile.

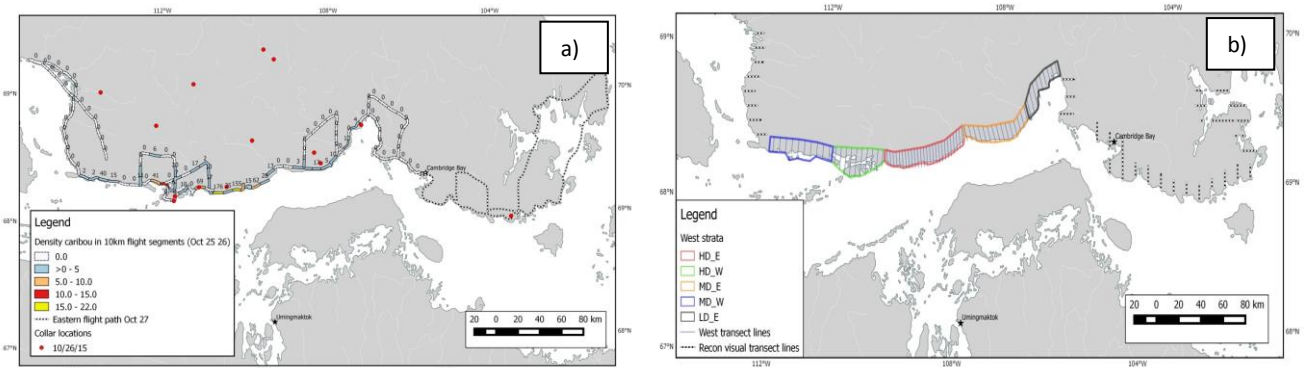

Figure 1: a) Survey tracks of the reconnaissance survey along the south coast of Victoria Island with the collar in red dot and b) visual systematic survey lines.

Results

Population estimate, 2015

During the visual survey, 3,083 caribou were counted in 210 groups. The majority of group sizes were 1-10 (median = 10) with sizes up to 135 caribou. The Dolphin and Union caribou herd has undergone a decline from the extrapolated population estimate of 27,787 ± 7,537 (95% CI, 20,250-35,324) animals in 2007 to 18,413 ± 6,795 (95% CI, 11,664-25,182) caribou in 2015 (Figure2). This decline is statistically significant and puts the herd in a "Declining Status" based on the management plan.

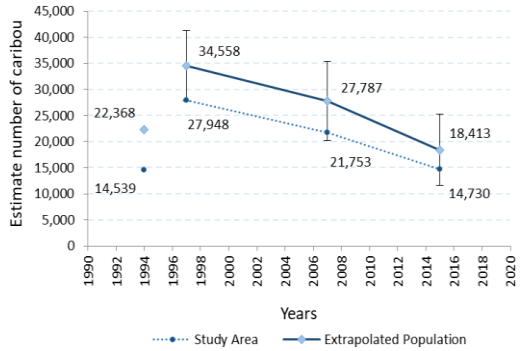

Figure 2: Population estimates of the Dolphin and Union from 1994 to 2015.

Demographic indicators

The cow survival rate was of 0.70. From the 33 Dolphin and Union fecal samples successfully analysed, only five females were barren. This represents a pregnancy rate of 88% in spring 2015 (15/17 caribou pregnant) and 88% in spring 2016 (14/16 caribou pregnant).

In the fall composition survey, 136 groups were seen and 1,225 caribou was classified; there were 873 cows, 218, calves, 129 yearlings and 134 bulls. The Dolphin and Union calves to cows ratio was 0.25 and has a low bull: cow ratio of 0.15.

During the spring composition survey, to find group of caribou, collar locations were visited. From the 17 collar locations in the study area, 15 were visited and only 2 collars were seen. Thus, 24 groups and 229 caribou were classified. The calf:cow ratio was established at 0.11.

These demographic indicators show no sign of increase in the Dolphin and Union population since the last population survey; declining trend, low cow survival rate, and low productivity.

Fall Population Estimate of the Dolphin and Union Caribou herd (*Rangifer tarandus groenlandicus* x *pearyi*) Victoria Island, October 2015

And

Demographic Population Indicators 2015-2017

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STATUS REPORT 2018-10
NUNAVUT DEPARTMENT OF ENVIRONMENT
WILDLIFE RESEARCH SECTION
KUGLUKTUK, NU

Executive Summary

Dolphin and Union Caribou (*Rangifer tarandus groenlandicus* x *pearyi*) have a large distribution covering Victoria Island and the northern region of the Canadian mainland. This paler and smaller caribou, similar to Peary Caribou in appearance, are genetically distinct from other Barren-ground caribou herds in addition to displaying unique behaviors. The main objective of this study is to provide an extrapolated population estimate, as well as highlight the demographics of the Dolphin and Union Caribou (DUC) herd. In fall of 2015, the total estimate of the final visual strata was 14,730 (SE=1,507, CV=10.2%, CI=11,475-17,986) caribou (1 year and older), resulting in an extrapolated population estimate of 18,413 ± 6,795 (95% CI=11,664-25,182) by using real time collar location. This estimate shows gross change of 66% from the 2007 survey estimate (z-test, Z=-2.19, p=0.036). This translates to a statistically significant annual rate of decline of 4% (CI=1-7%) since the 1997 survey. The yearly collared female survival estimate from the Program MARK was 0.70 (SE=0.071, CI=0.55-0.82). In the fall 2016, the Dolphin and Union calf to cow ratio, measured as calves/100 cows, was 0.25 while calf survival dropped by 0.11 in the following spring of 2017. Laboratory analysis of female feces, collected from collared caribou, were analysed to determine the pregnancy rate. The pregnancy rates were consistent between years (2015 and 2016) with 88%. Though pregnancy rates appear normal, calf to cow ratio and survival rate show little indication of recovery for the DUC population since the last population surveys and low calf survival suggest that further decline is likely to occur. Since there is low survival and low calf productivity this hers would not be able to tolerate a substantial harvest levels. With the current available information, it is recommended to inform users about the current decline and increase the research and monitoring effort on this herd.

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Introduction

Dolphin and Union Caribou (*Rangifer tarandus groenlandicus* x *pearyi*) are of great importance for Inuit subsistence and cultural needs for the communities of Kugluktuk, Cambridge Bay, Bay Chimo, and Bathurst Inlet. At the beginning of the century, although Dolphin and Union Caribou (DUC) were recognized as a distinct species, there was little information about this population. The only available information pertinent to their abundance was registered in explorers' log books, records from trading posts, and observations from geologists during short exploration trips (Manning, 1960; Hewitt, 1921). Based on these historical transcripts, it was estimated that there was an abundance of caribou in the Arctic that may have reached up to millions in 1907 according to Ernest Seton estimate (Godsell, 1950). After the early 1900s, hunters reported almost no caribou sightings; and by the early 1920s, the caribou had essentially disappeared of the barren land. It was also observed that a small portion of caribou remained on Victoria Island year round, and the remaining portion migrated across the Dolphin and Union Strait (Manning, 1960). In the early first half of the century, the caribou herd had declined to levels where the caribou's behavior halted its migration to the Canadian mainland (Godsell, 1950). In the 1970s and into the early 1980s, hunters reported increased sightings of caribou on southern and central Victoria Island that suggested an increase in abundance (Gunn, 1990). By 1993, the DUC migrated by the thousand from the mainland back to Victoria Island; 2,500 animals were seen to cross north, while an additional 4,700 caribou were staged to cross (Gunn *et al*., 1997).

As the herd started to increase, the first attempt to systematically survey the DUC herd took place in 1987 and 1988, following the calving ground survey methodology for Barren-ground caribou (Heard, 1985). In June 1987, 1,601 km were flown and 652 adult caribou and 94 newborn calves were counted on the west-central Victoria Island transect (Gunn and Fournier, 2000). Low cloud cover prevented the determination of the northern and the eastern edge of the calving ground, in addition cow-calf pairs were sparse on the eastern transects. In June 1988, the survey area was increased to the south and to the northeast to 2,155 km of transect lines and 805 caribou and 203 calves were counted on transect (Gunn and Fournier, 2000). The boundaries for the calving grounds were diffuse, and the sparse density of calving cows made it difficult. Defining the boundary of the calving ground is essential when applying the calving ground survey method, as the abundance estimate depend on the extrapolating from the area surveyed.

In 1994, Nishi and Buckland (2000), aiming to define the core calving area, flew transects in the western part of Victoria Island and estimated 14,529 ± S.E. 1,015 caribou on 63% of the island. This assessment underestimated the total number of the DUC herd, since an unsystematic aerial search in the eastern portion of Victoria Island confirmed additional female caribou sightings. Therefore, the amount of area covered was still insufficient to delimit the DUC calving ground. Newborn calves were also observed on eastern Victoria Island from the Collinson Peninsula up

to Storkerson Peninsula (Nishi and Buckland, 2000). Satellite collar data confirmed that DUC have an individualistic calving strategy that extends over most of Victoria Island, despite some higher density aggregations. June 1988 and 1994 systematic aerial surveys of west-central and western Victoria Island respectively failed to effectively delineate the DUC calving ground. The determination of caribou population estimate based on traditional calving ground is not applicable to caribou herd that seems to have an individualistic and dispersed calving strategy (Bergerud, 1996).

Because of the inability to effectively delineate the calving ground, a new survey technique was developed by Nishi and Gunn (2004). Based on hunter observations, biologists designed the survey with the premise that the large majority of DUC gather during the rut on the southern coast of Victoria Island waiting for the sea-ice to form. There, they wait to begin their migration across the mainland as soon as the grey ice form to a thickness allowing it. Using this method, the first population census of the DUC resulted in an estimate of 27,948 ± SE 3,367 caribou in 1997 (Nishi and Gunn, 2004).

In 2007, following the same survey technique, Dumond and Lee (2013) estimated 21,753 ± SE 2,343 caribou in the survey area on the south of Victoria Island. Based on satellite collar data from previous years, Dumond later extrapolated this estimate to 27,787 ± CI 3,613, by taking into consideration the proportion of latent caribou that had not yet reached the coast at the time of the aerial survey (Dumond and Lee, 2013). The same analysis was applied to the 1997 estimates resulting in a revised extrapolated estimate of 34,558 ± CI 4,283 caribou (Dumond and Lee, 2013). Statistically, the difference between the 1997 and 2007 population estimates were not significant. Although the survey area remained reasonably consistent between 1997 and 2007, it was slightly extended based on local observations. No trend in the population between these two surveys was statistically confirmed. Based on the 1997 and 2007 surveys, the only conclusion made was that the population remained at best stable over that decade (Dumond and Lee, 2013). Nonetheless, potential annual fluctuations could have taken place during the interval between surveys.

Local knowledge including interviews conducted in Cambridge Bay in 2014-2015, indicated that there was a period when the caribou population was increasing (1960-1990), followed by a peak reaching a high in abundance between (1990-2005), followed by a period of population decline (mid-2000s to present), more evident since 2010 (Tomaselli, 2018). Interviewees indicated that they were seeing about 80% less caribou around Cambridge Bay compared to what they observed in the 1990s. Trends in age class, body condition and health of DUC were also observed between the peak period and the declining period. Since the decline, hunters have observed a decrease in the yearlings and calves, observations of poorer caribou body condition, and increased observations of caribou with abnormalities or diseases (Tomaselli, 2018).

Due to the minimal information on the population size in relation to the increase of harvest level of this herd, the DUC was assessed by the Committee on the Status of Endangered Wildlife (COSEWIC) in Canada and is listed under Schedule 1, Part 4 of the Species at Risk Act in Canada in 2004 (COSEWIC 2004; Miller 1990b; Gunn *et a*l., 2000; Harding 2004). In 2011, it was listed as a species of "Special Concern" by the Canadian Wildlife Service under the *Species at Risk Act (SARA)*. Over the last three to four years, hunters have noticed a decrease in the number of DUC around the community of Cambridge Bay.

This project aims to address concerns of Inuit, as well as to provide new scientific information, by establishing a new population estimate on the DUC for fall 2015. In addition, demographic indicators will be monitored from 2015-2017. By increasing the monitoring of this herd, this ongoing effort would have four additional objectives: 1) Determine the cow survival rate 2015-2017, 2) Determine the pregnancy rate among female in spring 2015 and 2016, 3) Determine the sex ratio of the herd during rut in the fall 2016, 4) Determine the calf: cow ratio in the fall 2016, 5) Determine recruitment, calf: cow ratio in spring 2017.

Methodology

Study area

The range of the DUC encompasses Victoria Island and the Canadian mainland, more specifically the land on both sides of Bathurst Inlet. Victoria Island is mainly characterized with undulating lowlands formed on flat-lying Palaeozoic and late Proterozoic carbonate rock that slope gently and where the maximum elevation is 200 meters (Environment Canada, 1995). The land is covered with low rocky promontories, scattered eskers, and numerous ponds and small lakes. Victoria Island is part of the Northern Arctic Ecozone characterized with three ecoregions, the Wager Bay Plateau, Victoria Island Lowlands, and the Shaler Mountains (Environment Canada, 1995). The willows in southeastern Victoria Island are also found to be greater than further north on the island (Eldun, 1990). The southern coast of Victoria Island is part of the Wager Bay Plateau ecoregion. Some sites are characterized by taller dwarf birch and alder, but the vegetation is mostly characterized with a discontinuous cover consisting of willow, northern Labrador tea, *Dryas* ssp., and *Vaccinium* spp. In the Wellington Bay region (southeastern), eight vegetation classes were distinguished and the presence of *Dryas* and *Salix* in many habitat classes suggests a wide capacity for environment tolerance (Schaefer and Messier, 1993). The Victoria Island Lowlands ecoregion, which constitute two-thirds of Victoria Island, is mainly dominated by arctic willow, alpine foxtail, wood rush, and other saxifrage species, such as the purple saxifrage. The lakes are surrounded with sedge, cotton grass, saxifrage and moss (Environment Canada, 1995).

Bathurst Inlet, within the Canadian Shield, is part of the mainland between Thee River and The Queen Maud Gulf Bird Sanctuary. Its northern location, above the tree line, place it within the southern border of the Arctic tundra region. There are Uplands on either side of the inlet; to the east the Buchan and Bathurst Drift Uplands; and to the west, the Contwoyto Plateau, Wilberforce Hills and the Tree River Uplands (Bird and Bird, 1961). The vegetation in the river valley is lush where shrubs, birch, and the willow can reach up to 2 -3 meters (Cody *et al.,* 1984). The Uplands are characterized by a rock desert cover with a patchy distribution of cushion plants, prostrates shrubs, lichens, and bryophytes. The winter conditions are among the most severe in the Arctic and the summer is relatively mild at the head of the inlet (Maxwell, 1981).

Collar deployment 2015 and 2016

The DUC winter on the tundra on the Canadian mainland. As the spring approaches, the caribou move to the coast of the mainland, concentrate to feed and rest, and start to cross back to Victoria Island in the thousands (Gunn *et al.* 1997; Bates, 2006). At this time, they are found in high densities near the coastlines. Collars were deployed at this time, from Tree River to Hope Bay, to take advantage of these aggregations before they disperse on Victoria Island for the summer. Adjacent herds are believed not to be t in the coastal area. The Beverly herd, are believed to be in taiga habitat, south of the treeline, and the Ahiak herd on the tundra further south and east than the DUC spring distributions (Campbell *et al*., 2013).

At the end of March and early April, between Kugluktuk and the western fringe of the Queen Maud Migratory Bird Sanctuary, 25 caribou were collared in 2015 and 19 in 2016. The caribou were collared with Lotek GPS Globalstar Lifecycle satellite collars following the capture methods involving tangle net and net gunning team from a helicopter (TAEM, 1996). The caribou capture work was performed by an experienced capture crew: net gunner and two handlers, under a fixed time. The time between the beginning of the pursuit (which was kept under 1 minute) to the animal being released did not exceed 10 minutes. This was done in order to keep stress levels to a minimum and thereby increase the survival rate post-collaring. To decrease post-collaring mortality, collars were deployed at outside temperature above -25° C to avoid freezing the lung tissue of the caribou. Once the caribou was immobilized, hair samples from two different body locations (rump and neck), feces, blood samples, and photographs (teeth, body and eye) were taken. By palpitation of the shoulder, ribs, and hips/spine, a body condition score (based on fat) was given according to CARMA's protocol level 2 for live animals (CARMA, 2008) to determine overall fatness. All noticeable injuries were recorded. The scat samples were sent for laboratory analysis under the standard set of 19 microsatellite markers to confirm the specific genetics

signature of the DUC similarly to what has been employed in past caribou projects from across Canada (Serrouya *et al.,* 2012).

Population Estimate

Aircraft configuration

During the rut, at the end of October, DUC congregate along the southern coast of Victoria Island waiting for the sea-ice freeze-up. Once the highest proportion of the collared caribou would have reached the shore, the study area, from Read Island to Parker Bay, would be surveyed. The reconnaissance survey and the systematic transects line survey were both flown with a fixed-wing single engine turbine aircraft, a Single Otter. The transect lines were surveyed at a speed of 160 km/hr and at an altitude of about 150 meters, which was easily maintained with an radar altimeter and due the flat relief of the study area. Pre-determined transect width of 400 meters was set on each wings based on calculation using the formula of Norton-Griffiths (1978) and others (Gunn and Patterson, 2000; Howard, 2011; Nishi and Gunn, 2004; Dumond and Lee, 2013).

$$w = W\left(\frac{h}{H}\right)$$

Where, *W*= the required strip width; *h* = the height of the observer's eye from the tarmac; and H= the required flying height (Figure1).

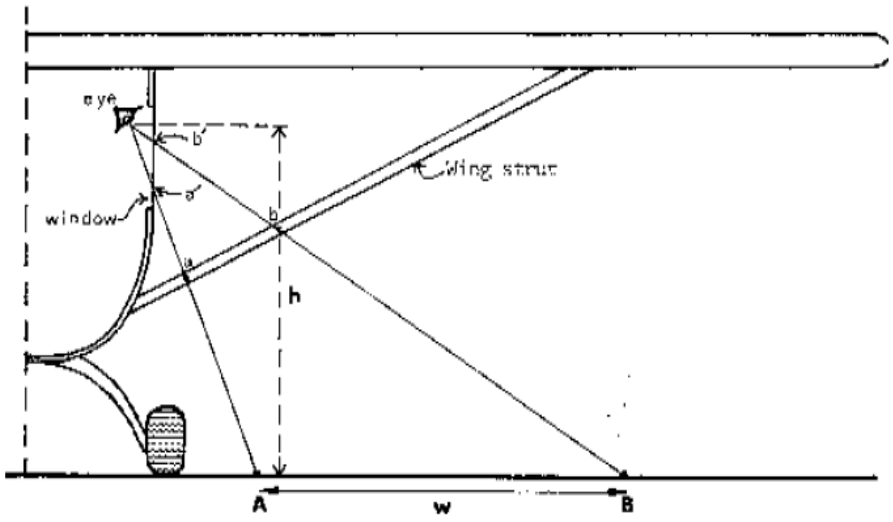

Figure 1: Schematic diagram of aircraft configuration for strip width sampling North-Griffiths (19878). W is marked out on the tarmac, and the two lines of sight a'-a-A and b'-b-B establish, whereas a'- and b' are the window marks.

The survey crew consisted of the pilot, the front right navigator/recorder, a front and rear observers on both sides of the plane and a second recorder on the left side in the back of the plane as backup. Sighting and caribou count, all sexes, were recorded on a touch screen tablet computer commonly used in other barren-ground caribou surveys. As each caribou group waypoints (observations) were instantaneously entered with the number of caribou composing the group and a real-time GPS waypoint was generated allowing geo-referencing of the survey data. The use of this tablet did not only increase the data entry speed, accuracy, but it reduced the time require to perform preliminary analysis of the reconnaissance data for stratification needed in the visual survey.

The survey was structured into two main components 1) a systematic reconnaissance survey that was used to delineate the extent of caribou on the coastal study area and 2) the systematic visual survey that was used for estimates. Effort for survey strata was allocated using a proportional allocation methodology similar to calving ground surveys of other herds (Boulanger et al., 2014b). Two potential strategies for allocation were considered. First, optimal allocation of survey effort was considered based on sampling theory (Heard 1987, Thompson 1992, Krebs 1998). Optimal allocation basically assigned more effort to strata with higher densities given that the amount of variation in counts is proportional to the relative density and size of caribou within the stratum. If strata were reasonably small, then optimal allocation was further adjusted to ensure an adequate number of transect lines for each stratum. In particular, previous surveys suggested that there should be a minimum of 10 transects per stratum with closer to 20 transects being

optimal for high density areas. In general, coverage should be at least 15% with higher levels of coverage for high density strata. In the context of sampling, increasing the number of lines in a stratum is insurance that it minimizes the influence of any one line on estimate precision. As populations become more clustered, a higher number of transect lines is required to achieve adequate precision (Thompson 1992, Krebs 1998). Caribou abundance in each strata was estimated using standard formulas for aerial surveys (Jolly, 1969; Krebs, 1998). The population estimates for fixed-width strip sampling using Jolly's Method 2 for uneven sample sizes are derived from the following equation:

$$\hat{Y} = RZ = Z\frac{\sum_i y_i}{\sum_i z_i}$$

Where $\hat{Y}$ is the estimated number of animals in the stratum, R is the observed density of animals (sum of animals seen on all transects $\sum_i y_i$ divided by the total strta area$\sum_i z_i$), and Z is the total strata. The variance for each strata is given by:

$$Var(\hat{Y}) = \frac{N(N-n)}{n}\left(s_y^2 - 2Rs_{zy} + R^2 s_z^2\right)$$

Where N is the total number of transects required to completely cover stratum Z, and n is the number of transects sampled in the stratum. s_y^2 is the variance in counts, s_z^2 is the variance in areas surveyed on transects, and s_{zy} is the covariance. The estimate $\hat{Y}$ and variance $Var(\hat{Y})$ are calculated for each stratum and summed. The Coefficient of Variation (CV = σ/$\hat{Y}$) was calculated as a measure of precision.

Analysis of collared caribou data

Sixteen radio collared DUC on Victoria Island were tracked daily to index the distribution of the caribou herd relative to the coastal study area. The daily fixes were not always returned for individual caribou. In these cases, the location of the caribou was interpolated under the assumption that movement rate and trajectory was constant between successive daily locations. An example of this would be that an interpolated location for day 2 would be midway between a straight line connecting GPS fixes on day 1 and 3. The systematic reconnaissance survey was triggered when the greatest portion of the collars had reached the southern coast of Victoria Island, but still had yet to start their migration across the newly formed sea-ice.

For the collars that did not reach the study area during the reconnaissance survey, we flew to the collar locations to determine the groups sizes of animals associate to specific collars, as well as

to determine the presence or absence of other groups in the area. The collar locations relative to when the strata areas were surveyed were also summarized to determine the proportion of collared caribou that were within the survey area when the aerial transect sampling occurred. This percentage was later used to extrapolate the final herd estimate as detailed in the Extrapolated Population Estimate section.

Extrapolated Population Analyses

The Lincoln Peterson estimate of herd size was calculated based on the proportion of collared caribou being within the survey area when the survey occurred. The estimate of herd size was calculated as:

$$N_{LP}= (((M+1)*(C+1))/(R+1))-1$$

with M equal to the number of collared caribou, R equal to the number of collared caribou detected, and C equal to the estimate of herd size from the strata surveys (N_{strata};) (Seber, 1982; Krebs, 1998).

The estimate of variance from just the Lincoln Petersen estimator was not correct given that there was error in both the strata estimate and in the proportion of caribou estimated in the study area. Using the Lincoln Petersen estimate of variance accounted for variance in the estimate of detection probabilities based on collared caribou. Therefore, we used a modification of the variance estimator proposed by Innes *et al*., (2002) that considers both sources of variance. In this case the variance estimate was:

$$var(\ N_{LP}) = N_{LP}^2(\ CV^2(p_{LP}) + CV^2(N_{strata}))$$

where $CV^2=(var(x)/x^2)$. The variance of the Lincoln Petersen estimate of capture probability (p_{LP}) was estimated based on the hypergeometric probability distribution which is assumed with the Lincoln Petersen estimator (Thompson 1992). Confidence limits were calculated using the t-statistic from strata surveys.

The estimate from the availability estimator of Innes *et al*., (2002) was similar to the Lincoln Petersen estimator given that it uses the same general method to estimate detection probabilities of caribou in the study area. The main difference was that the Lincoln-Petersen formula adjusts the herd estimate for small sample sizes of marked animals. The Lincoln-Petersen estimator also assumes a representative distribution of collared caribou relative to caribou within the herd, so that the ratio of caribou within the study area indicates the detection probability of caribou within the herd (Rivest *et al.,* 1998).

Overall Trend

The 2015 estimates was initially compared to the 2007 estimate using a t-test to determine if the two estimates were significantly different (Gasaway *et al.*, 1986). This comparison did not allow an actual estimate of trend given that 8 years separated the two surveys. The low number of points (3) also challenged the use of traditional regression methods. A Monte Carlo sampling-regression approach (Manly, 1997) was therefore applied to estimate trend from the 1997, 2007, and 2015 surveys. The basic procedure employed was to generate simulated estimates for each year surveyed (1997, 2007, and 2015) based on the point estimate and confidence limit of each survey under the assumption of a normal distribution of survey estimates. The normal distribution was generated using a t-distribution with degrees of freedom used to calculate the confidence interval for the estimates. Trend was then estimated as the slope of the log of population estimates and year using regression analysis (Thompson *et al*., 1998). Estimates of slope of the regression were an estimate of r (per capita growth rate). The per capita growth rate can be related to the population rate of change (λ) using the equation $\lambda=e^{r}=N_{t+1}/N_{t.}$. The simulations were repeated 1,000 times which resulted in 1,000 estimates of λ. The point estimate of λ and the percentile based confidence limits were then estimated, therefore providing an estimate of annual rate of change.

Population demography, 2015 -2017

Demographic indicators for the population of DUC, survival rate, the sex ratio, fall calf:cow ratio, spring calf:cow ratio, and the pregnancy rate were investigated between 2015 and 2017. The interaction between these various indicators can be difficult to interpret, but they nonetheless increase the overall understanding of the herd population demography and can be used in a population modelling (Boulanger *et al.*, 2011) to help determining the future trajectory of the herd and inform future management recommendations.

Cow survival rate

From the time the collared caribou was released until a mortality notification was received, the data generated from the DUC collared female caribou were monitored. The fates of the DUC collared caribou were determined by receiving the mortality notification once the collar stopped moving for 720 minutes, which was then recorded as mortality. Due to the logistical challenge to access the site after the notification was received to perform a necropsy, a determination of the

cause of death was not possible. Additionally, it was impossible to rule out the possibility of collar failure or device drop-off. This estimate of survival from collared caribou may be negatively biased if a substantial proportion of collars that were reported as mortalities were actually collar drop off or collar failure. Program MARK known fate models (White and Burnham, 1999) were used to estimate DUC year estimates of survival from April 2015 to April 2017.

Pregnancy rate

Fertility in caribou is usually influenced by body condition, of which two possible indicators could be body weight and body fat (Ouellet *et al.,* 1991). The pregnancy rate of female caribou is determined at the peak of calving by counting the number of females that have a calf at their heel. However, the Dolphin and Union calving ground is undefined and spread over Victoria Island making the identification of DUC cow/calf pairs problematic to determine (Nishi and Buckland, 2000). To keep the caribou capture time under 10 minutes in the field, we did not include determination of the pregnancy with an ultrasound. Therefore, we used progesterone levels in sampled feces to determine the pregnancy rate.

From the Dolphin and Union females collared in 2015 and 2016, fresh scat samples were collected. The samples were kept frozen until they were sent to the Toronto Zoo, Reproductive Physiology Laboratory for analyses. Immediately upon thawing, fecal pellets were mixed together, 0.5 g of feces was weighed into a glass vial, and 5 ml of 80% methanol in distilled water (v:v) was added to each vial. Samples were briefly vortexed and extracted overnight in a sample rotator. Samples were then centrifuged for 10 minutes and the supernatants were transferred to a clean glass vial for storage at -20C until analysis. Progesterone concentrations in the extracts were quantified using a progesterone enzyme immunoassay (CL425 from C. Munro, UCDavis). 96-well microtiter plates were coated with progesterone antibody (CL425) and incubated overnight. Progesterone standards, fecal extracts and HRP-labelled progesterone were diluted in assay buffer and loaded onto the microtitre plates in duplicate. Binding of the HRO was detected using ABTS and the color reaction measured using a spectrophotometer. Female caribou with > 600 ng/g progesterone were categorized as pregnant and caribou with 0.20-200 ng/ g of progesterone were categorized as non-pregnant.

Fall and spring composition survey

The fall and spring composition surveys were undertaken based on the location of the DUC during their fall and spring migration. The proportion of calf per cow is based on two assumptions: 1)

female and male recruitment and mortality are comparable and stable and 2) female mortality is small relative to offspring mortality (McCullough, 1994). Prior to the start of the composition survey, the location of caribou was determined with the collar information and community-based observations.

At the end of October 25th to 29th, 2016, the fall composition survey took place during the rut along the shore of Victoria Island, from Cape Peel to Richardson Bay, to determine the sex ratio of the herd and the calf: cow ratio. A fixed-wing, Twin Otter, was used to reach the remote caribou locations and classify the caribou due to the challenging weather conditions and assure crew safety. The survey altitude was set to 160 meters above the ground level with the slowest possible speed. The crew consisted of the pilot and the co-pilot, as well as one caller and two community members as recorders for each side of the aircraft. The external characteristics was limited to the presence of big antler and long hair below the neck for the male, small size of the calf, intermediate-size and straight face profile fort the yearling, and medium size with small hard antler for the female.

At the end of March 23rd to 28th, 2017, the spring composition survey took place to identify the recruitment of the calves by re-assessing the calf:cow ratio. Classification was done from a helicopter, where the majority of caribou seen from Tree River to Hope Bay were classified. Due to the space limitation in the aircraft, the crew consisted of the pilot, the caller, and the recorder. For these composition surveys, when possible using a helicopter the caribou was classified based on their appearance and external characteristics under predetermined groups: calves, yearlings, bulls, and cows. Sex determination was possible when the caribou was seen from the rear and was based on the presence or absence of the vulva patch; females have a darker coloration at this body location. Yearlings were characterized by their intermediate-size and straight face profile and calves by their small-bodied and short faces.

The variances of the fall and spring for the composition data was calculated using the Tukey's Jacknife method (Cochan, 1977; Krebs 1989; and Sokal & Rohlf, 198).

Results

Collar Deployment 2015 and 2016

Target locations for caribou capture were based on past information on winter distribution, local observations and Inuit Traditional Knowledge. Collar deployment began on April 6th, 2015 from Hope Bay (TMAC mine site) located on the east side of Bathurst Inlet. The first day, seven collars were deployed on the west side and one on the east side of Bathurst Inlet. On April 7th, a total of

nine collars were set out, two on the east side of the Bathurst Inlet south of Hope Bay and seven on the west side of the inlet. The remaining collars were deployed on April 8th, all of which were on the east side of Bathurst Inlet and mostly south-east of the mine site towards the Queen Maud Bird Sanctuary (Figure2, dots). A total of 1,214 km of non-systematic lines were travelled to collar 25 female caribou (DU-01-15 to DU-25-15).

In 2016, 19 additional collars were deployed (DU-51-16 to DU-69-16) (Figure 2, triangles). As in previous years, the collar deployment was from Hope Bay. On April 11th, 2016, 11 groups of caribou were seen, but only two collars were deployed. On April 15th, three additional collars were deployed and on April 16th seven animals were collars at the northwest part of Kent Peninsula. Further attempts to collar the DUC on the west side of Bathurst Inlet were undertaken, however, no caribou were found. Tracking evidence in the area suggested most of the caribou had initiated their crossing and were unavailable for capture. On April 17th, the seven remaining collars were deployed east of Hope Bay. A total of 1,594 km of non-systematic lines were covered during the deployment period. No mortalities were observed after 1 month of collaring, with all collars transmitting. Pre-programming of data transmission coincided with a three-year battery lifespan. Data transmission from these 2015 and 2016 collars will continue until the collar release mechanism is activated in fall 2017 and 2018 respectively.

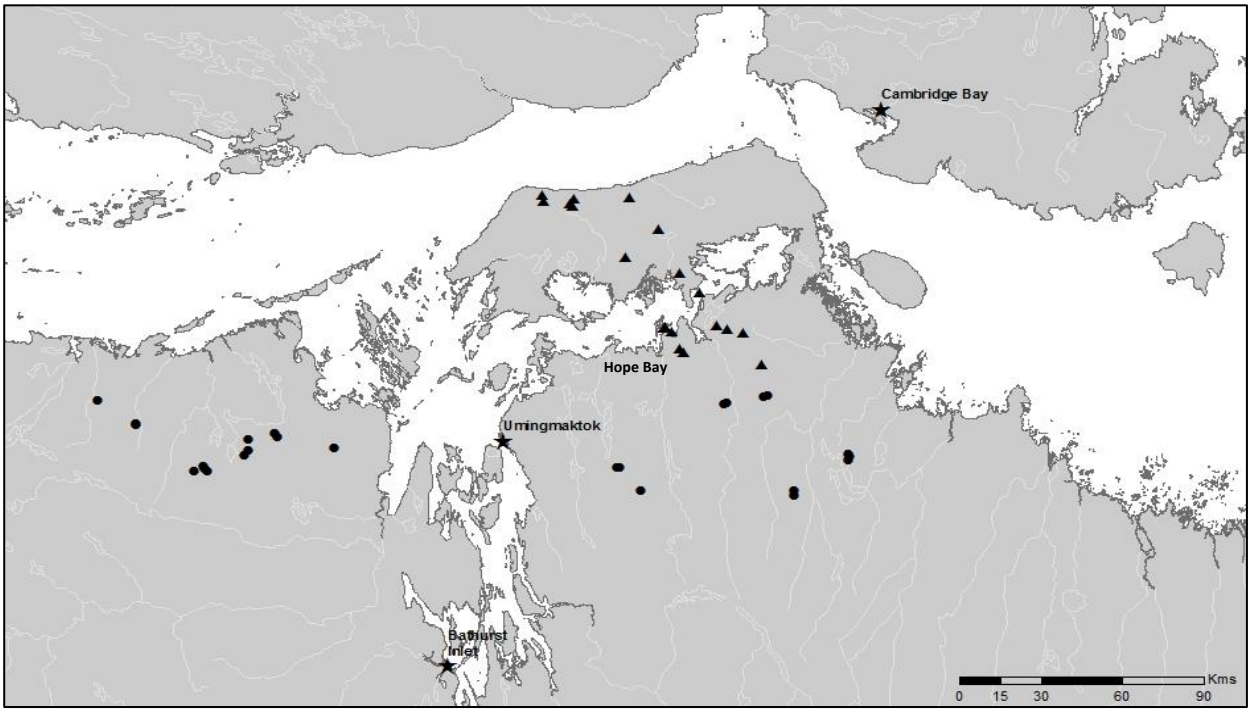

Figure 2: Map of Bathurst Inlet representing the 44 collar locations in April 2015 (dots) and 2016 (triangles) on the east and west side of the Inlet.

In 2015 and 2016, collars were unintentionally deployed on Ahiak caribou. Barren-Ground caribou had mixed amongst Dolphin Union caribou on the east side of Bathurst Inlet. From the caribou captured, eight caribou (DU-01-15, DU-10-15, DU-17-15, DU-18-15, DU-20-15, DU-22-15, DU-62-16, and DU-64-16) were genetically confirmed as Barren-Ground caribou. For the caribou that failed to be genetically identified, DU-19 and DU-24, the herd identity was confirmed based on two other criteria: their calving location on the mainland and their physical characteristics. For these two animals, slight phenotypic differences were noticed such as darker back with brown legs, elongated snout, and longer legs than DUC. Three of the collared animals (DU-52-2016, DU-63-2016, and DU-68-2016) were harvested within two weeks of collaring, so the identification based on calving location was impossible. Nevertheless, these three caribou were taken into consideration as DUC due to their physical appearance: cream back and legs, short snout and legs. Thus, a total of 34 DUC were collared, 17 in 2015 and 17 in 2016, and the remaining 10 caribou were not taken into consideration during the fall population survey nor in the body condition, cow survival, pregnancy rate indicators. From all the Dolphin and Union collared caribou, five mortality events were recorded during the 2015 and 2016 fall migration (October 26 to December 7) with only one during the crossing. DU-05-2015 died on the ocean a few kilometers from the mainland on November 24th 2016. This mortality site was investigated in March 2017, but neither the caribou carcasses nor the collar were seen.

Body condition of captured caribou in 2015 and 2016

For each DUC captured (n = 34), we assessed its body condition by palpitation of the shoulder, ribs, and hip-spine to attribute a score from 1 to 4 (CARMA, 2008). The total score ranged on a scale from 6 to 12, where 12 is the healthiest caribou. For both years, no caribou scored below 4; with a mean of 9 for both years (Figure 3, A and B). The majority of DUC scored 12 where it was hard to feel the edges of the bones of the shoulders, the ribs were nearly flush with fat tissues between them, and the hips were well padded.

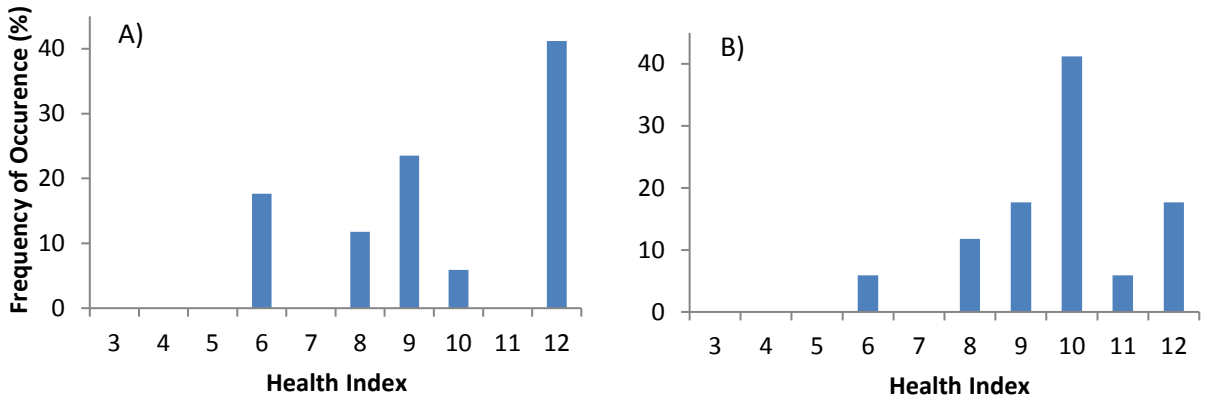

Figure 3: Average body score condition displayed as frequency of occurrence (%) of captured Dolphin and Union caribou in A) 2015 (n = 17) and B) 2016 (n = 17). The index score scale range from 6 to 12, where low number represent unhealthy to high number represent healthy caribou.

Population estimate:

DUC 2015 fall distribution

From October 10th to November 11th, the collar locations of 15 DUC on Victoria Island were closely monitored. In mid-October, most of the collars were moving south, but did not reach the study area, a distance within 10 kilometers of the shoreline (Figure 4). Assuming that these collars characterize the distribution of the herd, the reconnaissance and the visual survey need to be timed with the distribution of the collared caribou relative to the study area, without having initiated their migration over the forming sea-ice. In the circumstance that the sea-ice formation allows for 30% of the collar to cross, the survey would be cancelled and postponed to the following year. One mortality event on Victoria Island, DU-04-2015, happened during the survey. On November 11th, five collars left the study area and were completing the crossing of the Coronation Gulf and Dease Straight (Figure 4).

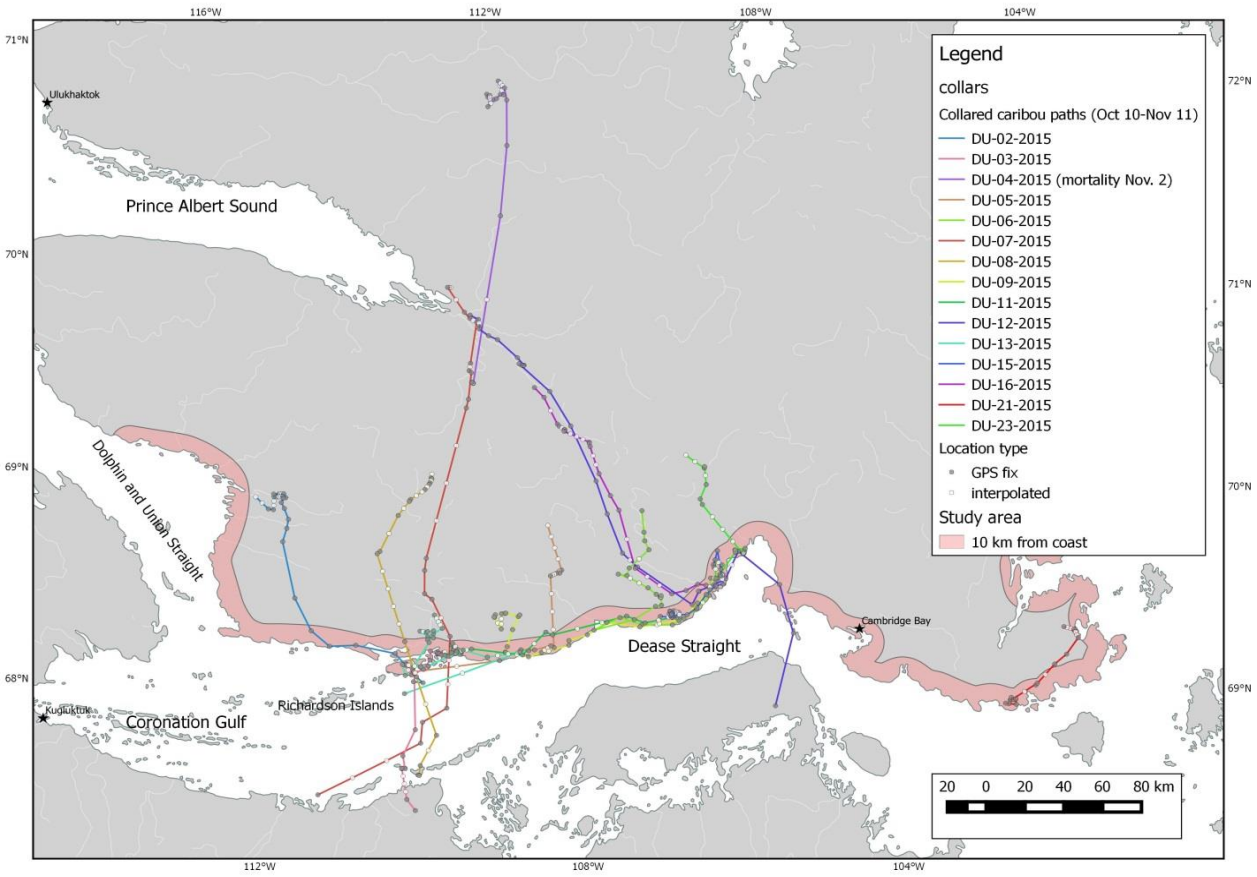

Figure 4: The movement pattern of 15 Dolphin and Union caribou from October 10 to November 11, 2015 in relation with the costal study area extending from the shoreline to 10 km in land (pink).

Collared caribou that were far away from the shoreline or outside the study area were considered in the design of the visual strata. When possible, we flew to the specific collar location (DU-02-15, DU-04-15, DU-16-15, and DU-21-15,) to determine the number of caribou associated with the specific collar. Only small isolated groups of caribou, varying from 2 to 21 individuals, were seen. None of the group found associated with the collar or in its proximity, were large enough to justify a stratified transect sampling at these locations outside the study area (Table 1). However, the occurrence caribou outside the final visual strata was still included in the final extrapolated population estimate.

Table 1: Minimal occurrence of small group of DUC outside the final visual strata

Area	Number of caribou	Likely impact on overall population estimate
East Victoria Island	9 caribou (all off transect) on October 29. 12 caribou with DU-21-15 on October 27.	Minimal given that surveys close to Ross point in the same time period observed large aggregations of caribou.
West Victoria Island	13 caribou were associated with DU-02-15 on October 31.	Minimal given that surveys close to Ross point in the same time period observed large aggregations of caribou.
Western strata	21 caribou observed on Richardson Islands (off transect and out of strata) on November 2 survey.	Minimal given ice condition and lower densities of caribou observed in the same area on October 31.
Coronation Gulf	Single collared caribou crossed the ice on November 1st prior to survey.	Minimal given poor ice condition during this time and low numbers of caribou observed in the MD_W stratum on October 31
Inland survey, Northwest Territory	4 groups of 14, 6, 2 and 13 caribou were observed in the proximity of DU-04-15 on October 30, which one died on November 2.	Minimal given that there caribou could have been Peary Caribou that are known to winter in these areas.
Inland survey	13 caribou were observed with collar DU-16-15 on October 30 and crosses into strata on November 9.	Minimal as no other caribou were observed in the proximity.

Systematic reconnaissance survey

Two reconnaissance surveys were flown. The first initial reconnaissance effort done over three days (October, 25th, 26th, and 27th) was to survey parallel to the shoreline to determine aggregation of caribou on the coast from Read Island to Collinson Peninsula (Figure 5). The 1997 and 2007 survey area was extended eastward to account for the possibility of caribou east of the Island based on hunter observations. Transects were oriented perpendicular to the coastline to reduce potential bias and to detect possible concentration of caribou that has not reach the coast yet. Ten transects were flown perpendicular to the coast line 30 kilometers inland to assess the possibility of large concentration of caribou further away from the coast. We observe 0 to 5 caribou per 10 km segments (Figure5). To the east of Cambridge Bay on October 27th, only 12 caribou were observed in association with the only collar in the area, DU-21-15. To the west, larger aggregations of caribou were observed from Wellington Bay to west of Ross Point. No caribou were observed past Lady Franklin point to Read Island.

Given the distribution of collar caribou inland from the shoreline, further flying was postponed until October 29th and 31st when most collared caribou were closer to the study area (Figure4, pink area). A systematic reconnaissance survey with 10 to 30 kilometer transects spaced 10 to 12

kilometers apart was conducted to the east of Cambridge Bay on October 29th as well as within lower density abundance survey areas in the extreme west of Victoria Island on October 31st (Figure6, dotted lines). Even though few caribou where observed, effort was still concentrated in this very low density area to rule out the possibility of having missed significant aggregations of caribou during the first reconnaissance survey and to confirm that there were few to no caribou on shoreline areas or inland. To the East, only nine caribou were observed, of which were off transect. These areas were not surveyed further given extremely low density and lack of caribou occupancy.

On October 31st, a second reconnaissance survey from west of Ross Point to Wellington Bay, in the higher density area, was carried out to capture any potential shift of caribou along the coastline and/or a higher number of caribou reaching the coastline. The largest aggregations of caribou were observed from the west side of Wellington Bay to west of Ross Point. This data was also used to stratify and allocate effort between the west visual strata.

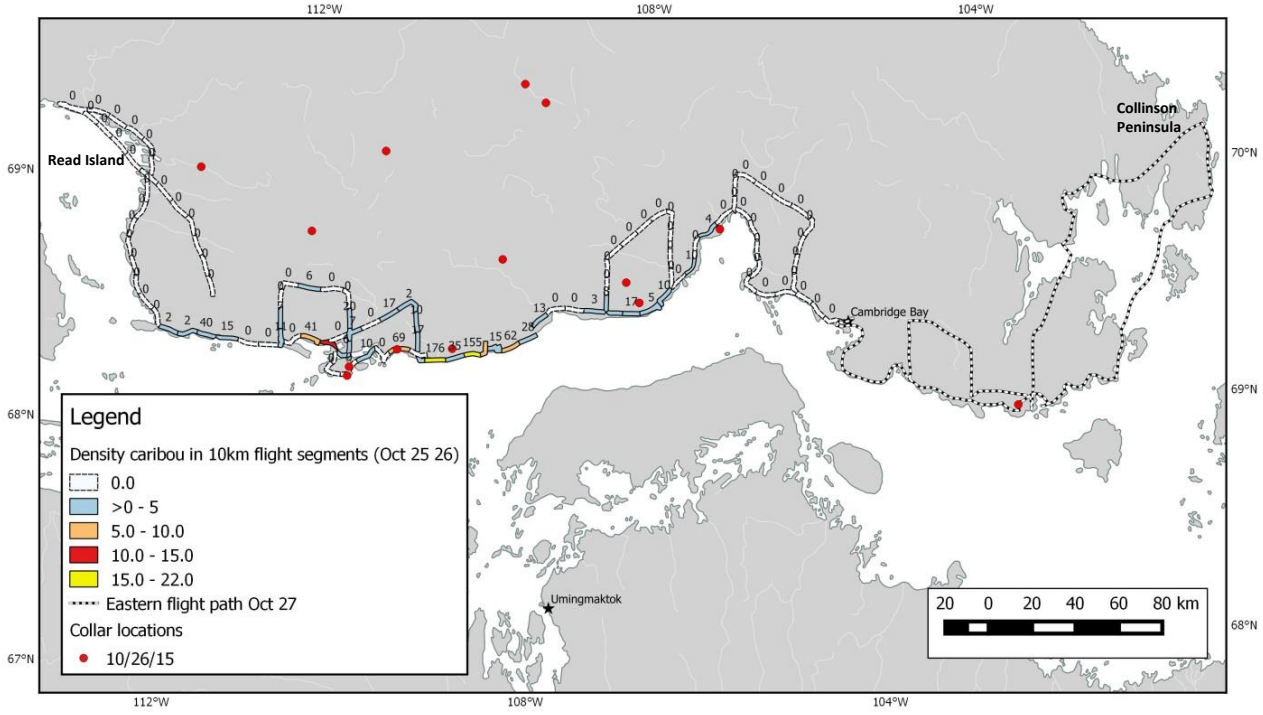

Figure 5: Transect of the initial reconnaissance fight on October 25th, 26th West of Cambridge Bay, dotted line) and October 27th (East of Cambridge Bay, color coded segments). The density of caribou observed per 10 km was attributed a color code where white is = 0, blue = 0 to 5, orange = 5 to 10, red = 10 to 15, and yellow = 15 to 22. The collar locations, as on October 26th, are indicated by red dots.

Systematic visual surveys

The observations from the shoreline reconnaissance survey of October 26th and October 31st and the latest GPS collars were used to stratify the highest density area into visual strata (Figure6). The average segment densities were then used to allocate sampling effort. The final visual strata had to be flown in 1.5 days, which assumed full flying days of 600 km with ferry time from Cambridge Bay and daylight restriction. Using the location and number of caribou per group, density strata were delineated to increase the survey effort where the density of caribou is found to be the highest. Five visual strata were defined: low density west (LD_W), medium density west (MD_M), a high density (HD) and medium density east (MD_E), and a low density east (LD_E). Note that the coverage for the LD_E stratum was kept similar to the MD_E strata given uncertainty in the density of the strata (Figure6). The final coverage for each stratum varied from 27.9% for the high density (HD) stratum to 13.6% for the low density stratum (LD_W) (Table 2) based on optimal allocation from the reconnaissance survey data. The total kilometers flown on transect was 900 km.

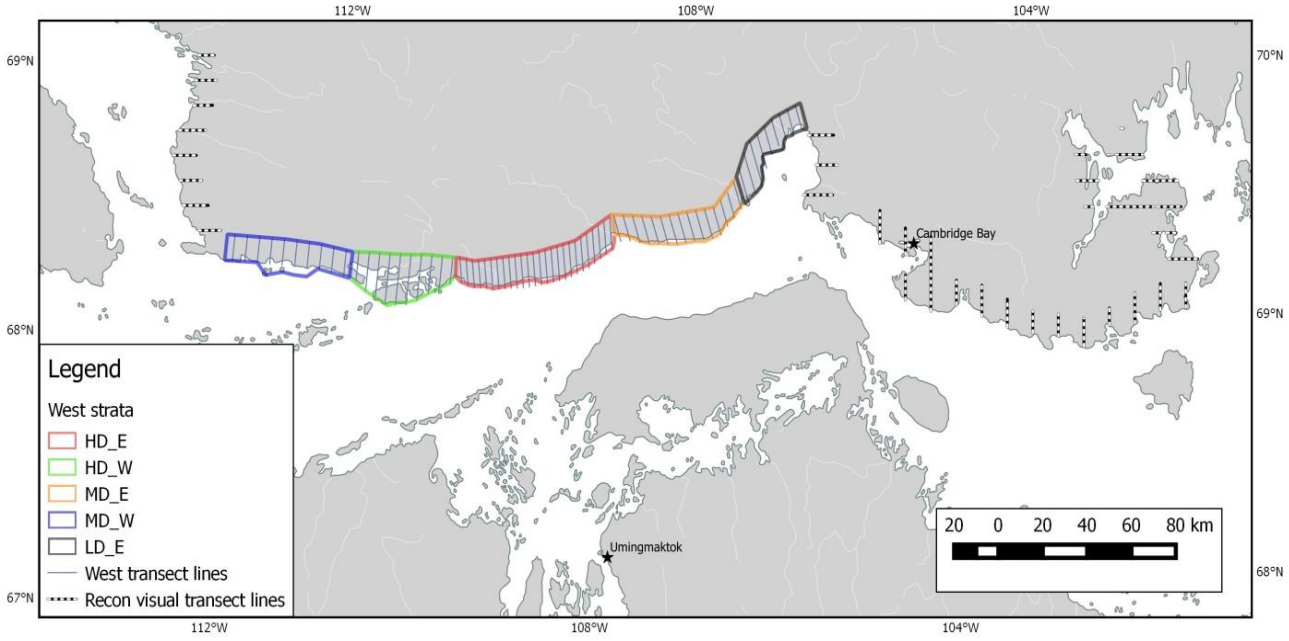

Figure 6: Final systematic reconnaissance transects for east of Cambridge Bay and west of Cambridge Bay (dotted lines) with the final visual stratification layout in blue (MD_W), green (HD_W), red (HD_E), orange (MD_E) and black (LD_E).

Table 2: Strata dimensions for the Dolphin and Union population survey based allocation.

Strata	Area of strata (km^2)	Baseline (E-W) distance (km)	Total transects possible	Number of transects sampled	Transect area sampled (Km^2)	Coverage
LD_W	740.87	56.9	71.1	10	100.5	13.6%
MD_W	841.33	47.5	59.4	10	138.4	16.5%
HD	944.98	72.4	90.5	26	263.2	27.9%
MD_E	672.57	55.4	69.3	14	115.8	17.2%
LD_E	548.79	40.2	50.3	10	102.5	18.7%

The visual surveys were conducted on November 2nd and 3rd when the highest proportion of collars were in the survey area and a minority started their migration on the sea-ice and was out of reach (MD_W, HD, MD_E and LD_E), which coincided with peak numbers of collared caribou in the survey strata (Figure5). Only one collar, DU-03-15, had left to MD_W and HD strata and started crossing when it was surveyed. The low density stratum was surveyed on November 5th (LD_W), when one collared caribou, DU-02-15, was within the stratum. The timing of the survey of the higher density area (November 2nd) occurred with the most collared caribou near the shore, but before they started crossing the Coronation Gulf (Figure5). The locations of collars indicated minimal movement between November 1st and 2nd when the remainder of the areas to the east were sampled. Only one collar, DU-16-15, remained in land during the visual survey.

The Figure 7 summary the timing in which the reconnaissance and visual surveys took place in function of the caribou movement. The reconnaissance and visual surveys were scheduled for the time period when caribou were at the highest concentration in the study area. Locations of caribou were categorized by whether they were inland, in the study area, or crossing the sea-ice (Figure5). Using this information, the initial reconnaissance surveys were conducted on October 25th, 26th, and 27th to determine relative densities and locate aggregations of caribou. Systematic surveys were conducted in low density areas (east and west of Victoria Island) on October 29th and 31st. A second reconnaissance of the study area of highest caribou density was conducted on October 31st. This result was used to stratify and allocate effort between strata since it captured latest possible lateral caribou movement along the shoreline. The visual abundance surveys were conducted on November 2nd and 3rd when the highest proportion of radio collared caribou was in the visual strata and the lower density stratum was delayed to be survey until November 5th due to weather.

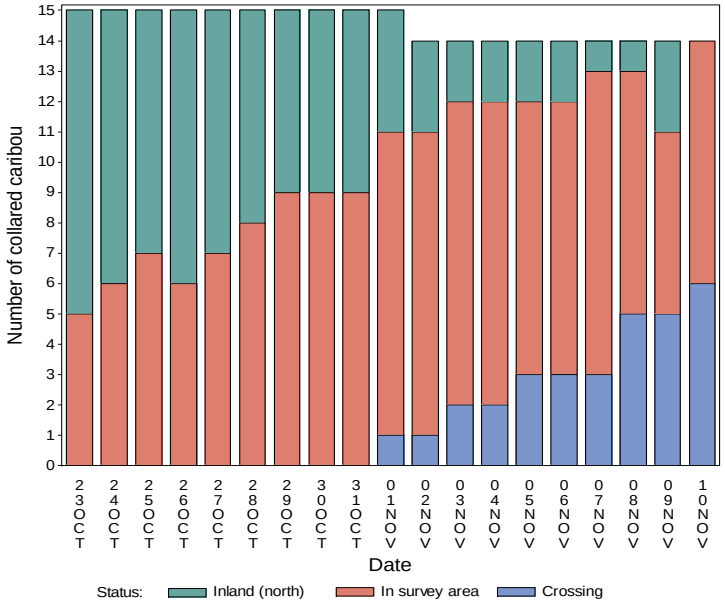

Figure 7: Status of collared caribou by date of survey based on their location, inland (green), survey area (pink) and crossing (blue) between October 23rd and November 1st.

During the visual survey 3,083 caribou were counted in 210 groups (Table3). Approximately half (47%) of group sizes were 10 or less caribou with 23% being great than 20 caribou with a mean group size of 15.2 (median=10, std. dev=16.7, min=1, max=135) (Figure8). Observations were assigned to strata and transect lines within strata for estimation of caribou within each stratum.

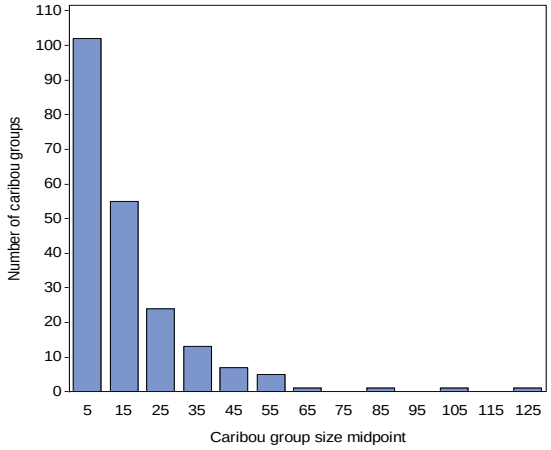

Figure 8: Distribution of group sizes observed during the final visual surveys on November 2nd, 3rd, and 5th.

The final estimates from the five visual stratum are given in Table 3. Highest densities of caribou were found in the HD and MD_E stratum with five caribou per km^2 and the lowest density was found in LD_W strata with one caribou per km^2. One third of the population was estimated from

the HD strata. The resulting estimate of 14,730 (SE= 1,507, CV= 10.2%, CI= 11,475-17,986) caribou was precise with a coefficient of variation of 10.2%. No caribou were seen on transects east from Cape Enterprise, and the majority of caribou were continuously distributed between Ross Point and Cape Peel (Figure9).

Table 3: Estimate of caribou on visual survey strata based on aerial survey conducted on November, 2nd, 3rd, and 5th 2015.

Strata	Caribou counted on transect	Density (Caribou per km²)	Estimated caribou ($\widehat{N}$)	Standard Error ($\widehat{N}$)	Coefficient of variation
LD_W	140	1.39	1,032	377.3	36.6%
MD_W	533	3.85	3,240	769.8	23.8%
HD	1,537	5.84	5,518	814.2	14.6%
MD_E	584	5.04	3,393	754.9	22.2%
LD_E	289	2.82	1,548	550.6	35.6%
Total	3,083		14,730	1,507.0	10.2%

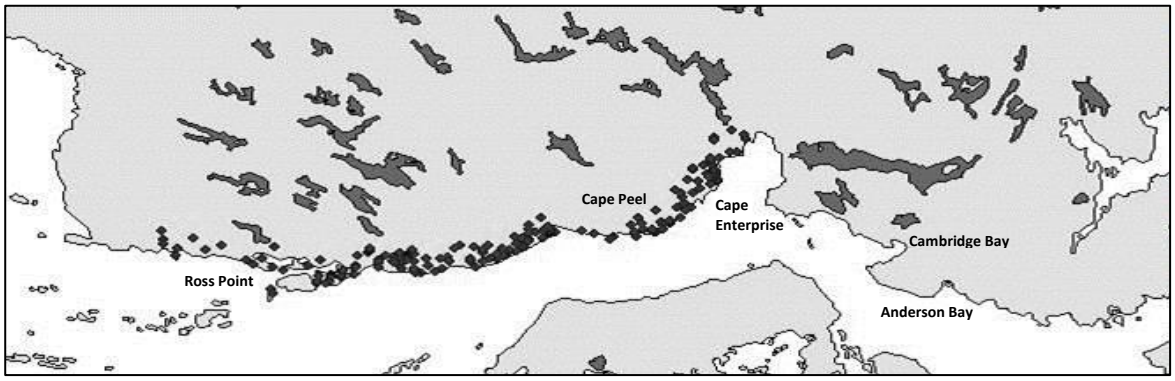

Figure 9: Distribution of Dolphin and Union caribou based on the location of the groups observed during the Final systematic reconnaissance transect line and the final visual stratification.

Extrapolated population analysis

Overall, 11 of 14 collared caribou were within the final strata as the visual survey was progressing. The three collars outside the survey area were: DU-03-15 that crossed the ice, DU-16-15 that was north of the strata for the entire survey, and DU-21-15 that was in areas east of Cambridge Bay. This eastern area was surveyed twice during the reconnaissance flight and the sample sizes of caribou were too low (12 caribou observed on transect) to derive an estimate of caribou at this location. Therefore, DU-21-15 was considered to have not been surveyed, so that the estimate

would pertain also to the eastern area. The resulting percentage of collars within the visual survey strata was 79%.

Table 4: Summary of collar locations relative to surveyed areas used for estimation of proportion of collar available. The shaded boxes indicate when a collared caribou was in a stratum that was surveyed.

Id	Location (Date)				
	Nov 2	Nov 3	Nov 5	Available	Comments
DU-02	north	north	1	1	In strata when surveyed
DU-03	cross	cross	cross	0	Across ice before survey conducted
DU-05	1	1	1	1	
DU-06	1	1	1	1	
DU-07	1	1	cross	1	Crossed ice after being surveyed
DU-08	1	cross	cross	1	Crossed ice after being surveyed
DU-09	1	1	1	1	
DU-11	1	1	1	1	
DU-12	1	1	1	1	
DU-13	1	1	1	1	
DU-15	1	1	1	1	
DU-16	north	north	north	0	North of strata for all of survey
DU-23	1	1	1	1	
DU-21	east	east	east	0	In area east of Cambridge Bay
			Average	0.79	

Assuming that the East side of Cambridge Bay contained minimal caribou, as suggested by the surveys (Table 3), then DU-21-15 should not be included in the extrapolated herd estimate, which would reduce the number of total collars within the survey area to 13 and a resulting proportion of collars in the visual survey strata of 85%. The resulting extrapolated herd estimate, in this case, is 17,185 caribou (SE=2,640.8 CV=15.3%, CI=11,481-22,890) which is 2,455 caribou higher than the strata estimate.

However, the extrapolated herd estimate was also calculated with the 11 of 14 collared caribou being within the survey area. The resulting extrapolated herd estimate, using 14 collared caribou, is 18,413 (SE=3,133.8, CV=17.0%, CI = 11,664 to 25,182), which is higher than the strata-based estimate by 3,683 caribou. Confidence limits were calculated using the t-statistic from strata surveys (Table 2; 2.16) with a resulting confidence limit of 11,664 to 25,182 caribou. The estimate of 18,413 DUC assumes that the survey area to the east of Cambridge Bay contained a sizeable number of caribou as indicated by the collared caribou in this area.

Overall trend

A t-test was initially used to compare the 2015 extrapolated estimate 18,413 (SE=3,133.8, CI=11,664-25,182, df=13) and the 2007 extrapolated population estimate 27,787 (SE=3,613, CI=20,250-35,324, df=20). The difference between estimates was significant (t=1.91, df=32, p=0.065) at α=0.1. The ratio of the 2007 to 2015 extrapolated population estimates suggests a gross change in herd size of 66.3% (SE=0.15, CI=19.9-96.2%) during the eight-year interval between surveys. Using a z-test, the 2007 extrapolated estimate is also significantly different from the 2015 extrapolated estimate (Z= -2.19, p= 0.036)

For the trend analysis, the 1997 extrapolated population estimate 34,558 (SE=4,283,CI=27,757-41,359) (Dumond and Lee 2013) was also considered (Figure9). The simulation-based estimate of annual rate of change was 0.96 (SE=0.015, CI=0.93-0.99) suggesting that a significant decline has occurred (the confidence limit for λ does not overlap 1). This translates to an annual rate of decline of 4% (CI=1-7%) since the 1997 survey. This estimate of trend assumes a constant exponential change in herd size. The small number of data points, three surveys, precluded the use of more complex trend models.

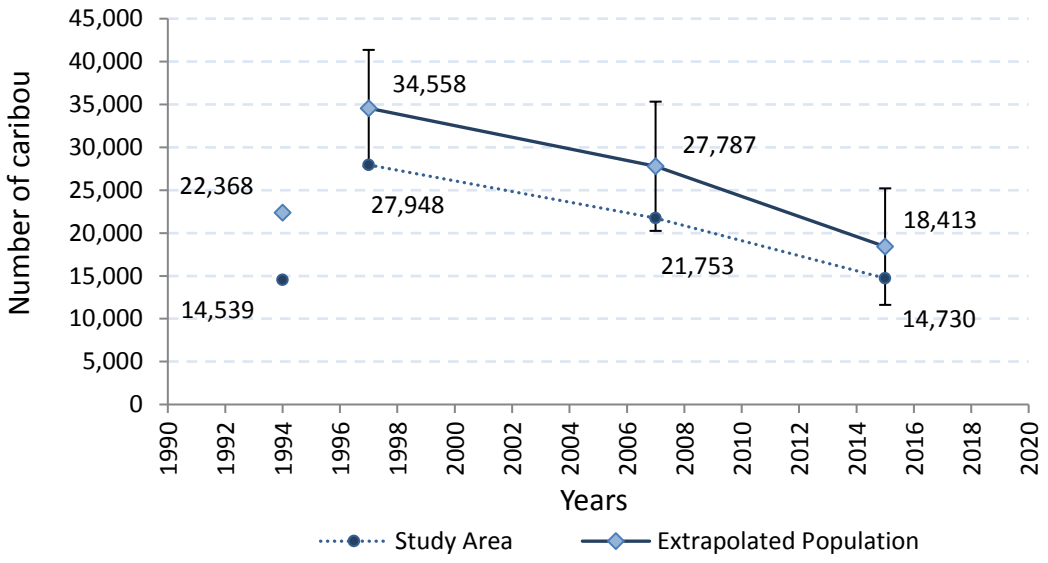

Figure 10: Estimates of herd size for the Dolphin-Union caribou herd from the 1997 survey (Nishi and Gunn 2003), 2007 survey (Dumond and Lee 2013), and the 2015 survey. Estimates based on the surveyed visual strata (dotted line) as well as the extrapolated estimate (solid line) are given.

Population demography, 2015- 2017

Cow survival rate

Dolphin and Union collared caribou were monitored from April 2015 to December 2016 for survival rate analysis. Sample sizes of Dolphin and Union collared caribou ranged from 14 to 30 with an average of 19.7 collars monitored each month (SD = 5.0, n = 21 months) which added up to 414 collar months monitored. During this time there were 18 mortalities with 0.86 deaths per month (SD=1.15, min=0, max=4, n=21 months). Of the mortalities, six (DU-52-2016, DU-57-2016, DU-63-2016, DU-65-2016, DU-67-2016, DU-68-2016) could be attributed to harvest, and one (DU-05-2015) to drowning during the fall migration. Given the relatively low sample sizes, a survival model with equal monthly survival was used. The yearly female survival estimate from this model was 0.70 (SE=0.071, CI=0.55-0.82).

Pregnancy rate

Fecal samples of 34 DUC were collected and 33 were successfully analysed for progesterone level to indicate the pregnancy rate. Individual caribou were confirmed as pregnant if the level was more than 600 ng/g wet feces of progesterone and non-pregnant if this level was below 200 ng/g wet feces (Figure10). From the 33 samples successfully analysed, only four females were barren. This represents a yearly pregnancy rate of 88% in spring 2015 (15/17 caribou pregnant) and 88% in spring 2016 (14/16 caribou pregnant).

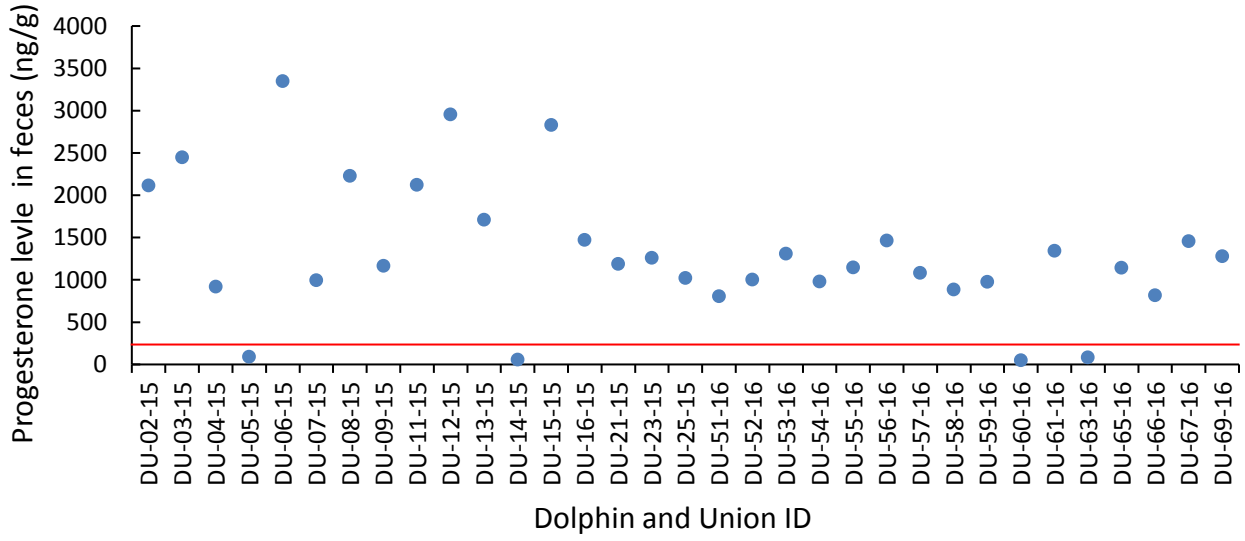

Figure 11: Progesterone level in feces (ng/g) for each Dolphin and Union caribou collared. Level below 200 ng/g were considered as non-pregnant.

Fall and Spring composition survey

The fall composition survey took place from October 26th to 29th, 2016. The survey consisted of transect lines oriented perpendicularly to the shoreline from west of Ross Point all the way to Cape Peel. As the biggest concentration of caribou was found at Ross point and at Cape Peel (Figure11), survey intensity was focus at these two locations with two kilometer transect lines to increase the number of caribou classified.

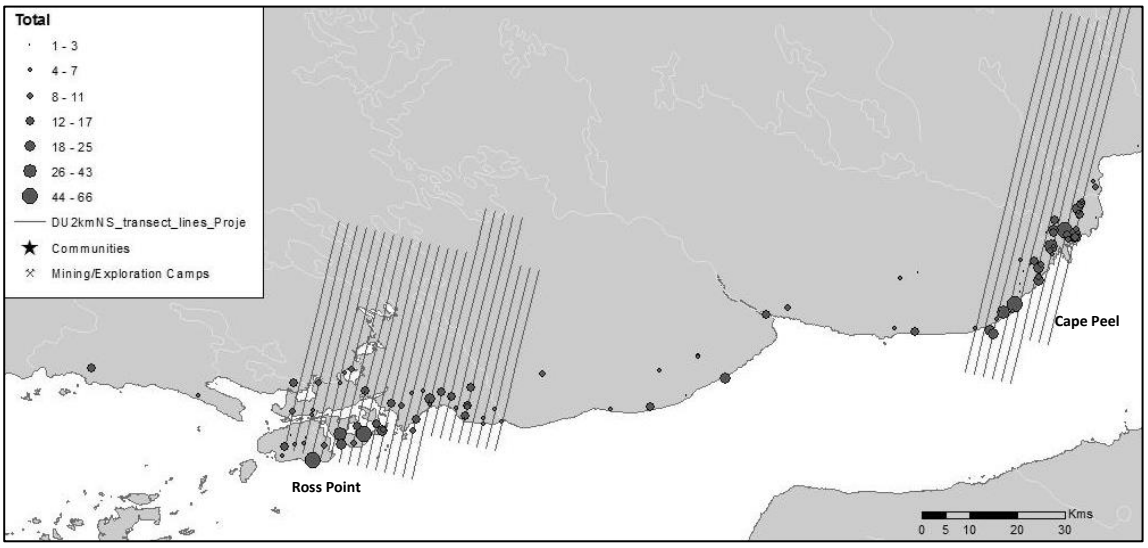

Figure 12: Location and caribou classified in the group during the fall composition survey from October 26 to 29, 2016 along the shore line of Victoria Island mainly at Ross Point and Cape Peel.

During this survey, 136 groups were seen and 1,225 caribou were classified, from which there were 873 cows, 218, calves, 129 yearlings, and 134 bulls. Figure 11 represents the number of caribou classified in each group and not the total caribou within the group. Some caribou were not adequately positioned to assure proper distinction from a male to a female. The calf:cow ratio was of 25:100 (SE= 0.034, CV= 11%). The bull:cow ratio was 15:100. Both Ross Point and Cape Peel has a low bull: cow ratio, which suggests a uniform distribution of sex along the shore line.

The spring composition survey was performed from March 24th to 28th, 2017 on the Canadian mainland from Tree River to Hope Bay. Collar locations (red dots, Figure 12) were used to find caribou. From the 17 collar locations in the study area, 15 were visited and only 2 collars were seen. 24 groups and 229 caribou were classified. The calf:cow ratio was 11:100 (SE= 0.025, CV= 22%).

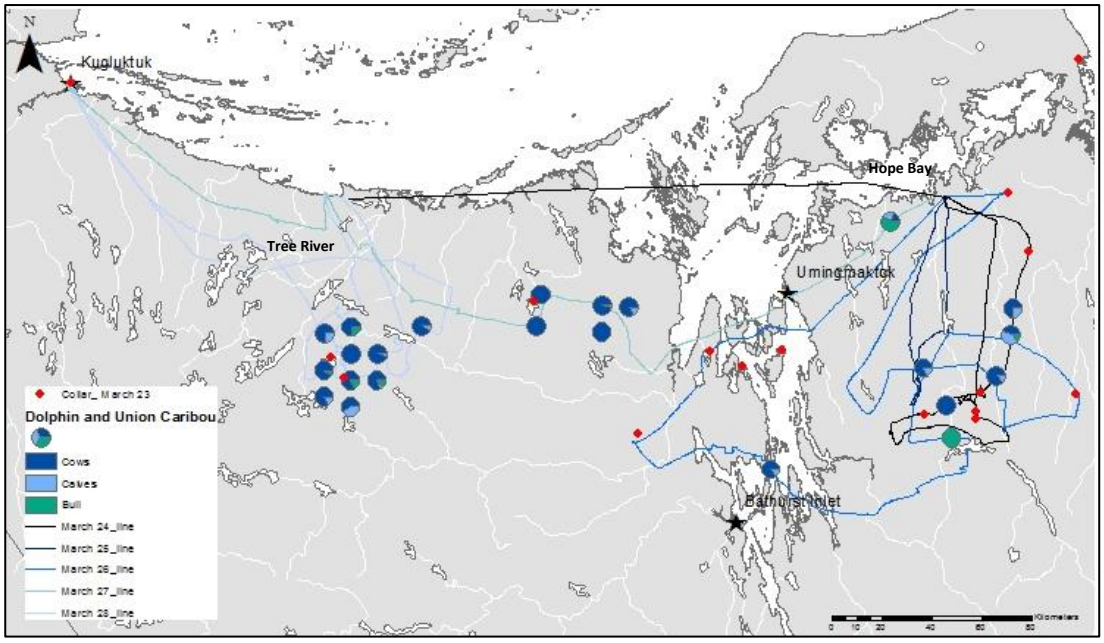

Figure 13: Location and group composition of caribou classified during the spring composition survey from March 24 to 28, 2018 on the Canadian Mainland from Tree River to Hope Bay. Active collar locations are represented by red dots.

Discussion

Collar deployment, 2015 and 2016

The DUC herd winter on both side of Bathurst Inlet and are known to start their spring migration in early April (Gunn *et al*., 1997). In 1993, a mainland coastline survey to monitor the number of caribou crossing back to Victoria Island was carried out between April 30th to May 13th (Gunn *et al.,* 1997) and where the median date for the spring crossing was May 24th in the late part of this decade(Pool *et al.*, 2010). From 2015 and 2016, the best time to find the caribou on the coast line was around April 7th to 11th. The occurrence of caribou along the coast in early April suggests a shift in the timing of the spring migration that might have occurred in the recent years. On April 15th 2016, caribou tracks were already seen off the coast onto the sea-ice, prohibiting us from collaring any further at this location and limiting us to concentrating our effort to the east side of Bathurst Inlet. DUC wintering to the west of Bathurst Inlet are known to cross earlier than the animals to the east side of Bathurst Inlet (Pool *et al.,* 2010).

In addition to a timing difference in the spring migration, it seems that the wintering strategy between the animal wintering on the east and the west side of Bathurst Inlet is also different. Contrary to the west side, the DUC wintering range overlaps spatially and temporally with a

Barren-ground caribou herd on the east side of Bathurst Inlet. Individuals of the DUC herd and Barren ground caribou herd were found together in mixed groups. There are slight physical differences between the two types of caribou such as, the color of their backs and legs, the shape of their snouts, and the longer length of legs, which were confirmed by genetic analysis and/or by their respective calving location determined with collars. Although more intensive study is needed, the DUC herd appears to winter with the Ahiak caribou herd, tundra wintering Barren-ground caribou. Future collaring, harvest management, and the mining companies' mitigation and monitoring programs on the east side of Bathurst Inlet should take into consideration the overlap of these two herds.

During the collaring, DUC were pre-selected based on their general fatness appearance (well-padded ribs and hips) as healthy caribou have a better chance to survive during the collar life. This intentional bias explains the skewed health index toward caribou in good condition (Figure 3). Even though the collared caribou did not show any signs of disease, they can still be seropositive for pathogens. Blood samples from the collared caribou and harvest sample kits in 2015 and 2016 show that the DUC herd has a seroprevalance to *Toxoplasma gondii* (7%)*, Brucella suis* (15%), and *Neospora canium* (22%). These two first pathogens are known to cause abortion and weak calves in *Rangifer* or at least in domestic animals in the case of *N. canium* (Carlsson *et al*., in prep). As these pathogens are known to impact survival and fecundity, they can play an important role in ungulate population dynamic (Irvine, 2006).

Population estimates

The DUC were found staging on the southern coast of Victoria Island waiting for the sea-ice to form on Coronation Gulf and Dease Strait to resume their migration toward the Canadian Mainland. The DUC fall aggregation on the south coast of Victoria Island makes a population survey logistically feasible and biologically meaningful.

Nonetheless, conducting aerial surveys in October along the coast of Victoria Island is a challenging task. The weather characterized by freezing drizzle, ice crystals, low ceiling, patchy fog, and the difficulty of flying at survey altitude over thin grey ice makes it challenging. However, the survey took place in relatively good weather, when visibility was maximal or reduced visibility did not persist over the total length of a transect line. As the survey advanced into November, the daylight hours shortened, which meant the survey had to be completed over a short working day. Coupled with these challenges, is the short time frame in which most of the caribou have reached the coast, but not yet moved onto the newly formed sea-ice (Figure 7).

The reconnaissance survey, flown at the same time as the 2007 survey (Dumond and Lee, 2013), allowed us to determine the distribution of caribou, the higher density areas, and the extent of caribou inland. Most caribou group, of both sexes and all age groups, were within a narrow band along the shoreline with no caribou beyond 10 km inland (Figure 6). Transects were short, which kept the observers alert. In the two previous surveys, only a right and left observers were used (Nishi and Gunn, 2004; Dumond and Lee, 2013). In 2015, two observers were used per side on the final visual survey, but their observations were confirmed together and were reported as one observation. Previous research has suggested that if four observers are used fewer caribou will be missed and those that are can be estimated (Campbell *et al.*, 2012, Boulanger *et al.*, 2014a). For future Dolphin and Union surveys, we recommend the use of a double observer platform were the front and rear observers sightings can be recorded independently.

DUC are generally found in small groups along the coastline. In 1997, 322 groups varying from 1 to 477caribou were observed on transect, with a median of 8 and a mean of 15.8 (Nishi and Gunn, 2004). In 2015, the majority of group sizes observed on transect were 10 caribou or less, which is consistent of what has been reported by local knowledge a year prior to the survey (Tomaselli *et al.,* 2018). Some larger group sizes (up to 135 caribou) were also observed in 2015, which could have caused counting bias. The usual direction of counting bias of large caribou group is an underestimation (Elphick, 2008). It is hard to determine the exact magnitude of bias given few empirical comparisons of counted caribou in relation to true group size. A comparison of counts from a photo plane and visual counts on the Bluenose East 2013 survey (Boulanger *et al*., 2014) suggested that counts were up to 15% lower than photos, however, the difference in this study was due to both counting bias and detection of groups. The general assumption, in the context of the DUC studies, is that the magnitude of counting bias has been similar for all years of the study.

In 2015, the extent of the reconnaissance survey was greater than in 1997 and 2007. However, unlike with 1997 and 2007 surveys, no caribou were seen east of Cambridge Bay along the coast from Cape Enterprise to Anderson Bay (Figure 9). There was only a continuous density of caribou along the coastline from the Richardson Island to Cape Peel. Local knowledge gathered in 2014 revealed a decrease of 80% (75-90; range 50-95; n = 7) of DUC, where very few scattered caribou were seen around Cambridge Bay from October to mid-November (Tomaselli *et al.,* 2018). In 1997, 55.5% of the population estimate was determined by the number of caribou east of Cambridge Bay with density reaching 9.79 caribou / km^2 (Nishi and Gunn, 2004). With similar density to the west in 1997 (6.19 and 4, 35 caribou/ km^2) (Nishi and Gunn, 2004) and 2015 (3.85, 5.84 caribou/ km^2), the lack of caribou from Cape Enterprise to Anderson Bay has might have accounted for a decrease in the overall DUC population number. The reason behind the decrease of caribou to the east of their range is currently unknown, but the causes have had an impact at the population level.

All the final visual strata for the three Dolphin and Union population surveys were stratified based on relative caribou density. Therefore, the transect lines flown, the number of visual strata, and the percentage of coverage are expected to vary from survey to survey. In 1997, the survey consisted of 1,047 km of transects with strata variating in coverage from 9 to 20.4%. This resulted in 5,087 caribou counted on transect (Nishi and Gunn, 2004). The 2007 survey had less overall coverage, 651 km total, though survey coverage varied from 11% to 20% and 2,669 caribou were counted on transect and 4,362 counted on a small island (Dumond and Lee, 2013). In 2017, the final visual strata had a total of 900 km of transect line with coverage varying from 13 to 28% and 3,083 caribou were counted on transect. Coefficient of Variation varied between survey (1997= 12% 2007 = 13%, 2015 = 10%) with all falling within the targeted 15% of the mean estimate (95%) confirming the precision of the total number of caribou estimated in all the final visual strata.

Dumond and Lee (2013) used two methods to adjust the resulting estimates and generate an extrapolated population number, the Lincoln-Petersen Index method and Innes *et al*., (2002). All of the collar methods assume that the distribution of collars is representative of the overall distribution of the herd. The Innes *et al*., (2002) considered the availability of caribou on the study area based on collar locations in previous years. In this case, the availability was estimated by the proportion of locations of caribou in the study area for the entire duration of the study (Innes et al 2002). The availability estimator basically equates availability to detection probability to allow a corrected estimate of herd size. The 1997 and 2007 extrapolated population estimate was based on Innes *et al.,* (2002) resulting in 34,558 (SE =4,283, Cl= 27,272-41,359) and 27,787 (SE =3,613, Cl= 20,250-35,324) caribou respectively.

Similarly, we used the Lincoln Petersen Index method, which classified caribou as being within or outside the study area during the survey and used this ratio to estimate detection probability and adjusted herd size. Unlike previous surveys, we had direct locations of caribou during the survey and were therefore able to directly estimate availability relative to where areas were surveyed. The Lincoln Petersen method was then most applicable, since we had current locations of collared caribou during transect sampling. It was possible to accurately determine whether caribou were within or outside the survey strata when they were surveyed. We were also able to provide evidence confirming the assumption behind the fall survey that the large majority of this herd stage along the southern coastline prior to migration, as 79% of the collars had reached the survey area during the final visual survey.

An assumption of the Lincoln Peterson estimator is that the collars are exhibited randomly, so that each collared caribou represents the relative availability of caribou in the herd to be surveyed. Observations of caribou during the survey, and flights around single collared caribou that were not in the survey area indicate that this assumption was likely violated. Namely, the single collared caribou outside of strata were outlier with low numbers of caribou in their vicinity

compared to the majority of caribou (and collared caribou), which were aggregated into larger groups. If this is the case, then the actual availability of caribou to be surveyed was higher than that indicated by the collared caribou. Therefore, the adjusted estimate is positively biased. Regardless, the relatively small sample size of collars resulted in a relatively imprecise estimate of availability, which in turn reduced the adjusted herd size estimate. A higher number of collars available during the survey would help timing the final visual survey, increase the precision of the final extrapolated population estimate, and provide additional evidence validating the critical assumption behind a fall survey for this herd.

The 2015 survey resulted in an extrapolated population estimate of 18,413 (SE=3,133.8, CI = 11,664 to 25,182). Cambridge Bay hunters indicated that some caribou were seen in land on the east side of Cambridge Bay a few days after the survey was completed (G. Angohiatok pers. comm). Even though only one collar was at this location and no caribou were seen on transect east of this location, this ground observation justified the inclusion of the collar DU-21-05 in the extrapolated herd estimate, bringing the extrapolated population estimate from 17,185 to 18,413 caribou.

Overall trend

The 2007 and 2015 extrapolated population estimates are significantly different, suggesting that a decline has occurred between these periods. Trend estimates from the 2015 survey suggest the population is declining at a rate of 4% per year (CI= 1-7%). Trend analyses suggest that this decline cannot be attributed to variance in survey estimates. Since the DUC resumed their migration in the 1900s, the herd became accessible to harvest from the community of Kugluktuk, Cambridge Bay, Bay Chimo, and Bathurst Inlet (Department of Resource, Wildlife, and Economic Development, 1998). It was estimated with uncertainty that the harvest on this herd could have reached 2,000 to 3,000 caribou a year (5%-8% harvest rates) (Gunn *et al.,* 1986), which was a contributing factor for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the DUC has a species of special concern in 2004 (COSEWIC, 2004).

Harvest levels and overall harvest rates for the DUC herd were unknown after the Kitikmeot Harvest study due to an unsuccessful voluntary harvest reporting system in Nunavut. With the decline in population, the DUC became less accessible, which likely had the net effect or reducing harvest pressure on the herd (Environment and Climate Change Canada, 2018). Based on voluntary kill reports and an increase in Conservation Officers' monitoring effort, the total harvest estimate reported 350 caribou in 2015-2016 and 250 caribou in 2016-2017 harvest season, though these figures are likely underestimates. To determine if the current harvest pose a risk to accelerate the decline in the herd size, harvest model simulations with demographic

indicators (cow survival, calf productivity) should be carried out to obtain an accurate risk assessment (Boulanger *et al*., 2011; Boulanger *et al*., 2016).

Population demography, 2015- 2017

Cow survival rate

Estimates of survival from collars (0.70, CI=0.57-0.81) suggest a low survival rate, which is lower than the 0.76 survival rate from the collars monitored from 1999 to 2004 for this herd (Poole et al, 2010). The low survival rate is similar to the Bathurst herd in 2009, where survival was estimated at 0.67 (Boulanger *et al.*, 2011). This collar survival rate should be interpreted cautiously given low sample sizes of collars and a minimal amount of knowledge about fates of collared caribou. In this study, six collared females were harvested by Cambridge Bay hunters; one during the fall migration; and the remaining ones to the east side of the Kent Peninsula during the spring migration. Causes of known mortality suggest higher harvest rates then evident though voluntary reporting. With the rarity of DUC and the lack of availability of alternative caribou herds from Cambridge Bay, the Cambridge Bay hunters might not have avoided harvesting collared caribou. Of the non-hunting deaths, only one could have been attributed to a drowning incident. Previously, 50% of the mortality occurred between October 20th and December 8th (Pool *et al*., 2010), and these were mostly related to drowning incidents while the caribou attempted to cross freshly formed grey ice. This fall-early winter sea-ice crossing mortality was observed a few years after the migration to the mainland resumed. Thus, it is possible that the DUC have adapted to their environment and learned to cross the sea-ice more successfully (G. Angohiatok pers. Comm.). However, the delay in sea-ice formation and ice breaking activities can still generate unknown implications for the caribou, such as physiological cost or reduce period of access to winter forage due to a longer staging period (Poole *et al*., 2010).

Pregnancy rate

The reproduction rate is one of the most important parameter used to monitor the growth potential of a population (Bergerud *et al.,* 2008). Pregnancy rate is usually established by the udder counts in June or calve at heel during the peak of calving. However, this would be an expensive method to determine pregnancy rate for the DUC herd due to their independent calving strategy spread over Victoria Island. Nonetheless, pregnancy rate was determined by the level of fecal progesterone of collared cows. Pregnancy rates of the DUC, were considered relatively high at 88% for both years. These finding suggest that the cows are in sufficient body

condition to ovulate in the fall (Bergerud *et al.,* 2008). For the George River Caribou Herd, a pregnancy rate of 89% to 100% was needed for the herd to increase in the 1970s, while pregnancy rates from 59% to 78% was recorded when the herd decreased in the early 1990s (Bergerud *et al.,* 2008). The 2015 and 2016 pregnancy rate is consistent with the reproduction rate supporting a population growth.

Additionally, these rates fell within the range of previous recorded pregnancy rates for this herd. Pregnancy rates of DUC, prior to resuming their migration, were available from a late-winter collection (April) on Victoria Island from 1987 to 1992. During this time, pregnancy rates ranged from 65% to 100%, with an average of 79.2%. The pregnancy rates were generally high, but the yearly variation suggested continued monitoring is required to track potential changes and investigate complementary mechanisms (Department of Resource, Wildlife, and Economic Development, 1998).

Fall and Spring composition survey

During the fall, the bull to cow ratio was investigated. The adult ratio is usually 1 male to 2 females, as the males are known to have a higher mortality rate than female (Bergerud *et al*., 2008). The low bull to cow ratio of the DUC herd (15%) might indicate a higher mortality rate for males. Even when the population was at its historic high in the late 1990s, harvesters have mentioned fewer bulls available to hunt during the fall (Department of Resource, Wildlife, and Economic Development, 1998). In the fall, the community of Cambridge Bay usually allows sport harvests to take place on the DUC, which target males only. This practice might explain the lower ratio of males encountered. The differential vulnerability of young caribou is most pronounced in fall and early winter due to exposure to more severe climatic conditions and potential winter food shortages. Results from the fall 2016 composition survey show a high summer mortality rate with 25 calves per 100 cows. However, the results of the fall 2016 composition survey should be interpreted with caution, as classification by fixed-wing is difficult and can be subject to significant error when classifying the sex of yearling. A composition done on the ground might be more suitable method.

The 2017 spring composition survey showed an indicator of the winter mortality. In 2017, the calf to cow ratio was low, 11 calves to 100 cows. Normally, a spring recruitment of 25 calves to 100 cows is necessary to maintain a stable caribou population number and 9-19 calves to 100 cows is characteristic of a declining herd (Bergerud *et al*., 2008). Bias in the spring composition survey was not likely attributed to missing early cows and calves (Gunn *et al.,* 1997), as the survey took place before the migration. However, the 2017 ratio could have been influence by the

difficulty to differentiate Barren-ground caribou from Dolphin and Union in the group composition on the east side of Bathurst Inlet. A more accurate spring composition survey should only be carried out on the west side of Bathurst Inlet to avoid this source of bias.

These demographic indicators suggest recruitment rate consistent with decline, since the last population survey. There is a need to monitor these vital rates on a yearly basis to allow for a better estimate of trend in the population in-between survey years (Todd and Rothermel, 2006).

Conclusion

The DUC are a migratory herd that is vulnerable to threats to their habitat and survival along their range. Numerous reported anthropogenic and environmental factors are potentially having a negative impact on the herd. From 1997 to 2007, the DUC population abundance was, at best, stable, but many factors indicate that the population could be declining. The likely: higher harvest level, the increase in predation by predator species colonizing on Victoria Island, increase in fall mortality due to delay of ice formation, and reports of poor body condition (Species at Risk Committee, 2013), were all signs of a potentially declining population. A declining trend was confirmed in 2015 by the population assessment suggesting a 66% reduction in herd size. Since the system of co-management in Nunavut requires an extensive amount of consultation and cooperation between public officials and indigenous users, the development of management recommendations might be lengthy and there is a risk that management actions could be implemented too late. To avoid this from occurring, an early detection system, based on a fixed set of criteria should be developed to trigger population surveys that capture significant change in herd size.

No DUC were observed to be using the coast of Victoria Island from Wellington Bay and East of Cambridge Bay along the coast from Cape Colburne to Anderson Bay. The low number of caribou contributed to the difficulty to accessing the herd during the rut and consequently finding them on the land. Additional health and demographic parameters were investigated to gain a better understanding of the potential causes of the declining trend. Factors such as the low female survival rate and the presence of pathogens in the Dolphin and Union herd, which contribute additionally to the low calf survival and recruitment rate, have been found to be negatively affecting the population number and recovery. For the pregnancies that reached term, the weak calves affected by *Toxoplasma gondii, Brucella suis*, and/or *Neospora canium* could be more at risk of predation (Krumm *et al*., 2010; Murray *et al*., 1997) and their low natural survival rate may result in increased predation by wolves and bears. The harvesters of Kugluktuk and Cambridge Bay have reported an increase in number of predators, Wolf and Grizzly bears, on the seasonal range of the DUC (HTO pers. Comm., 2015, 2016, 2017).

The current research program did not gather information between the potential relationship between the trend towards late sea-ice formation and the increased risk of deaths due to drowning (Pool *et al.* 2010). In addition, development occurring on the eastern wintering range of the Dolphin and Union, may have an unknown degree of impact on the caribou population that could become cumulative over time and become more important as the herd's vulnerability increases. Although the population impact of these two factors remain currently uncertain, the changes to sea-ice affecting migration and human development (mining, roads) are still acknowledged as threats to the Dolphin and Union population (Environment and Climate Change Canada, 2018).

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HTO Consultations Report Dolphin and Union Caribou Management Recommendations

October 2018

Department of Environment, Government of Nunavut Iqaluit, Nunavut

Executive Summary

Government of Nunavut, Department of Environment (DOE) representatives conducted consultations with the Hunters and Trappers Organizations (HTO) of Kugluktuk and with the co-management partners in Cambridge Bay on September 28th, 2018. The primary purpose of these consultations was to consult on the recommended managements actions resulting from the results from the 2015-2017 Dolphin and Union Caribou (DUC) research program. During the consultations, feedback was received regarding the research manuscript, management recommendations. The concerns and input, from co-management partners, were taken into consideration during the final review of the research report and before submission to the Nunavut Wildlife Management Board (NWMB).

HTOs and community members agreed that the DUC herd is a fundamental part of their current subsistence, and this herd is declining in number. The rate of this decline is worrisome. At the present time, the implementation of a Total Allowable Harvest (TAH) is not supported by the Government of Nunavut, HTOs, or the communities. However, the HTOs and community members are showing strong initiatives and stewardship in implementing community-based actions to address the current decline. The HTOs would like their own management initiatives to be recognized. The HTOs have shown constant interest in being part of the management of DUC through engagement in the monitoring of the herd and active participation in meetings and management processes. This report attempts to summarize the comments made by HTO board members during these meetings.

Preface

This report represents the Department of Environment's best efforts to accurately capture all of the information that was shared during consultation meetings with the Hunters and Trappers Organizations.

The views expressed herein do not necessarily reflect those of the Department of Environment, Nunavut or Government of Nunavut.

Table of Contents

1.0 Report Purpose and Structure

This report is intended to collate and summarize comments, questions, concerns, and suggestions raised during the consultations held with HTOs on the proposed management recommendations for the DUC. The summary and notes herein only reflect what was shared during the meeting.

2.0 Purpose of Consultations

After the round of engagement and meetings from 2015-2018 (Appendix I), the primary objective of the third round of meetings, organized and led by DOE, was to consult on the proposed management recommendations derived from the 2015-2017 Dolphin and Union caribou herd research program results. Such recommendations are in accordance with the recently approved Dolphin and Union Caribou Management Plan when the herd are in decline. These meetings were an opportunity to record HTO suggestions in order to potentially accommodate their requests and highlight their current community-based management initiatives. HTOs were consulted as the designated representatives of the hunting community under the Nunavut Land Claims Agreement (NLCA).

2.1 Format of Meetings

The meetings were held during the evening and morning and their duration varied between 1 to 3 hours in length depending on HTO engagement. The same information (herd status, recommendations from in the management plan, and recommendations from the report) was presented and their perspectives were recorded. Meetings were facilitated and lead by the Regional Biologist, and Conservation Officers were present in Kugluktuk to record the discussion. The presentation format was informal and the HTO Board was invited to ask questions, raise concerns, and make suggestions on the proposed recommendations. It was an open dialogue.

3.0 Public and HTO Consultation Summary

The objective for this consultation was made clear and pertinent information was given to the HTOs prior to the meeting, and at the start of the meeting. There were many similar questions, concerns, and suggestions raised by the HTO Boards.

The DUC have an important contribution to the subsistence of the communities, especially since there are harvest restrictions on the Bluenose-East and Bathurst caribou herds. Several members from different HTOs stated the importance of sustaining the Dolphin and Union herd to a certain number to assure the continuation of their harvest rights and their growing concern of a plausible limitation of these rights if the herd continues to decline. The following section summarized the consultations.

3.1.1 Kugluktuk HTO Consultation Summary-2018

Issues: Proposed management recommendations derived from the 2015-2017 Dolphin and Union caribou herd research program results.

Purpose of the Consultations:
A special meeting was organized in Kugluktuk on July 18, 2018. The primary purpose of the meeting was to engage the HTO in an ongoing dialogue on the Dolphin and Union caribou herd future management recommendations. The meeting was an opportunity to inform the audience that the DOE does not recommend a TAH based on the available information.

Date: July 18, 2018

Representatives:
Amanda Dumond (HTO manager)
Larry Adjun (HTO Chair)
Jayko Palongayak (HTO member)
Stanley Carpenter (HTO member)
Bobby Anavilok (HTO member)
Lisa-Marie Leclerc (DOE, Regional Wildlife Biologist)
Russell Akeeagok (DOE, Conservation Officer)

Summary of the Discussion:

The HTO was happy to announce that they now have someone at NTI to provide technical expertise to review governmental reports and associated management recommendations.

The current management recommendations were discussed. The Kugluktuk HTO has already been pro-active in implementing some conservative measures. Since about 2007, the HTOs by-laws do not support any sport hunt. Therefore, the sport tags allocation (35) for the DUC went all to Cambridge Bay HTO to be used as follow: 10 for the Cambridge Bay sport hunts and 5 for the local sport outfitter and the remaining 20 tags will be set aside. This Kugluktuk HTO is concerned about sport hunts, as this type of harvest targets big bulls. Their perspective on the matter is that it is important to keep big bulls so the “good” genes are transmitted to keep the population strong and be successful in mating.

The Kugluktuk HTO is also being very vocal to increase research on predators, such as wolves. Inuit Qaujimajatuqangit (IQ) suggests that wolves are the primary cause for the decline in DUC; wolf recruitment is high with 7 to 8 pups this year. They are satisfied that the GN removed the harvest season and there is currently no harvest limitation. However, they would like and are currently working with the carnivore biologist to develop a pilot project for wolf sampling collection. This might help in compensating the hunters in creating additional revenues so they could have a higher price for wolf (pelt and samples).

The number of sport tags for grizzly bear also increased for Kugluktuk, and can help in controlling predator numbers. Cambridge Bay is also doing their own research to understand how many bears there are on Victoria Island. In 1979, the first Grizzly bear was spotted in Read Island. Now, the Grizzly bear distribution seems to have spread over a large area on Victoria Island and sightings are more frequent.

Dolphin and Union migration was also discussed as a potential source of decline. In the fall, once they reach the south shore of Victoria Island, they always rush to cross the Coronation Gulf. Many years ago (15 to 20 years) and a few years back, many caribou were reported to have drowned. The majority of them seems to be bulls, since they lead the way and are more prone to fall first through thin ice.

Recommendations to the GN:

There was no proposed change in the current management recommendations. However, the Kugluktuk HTO proposed to add a management recommendation to minimize the impact of predators. It was proposed to develop a pilot wolf sample collection program to encourage research. This recommendation is supported in the Dolphin and Union management plan under a "declining status" and this additional management recommendation could be included to accommodate the HTO.

Since the management plan and the proposed recommendations call for community-based management initiatives, the HTO would like to complement its on-going management actions by hosting a community meeting. They will take this opportunity to discuss what is currently proposed, and to have the community members provide input for additional programs or management actions that they would like to see.

Comments and questions:

It was commented that the DUC front teeth seem to be abnormally worn. It was suggested to contact the team currently working on muskox teeth and potentially expend their research program, as there might be some links (share environmental conditions on Victoria Island can impact both ungulate species).

3.2.1 Face-to-Face meeting with co-management partners, Consultation Summary-2018

Issues: Proposed management recommendations derived from the 2015-2017 Dolphin and Union caribou herd research program results.

Purpose of the Consultations:
A consultation was organized in Cambridge Bay on September 28, 2018. The primary purpose of the meeting was to engage the HTO in an ongoing dialogue on the Dolphin and Union caribou herd future management recommendations. The meeting was an opportunity to inform the audience that the DOE does not recommend a TAH based on the available information.

Date: September 28, 2018

Representatives:
Beverly Maksagak (HTO manager)
Bobby Greenly (HTO chair)
Jame Panoyak (HTO member)
Larry Adjun (HTO chair)
Sam Kapulak (HTO chair)
Peter Kapulak (HTO chair)
Ema Qaqqutaq (KRWB manager)
Joe Ashevak (KRWB chair)
Attima Hadlari (KIA, wildlife)
David Lee (NTI)
Jorgen Bolt (NWMB, observer)
Lisa-Marie Leclerc (DOE, Regional Wildlife Biologist)

Summary of the Discussion:

The presentation was made to the co-management partners. Part of this presentation provided clarification on the survey methodology, as to why we do not perform a classic calving ground survey in June to estimate the number of DUC. Additional information was given to show the extent of the reconnaissance survey effort done in 2015, and explanations were provided as to why there was no final visual strata to the east side of Victoria Island.

Since 2015, there have been numerous meetings to engage, report, and discuss management recommendations for the DUC. However, it has been challenged that not all of these meetings could considered as formal “consultation”. There is a need to clarify what can be called a “consultation”. There is a duty to consult for different reasons. To engage and report progress at different parts of the research program or to report back the final results. There is also a duty to form management recommendations with co-management partners. Thus, there was a feeling that “consultation” should only be applied to meetings where management recommendations are discussed.

During the meeting, the HTOs shared what actions their respective community have been doing to remove pressure on the DUC and promote their recovery. For example, the Kugluktuk HTO has been working to educate people, does not support sport harvesting, participates in collecting health sample kits for

caribou, and encourages their members to harvest alternative species. The Cambridge Bay HTO are also doing their part by progressively reducing the number of non-resident sport hunt tags and shifting their economic interests. It was suggested that the HTOs capture their conservative measures under a small community-based management plan, and present it themselves to the Nunavut Wildlife Management Board.

Recommendation to the GN:

From the meeting a series of suggestions and modifications were provided for the report and management recommendations. These can be summarize as follow:

1) Although, there is a consensus among the management partners that the DUC is declining, it was recommended that the "management section" of the scientific report be removed. This brought confusion as there was no flexibility to accept the report without providing changes in the management recommendations.
2) There was no support to start developing a harvest model for the DUC, as there are too many assumptions to be made in such a model. Thus, this recommendation should be removed.
3) The HTOs have already implemented management actions, but would like to have more time to consult with the communities in the next months to increase the community participation and review/improve their current conservation measures.

In view of the next population survey, suggestions were provided. Even if there is currently no 2018 collars on the east side of Victoria Island, the HTO of Cambridge Bay has seen some caribou at this location and would like to have a survey block there. This will be accommodated in having a large reconnaissance survey block covering the area where previous collar tracks (1987-2017) were known to be found. If the collars do not cross back to the mainland or more collar are staying in land, the transect lines will be extended inland.

Comments and questions:

The DUC herd has changed their movement pattern in recent year, and the HTOs are wondering if some caribou are summering on the mainland or if animals are now starting to winter on Victoria Island. Although, collared caribou that were found calving on the mainland were all genetically confirmed as barren-ground, the possibility of some Dolphin and Union wintering on Victoria remains a possibility. Therefore, special attention will be given to the wintering location of the 2018 collars.

4.0 Conclusion- Next Steps

Since 2016, the DUC population survey results have been discussed on numerous occasions with the HTOs and other co-management partners. The DOE has committed to increasing the frequency of community and HTOs meetings to communicate key information as the research program progresses. The DOE has also committed to increase the monitoring of DUC through the deployment of 50 additional collars in Spring 2018 and by planning a new population survey in Fall 2018.

In addition to increased monitoring, DOE recommendations were already made to the NWMB for the limitation of sport hunting for non-residents and non-resident foreigners on the Dolphin and Union herd. The consultation process for this management recommendation was a separate process from the meetings summarized in this report. In June 2018, the Minister accepted a decision to limit the non-residents and non-resident foreigners hunting of the Dolphin and Union caribou to thirty-five (35) tags.

The current DOE management recommendations are consistent with what is recommended in the approved Dolphin and Union management plan, as an appropriate response to a “Declining Status”. The next steps will be to share the final recommendations with NWMB to assure that effective conservation measures are currently in place by the community, HTO, and Government level to address the current declining trend of the DUC. By working together, it could be possible to help the DUC to recover.

5.0 Dolphin and Union Management Recommendation minutes

Kugluktuk HTO

July 18, 2018,
4 board members present, HTO manager, Biologist and Conservation Officer.

Page 40 to 42 of the DUC report were presented to the HTO and the section of the DUC management plan referring to the management recommendations under a "declining status":

NTI allocated Cheryl Wray to provide technical help and expertise.

There is now 35 DUC sport tags. Kugluktuk did not want any allocated to them as they do not support sport harvest. Cambridge Bay has them all: 10 EHTO own sport hunt, 5 for local sport hunt, and 20 in reserve.

According to IQ, predators are the primary cause of caribou decline. Wolf litters are high with 7 to 8 pups this year. Grizzly bear has also increased in number on Victoria Island.

Sport hunt are killing the bulls. There is a need to keep the strong bulls alive. If all the strong bulls are killed, the herd will be weaker and there will be a reduction in pregnancy rate.

In addition to not supporting sport hunts, the HTO would like to see a decrease in the number of predators. Having no limit or season on wolf harvest as well as increasing the number of tags for Grizzly bear is a start. The HTO is working to have a pilot project: wolf samples collection programs. In addition to the price of pelt, hunters could then be compensated to provide samples (i.e. $300 for wolf skull). These wolf collection sample kits could increase our understanding of wolf.

In Contwoyto Lake last winter there were caribou and they were attracting wolves. We should send some hunters south to kill the wolves.

The decline could be caused by climate change. The DUC are always in a rush to cross the Coronation Gulf. 2 years ago and 15-20 years ago, there were a lot of reports of caribou drowning. The bulls are the ones that are mostly killed, because they lead the way and they are most likely to fall through the ice first.

The Kugluktuk HTO also increased the number of Grizzly bear sport tags.

Cambridge Bay is doing research on Grizzly bear to try to know how many there are on Victoria Island. The first bear was seen at Read Island in 1979, but now the Grizzly bear sighting are more frequent.

Appendix I

Timeline of the Consultations

The first series of meetings in 2015 to 2016 aimed to inform the progression of the research and to develop a set of harvest management recommendations for the Dolphin and Union management plan, by establishing different recommendations under set population status.

- KRWB AGM, 2015: Progress report on fall population surveys
- January 11-13, 2016: Second Joint Meeting in Cambridge Bay (NU), progress report on fall population surveys
- April 19, 2016: Draft Consultation with the Cambridge Bay HTO and Community of Cambridge Bay, progress report on fall population surveys and discussion on the harvest management plan recommendations
- April 28, 2016: Draft Consultation with the Kugluktuk HTO and Community of Kugluktuk, progress report on fall population surveys and discussion on the harvest management plan recommendations
- KRWB AGM, 2016: Final result on fall 2015 population survey and progress report on the fall 2016 composition survey

The second series of meetings in 2017-2018 were to inform the HTOs and the community on the final research results. The demographics indicators pregnancy rate, genetics results were only available in 2017. Thus, presentations were made to inform the public and co-management partners on the findings.

- May 25, 2017: Consultation with the Cambridge Bay HTO. Final result on fall 2015 population survey and final results on the fall 2016 composition survey and progress report on the spring composition surveys
- KRWB AGM, 2017: Final results on the demographics indicators: pregnancy rate, fall and spring composition surveys, and sex ratio
- January 24, 2018: Consultation with the Kugluktuk HTO, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring programs.
- February 1, 2018: Consultation with the Cambridge Bay HTO, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring program.
- February 22, 2018: Consultation with the Cambridge Bay Community, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring program.

A third series of meetings in summer and fall 2018 took place to review the report, propose management recommendations, seek the co-management partners' feedback, and allow for accommodation of the recommendations where possible. These meetings took place:

- July 18, 2018: Consultation with the Kugluktuk HTO, Dolphin and Union caribou herd management recommendations base on the report finding.
- September 28, 2018: Consultation with the co-management partners on the report, bring additional clarification, and discuss the management recommendation.

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Building Nunavut Together
Nunavuliuqatigiingniq
Bâtir le Nunavut ensemble

2015 Population Estimate and 2015-2017 Demographics Population Indicators of the Dolphin and Union Caribou Herd (*Rangifer tarandus groenlandicus x pearyi)*

Department of Environment

Lisa-Marie Leclerc

June 2018

Concerns expressed in 2014:

- The Community of Cambridge Bay expressed concerns about the recent lack of Dolphin and Union caribou around their community in the Fall (change in movement or population decline?).
- Preliminary results of a Traditional Knowledge Study showed a decline of ~85% of the Dolphin and Union caribou around the community of Cambridge Bay.
- With the decline in neighbouring barren-ground caribou herds, there was a need to update the Dolphin and Union population estimate from the last survey in 2007.
- There was a need to fill knowledge gaps while developing a collaborative (territorial and federal) management plan as this was a federal requirement under SARA.

These concerns triggered a extensive research and monitoring program on this herd.

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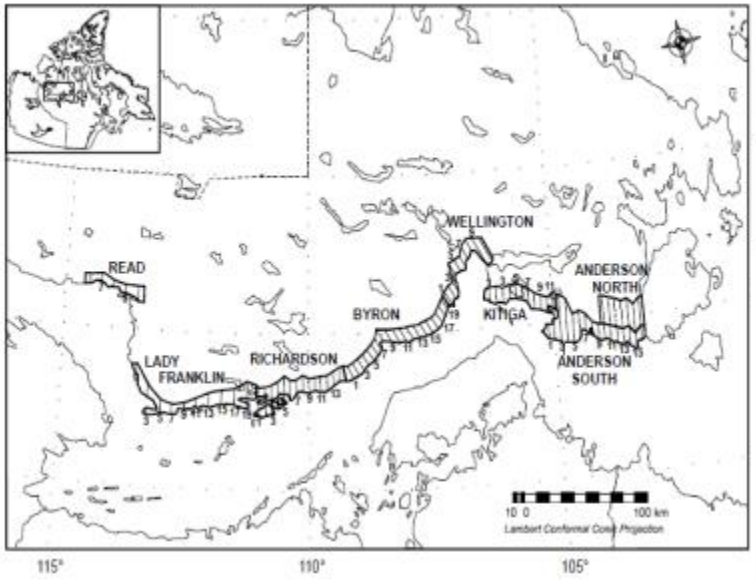
Dolphin and Union Caribou Herd population estimate
October, 2015

Distribution



(Nishi and Gunn, 2004)

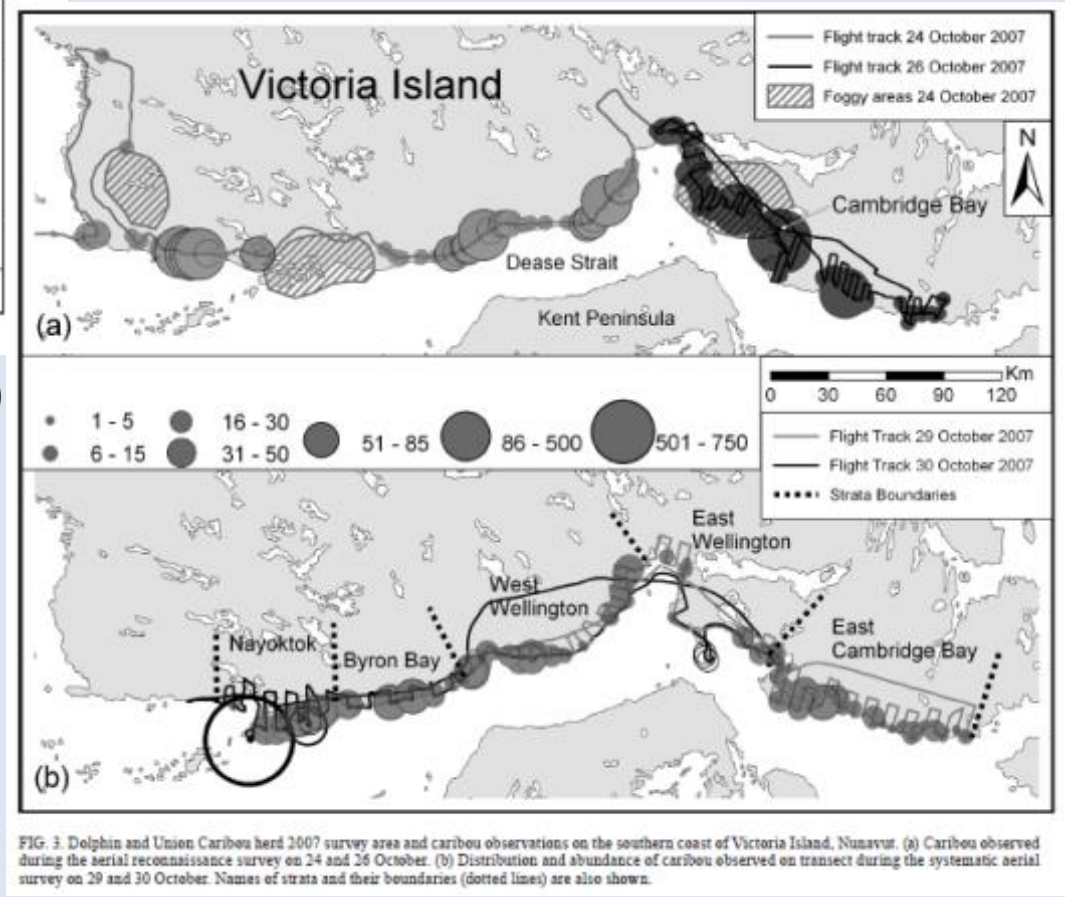
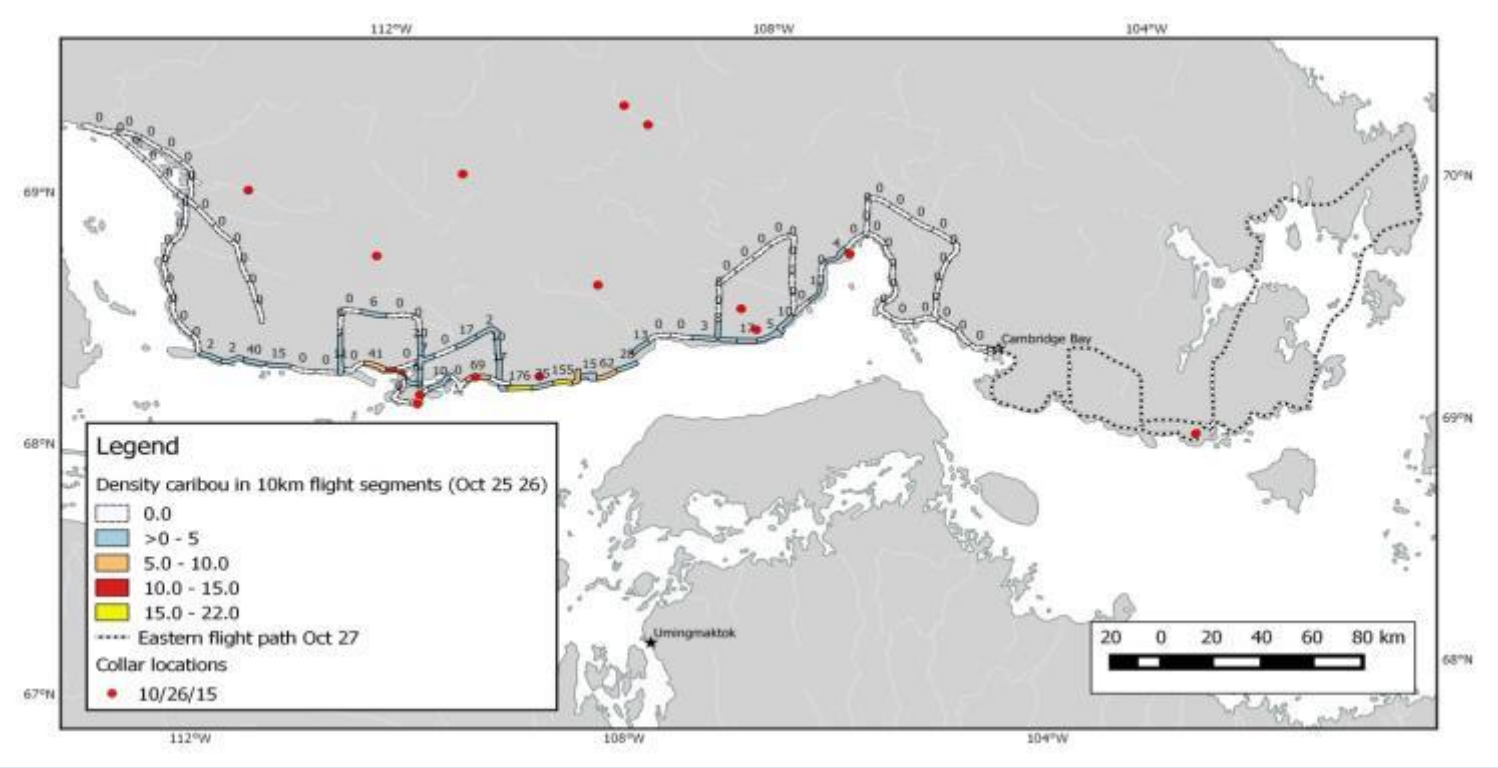


FIG. 3. Dolphin and Union Caribou herd 2007 survey area and caribou observations on the southern coast of Victoria Island, Nunavut. (a) Caribou observed during the aerial reconnaissance survey on 24 and 26 October. (b) Distribution and abundance of caribou observed on transect during the systematic aerial survey on 29 and 30 October. Names of strata and their boundaries (dotted lines) are also shown.

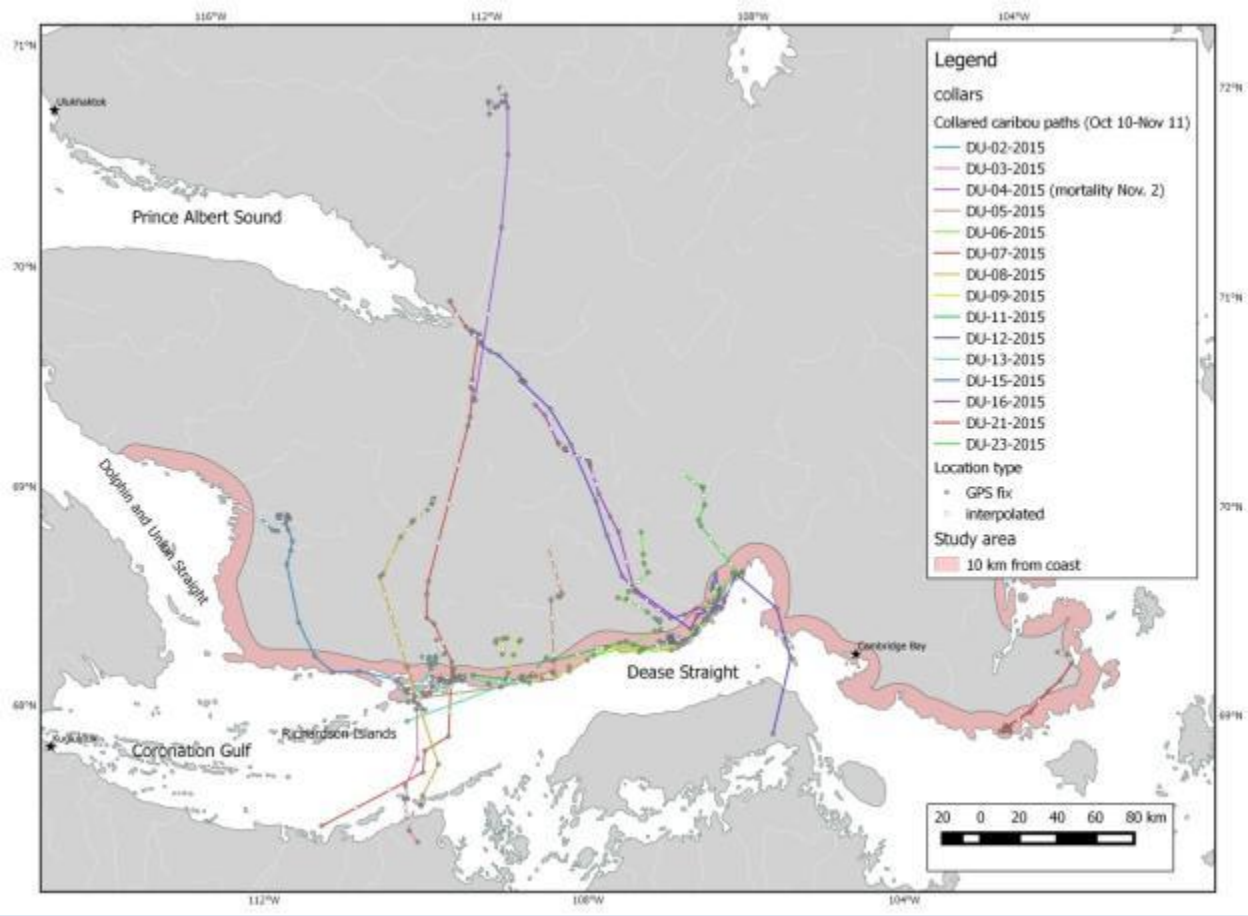
(Dumond and Lee, 2013)

Caribou Surveys – Dolphin and Union

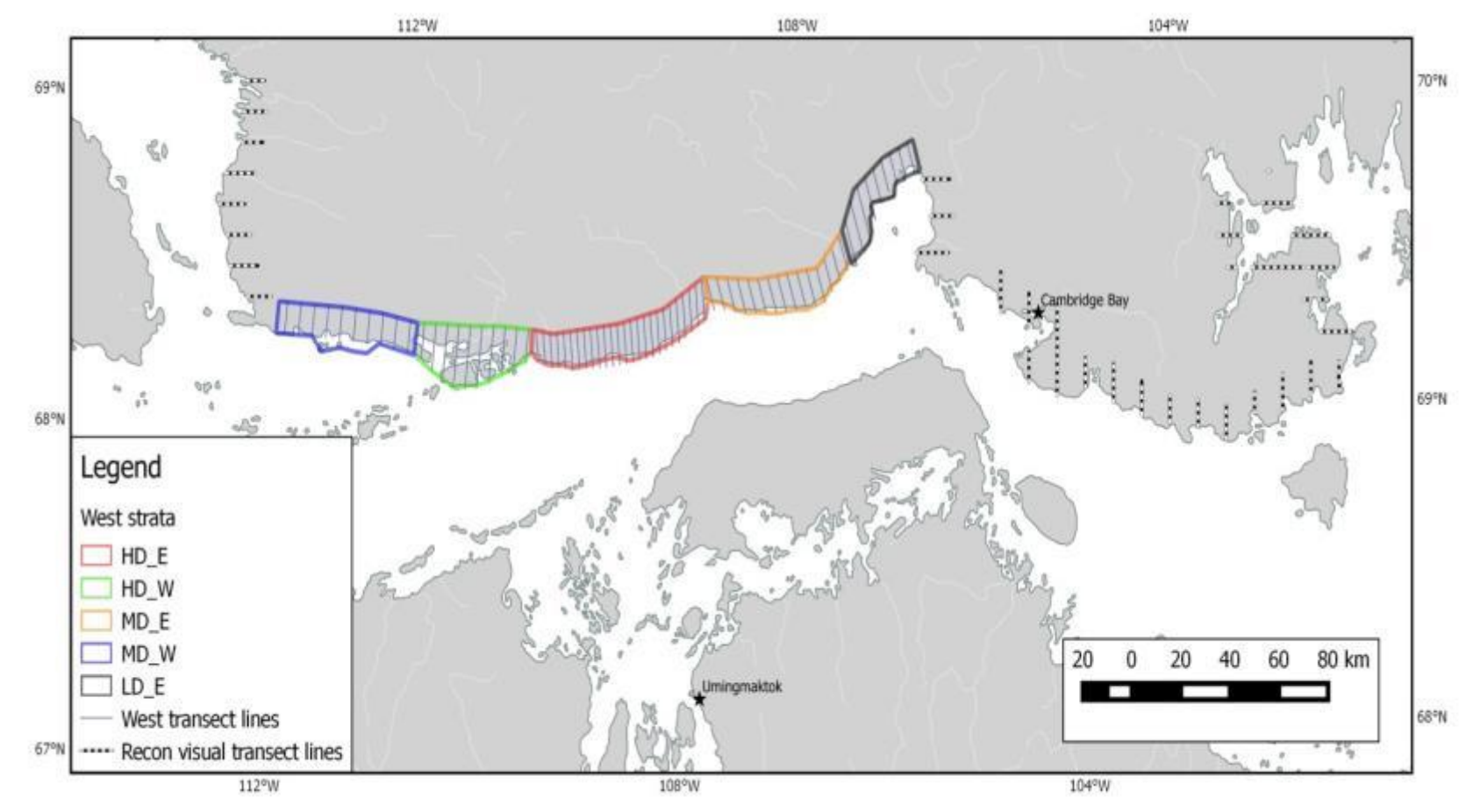
- Map of final systematic reconnaissance flights on October 25 and 26 and 27.



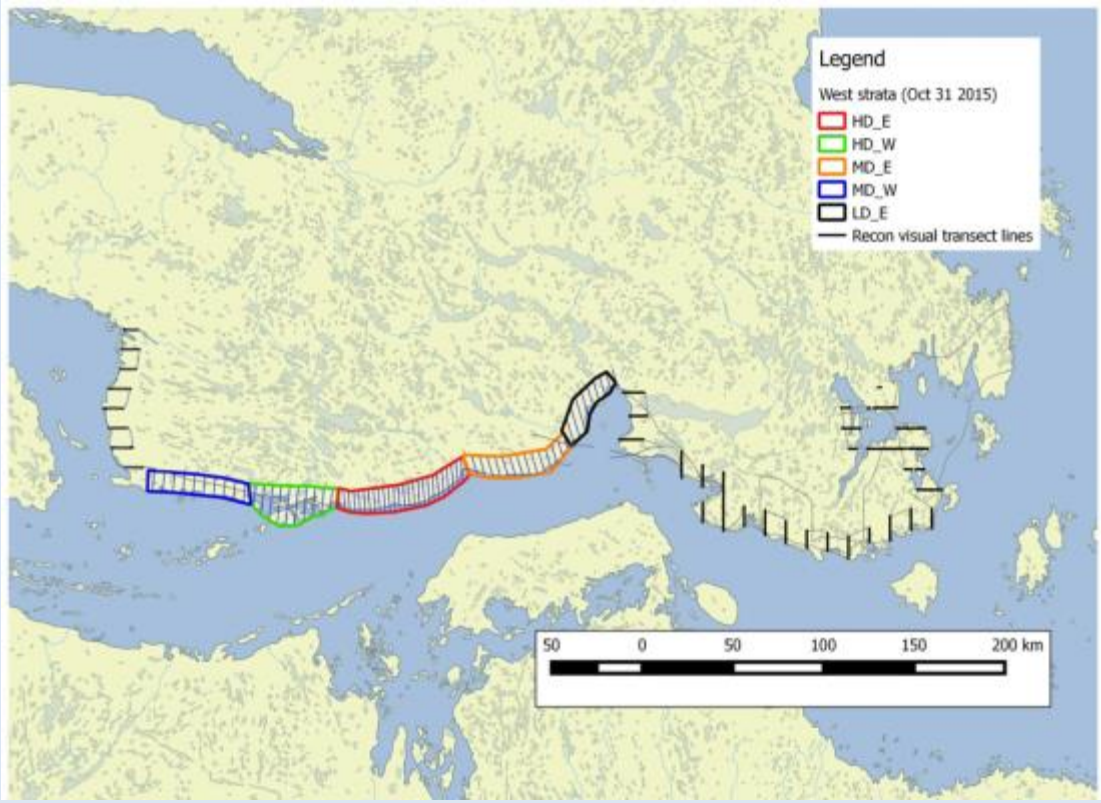
Caribou Surveys – Dolphin and Union

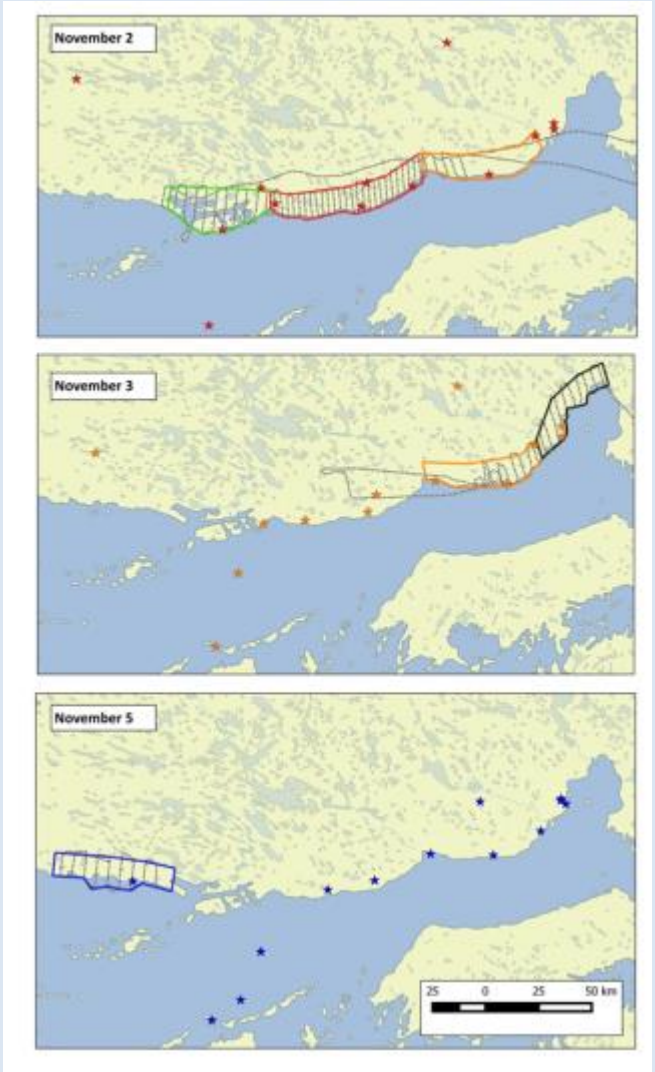


Caribou Surveys – Dolphin and Union

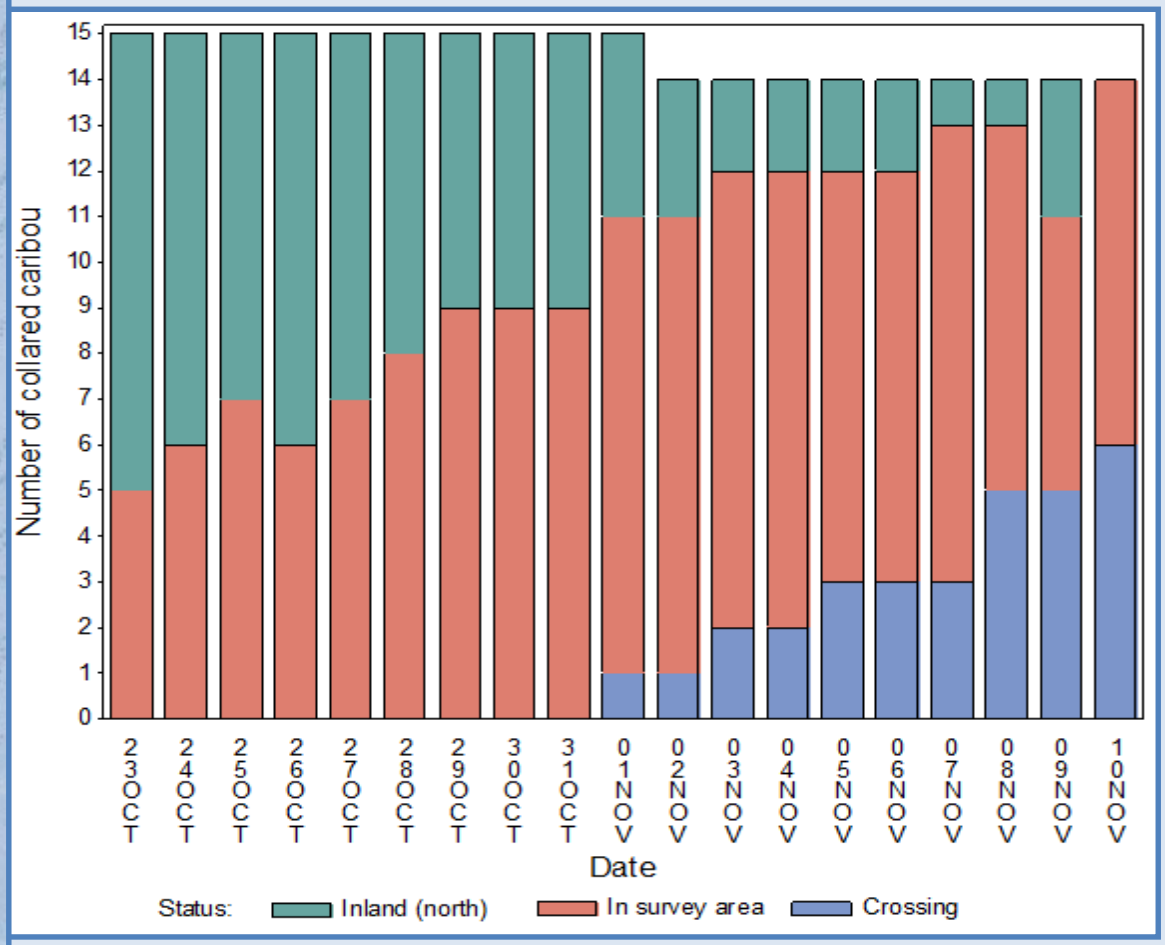


Caribou Surveys – Dolphin and Union



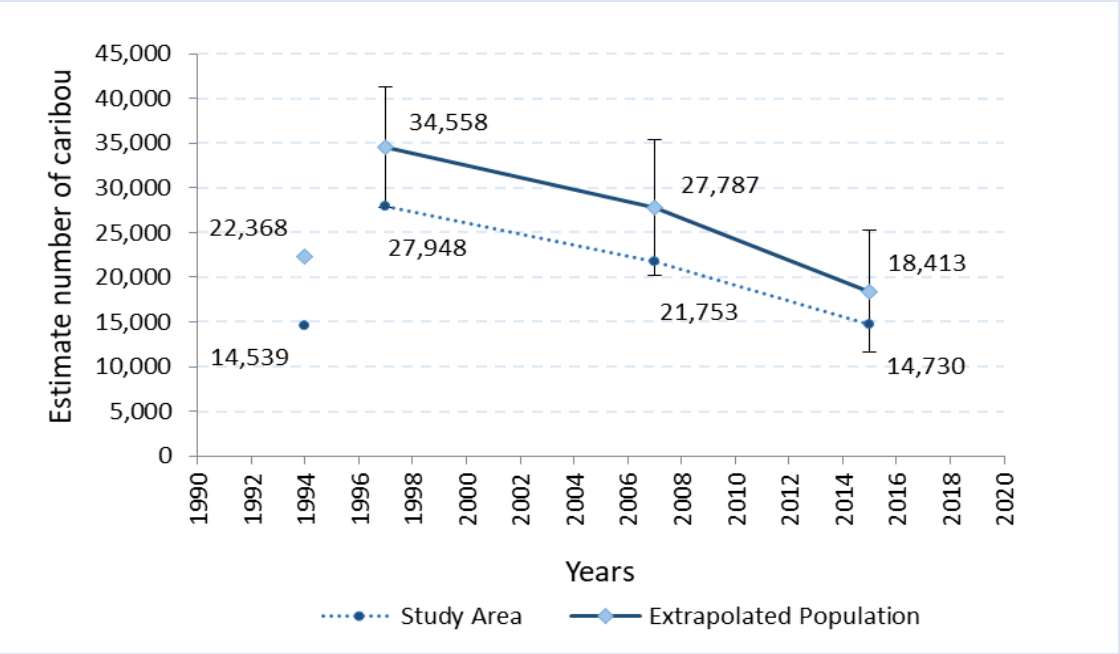


Caribou Surveys – Dolphin and Union



Dolphin and Union Population Status

- The resulting estimate of caribou of 14,730 (CI= 11,475-17,986) was precise with a coefficient of variation of 10.2%.
- in fall 2015, with the extrapolated population of Dolphin and Union caribou estimated at 18,413 ± 6,795 (95% CI, 11,664-25,182).



This estimate shows signs of decline relative to the 1997 survey estimates.

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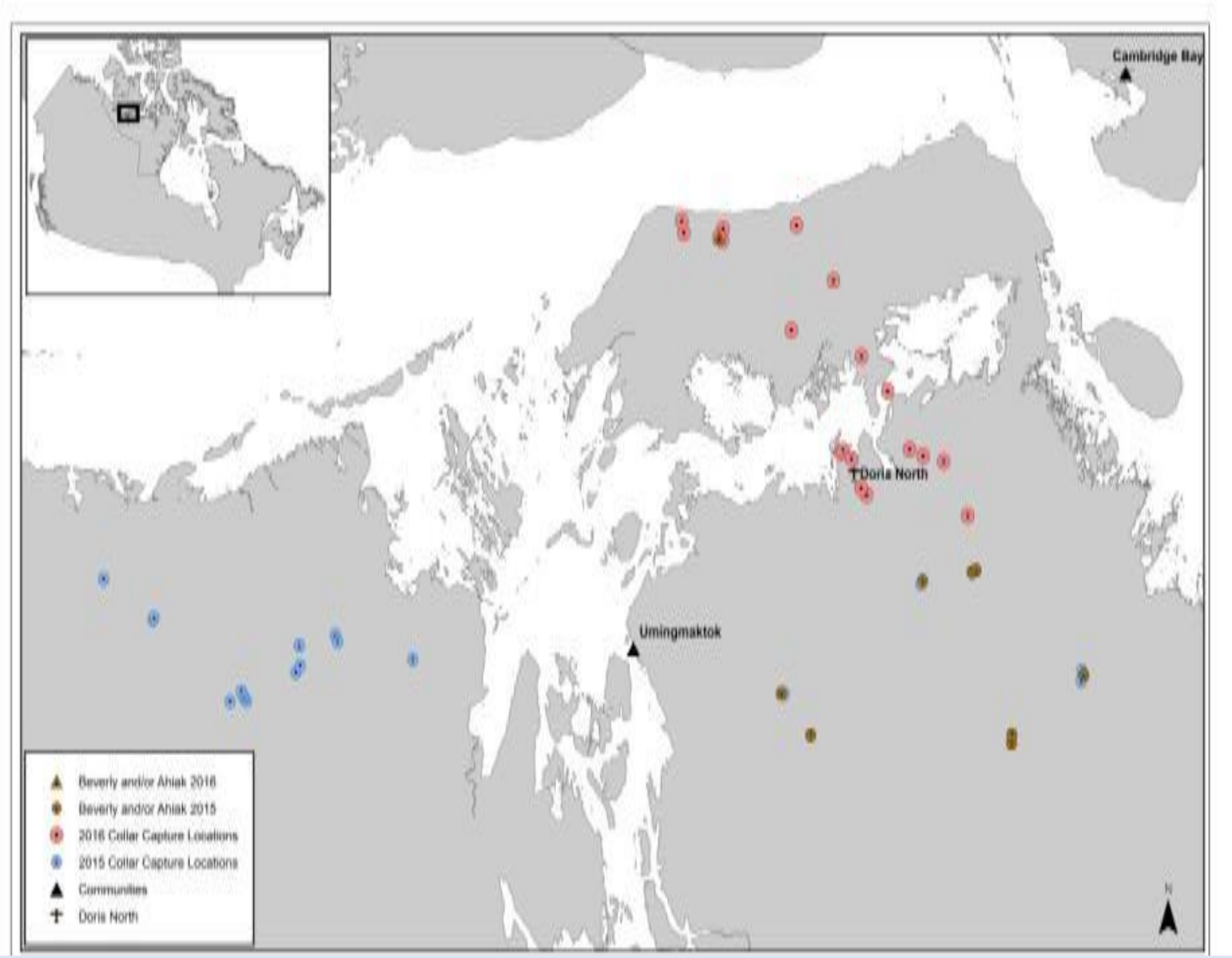
Dolphin and Union Caribou Herd Demographic Indicators 2015-2017

Dolphin and Union Collaring



Dolphin and Union Collars

2015 (April)
- 17 DU

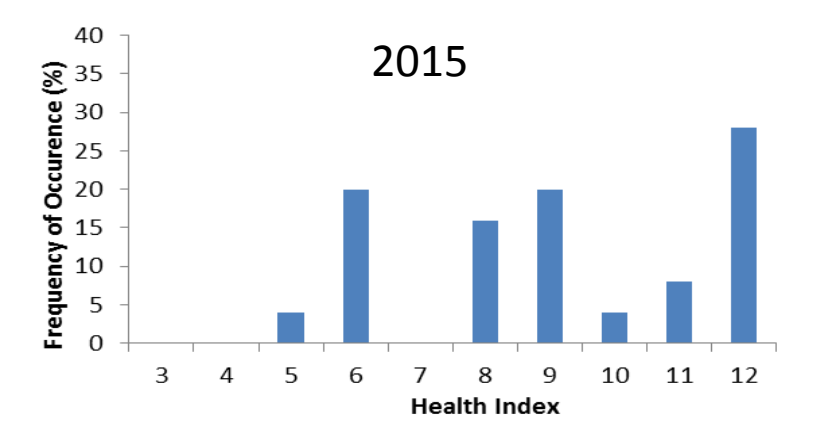
2016 (April)
- 18 DU collars deployed
- Total of 28 DU (10 from 2015 and 18 from 2016)

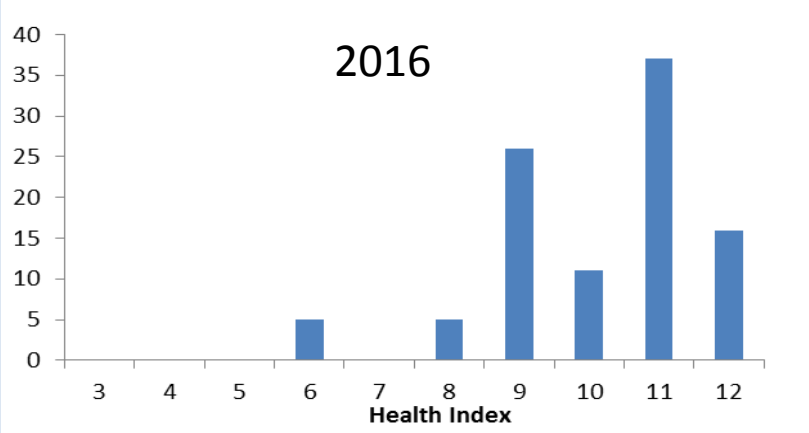
2018 (January)
- 4 DU from 2016, DU from 2015 released.

Dolphin and Union Health

The total score ranged on a scale from 6 to 12, where 12 is the healthiest caribou. For both years, no caribou scored below 4; with a mean of 9 for both years (Figure 3, A and B).

The majority of DUC scored 12 where it was hard to feel the edges of the bones of the shoulders, the ribs were nearly flush with fat tissues between them, and the hips were well padded.





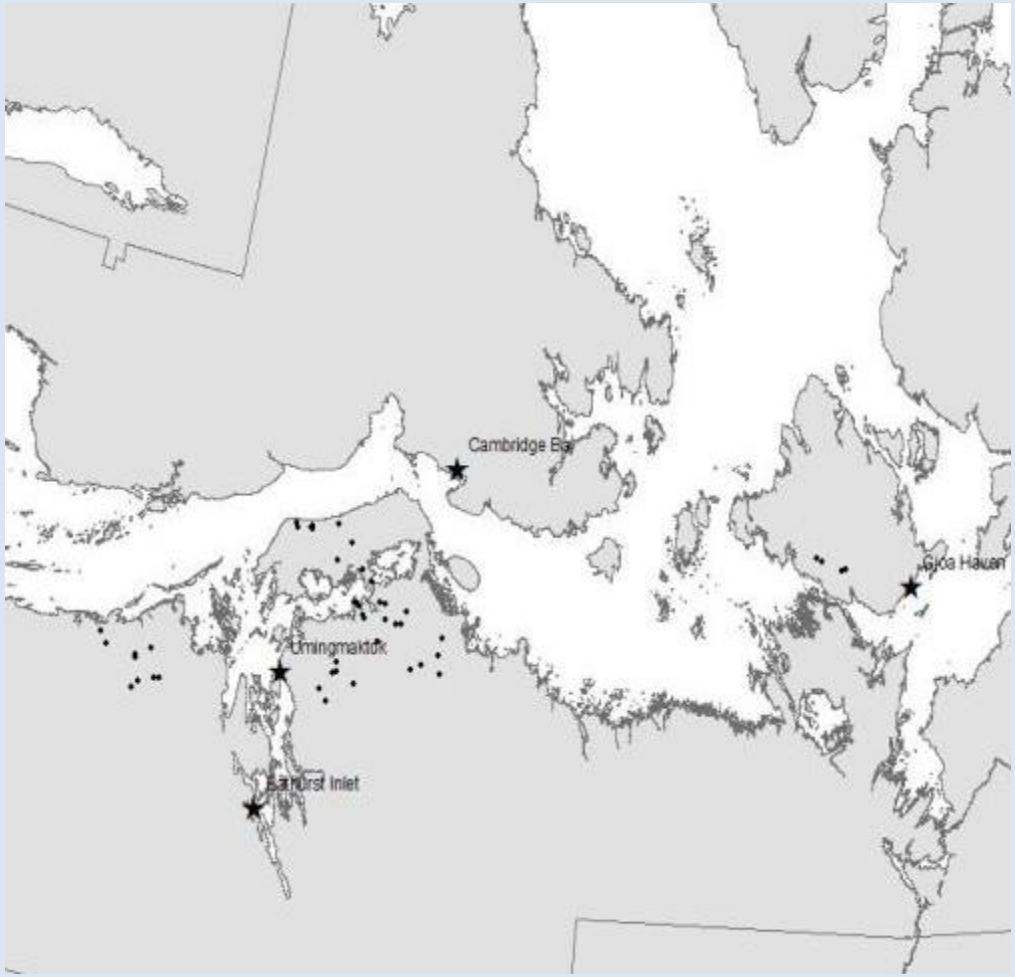
Dolphin and Union Genetics

Samples:

48 caribou pellet swab samples from 2015-2016 collared caribou

75% success rate (36/48) samples with 92% for the 2015 samples (23/25), 2016 contained 5 ground samples (3/5).

None of these individuals had previous detections in the Nunavut genetics data base



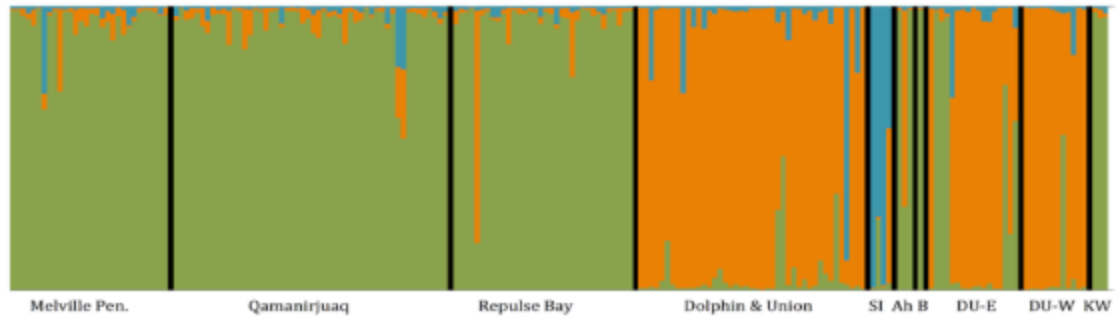
DU genetics- 2015-2016

Population	Individual ID	Peary	DU	BG
Ahiak	DU-01	0.00	0.01	0.99
Ahiak	DU-08	0.01	0.69	0.29
Ahiak	DU-20	0.01	0.01	0.99
Bathurst	DU-62	0.01	0.01	0.99
DUE	DU-09	0.01	0.99	0.01
DUE	DU-10	0.01	0.01	0.98
DUE	DU-17	0.01	0.04	0.95
DUE	Du-18	0.02	0.01	0.96
DUE	DU-21	0.32	0.65	0.02
DUE	DU-23	0.02	0.96	0.03
DUE	DU-25	0.01	0.98	0.01
DUE	DU-51	0.02	0.98	0.01
DUE	DU-53	0.00	0.98	0.01
DUE	DU-54	0.01	0.97	0.02
DUE	DU-57	0.05	0.94	0.01
DUE	DU-59	0.05	0.92	0.03
DUE	DU-61	0.02	0.98	0.01
DUE	DU-65	0.01	0.99	0.01
DUE	Du-22	0.01	0.27	0.72
DUE	DU-58	0.00	0.80	0.19
DUE	DU-64	0.08	0.33	0.60
DUW	DU-02	0.01	0.99	0.00
DUW	DU-03	0.01	0.99	0.01
DUW	DU-05	0.01	0.99	0.01
DUW	DU-11	0.01	0.99	0.00
DUW	DU-12	0.01	0.98	0.01
DUW	DU-13	0.01	0.98	0.02
DUW	DU-14	0.02	0.97	0.01
DUW	DU-15	0.03	0.43	0.55
DUW	DU-16	0.02	0.97	0.01
DUW	DU-04	0.17	0.79	0.04
DUW	DU-06	0.01	0.99	0.01
DUW	DU-07	0.01	0.98	0.01
King William	GHCAR02	0.01	0.02	0.98
King William	GHCAR03	0.01	0.03	0.96
King William	GHCAR05	0.02	0.01	0.96

Barren-ground, Peary Caribou, and Dolphin and Union Caribou are genetically clearly distinguishable

Two Dolphin and Union caribou show a mix in ancestry (DU-64 and DU-15)

In April, there are both Barren-ground and Dolphin and Union caribou on the East side of Bathurst Inlet where their field identification can be more difficult

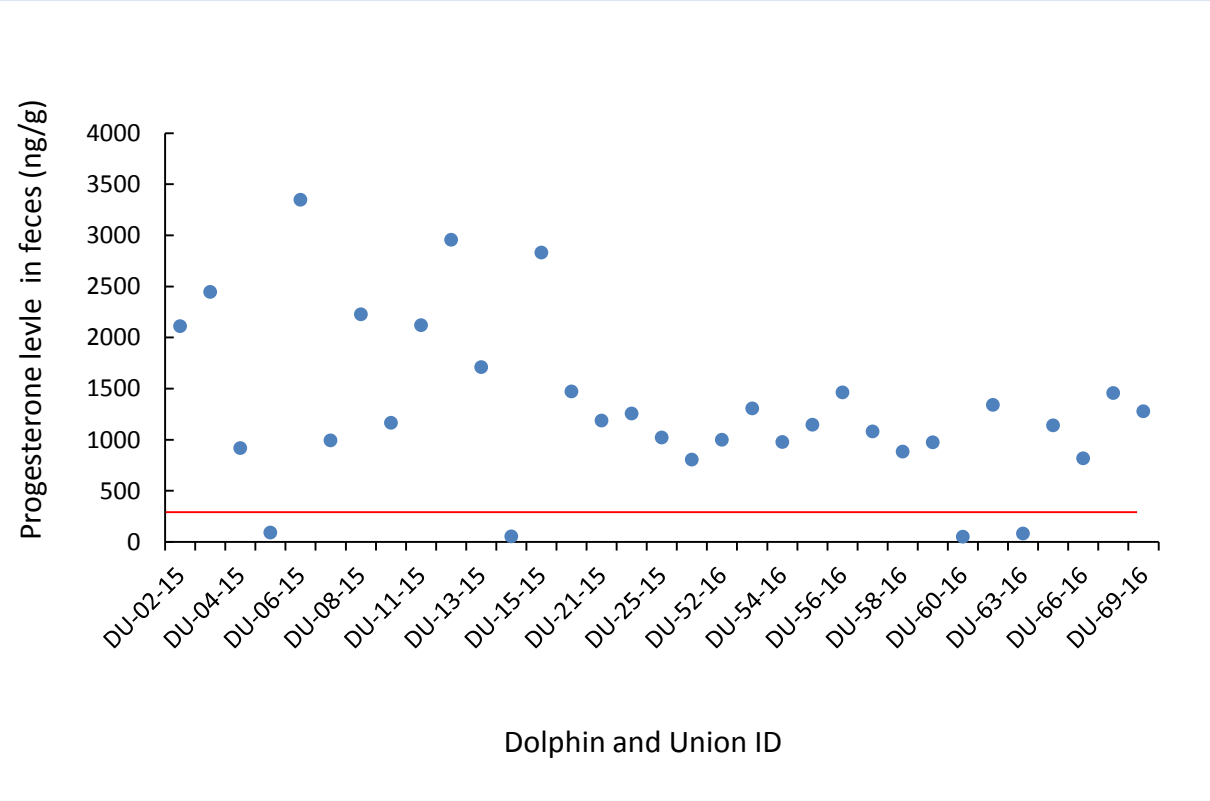


Dolphin and Union Pregnancy - 2015-2016

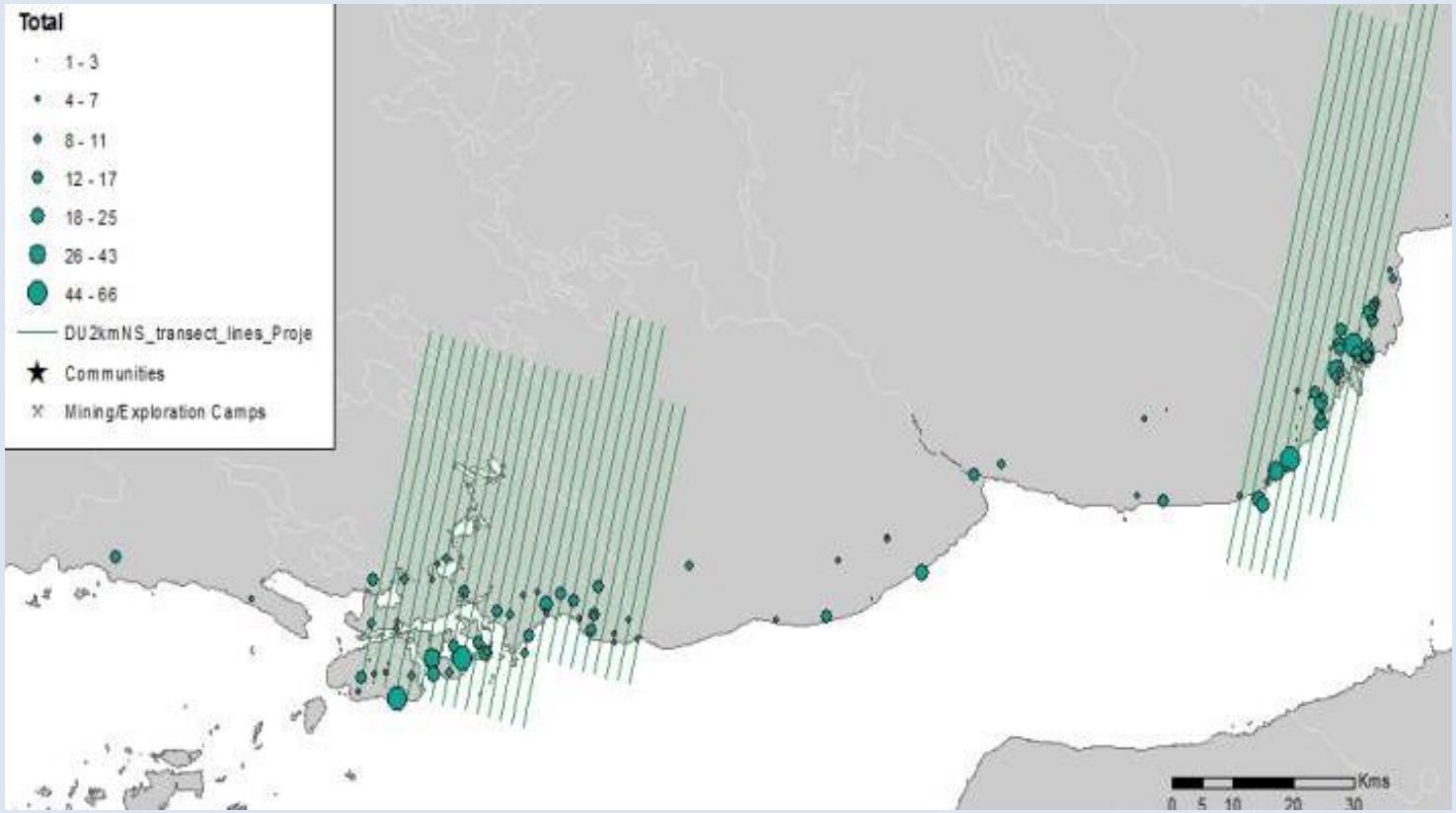
Fecal progesterone metabolite values for 43 samples:

Non-pregnant: 20-200 ng/g feces
Pregnant: >600 ng/g feces

The pregnancy rates were 88% in 2015 and in 2016.



Dolphin and Union composition survey – Fall 2016



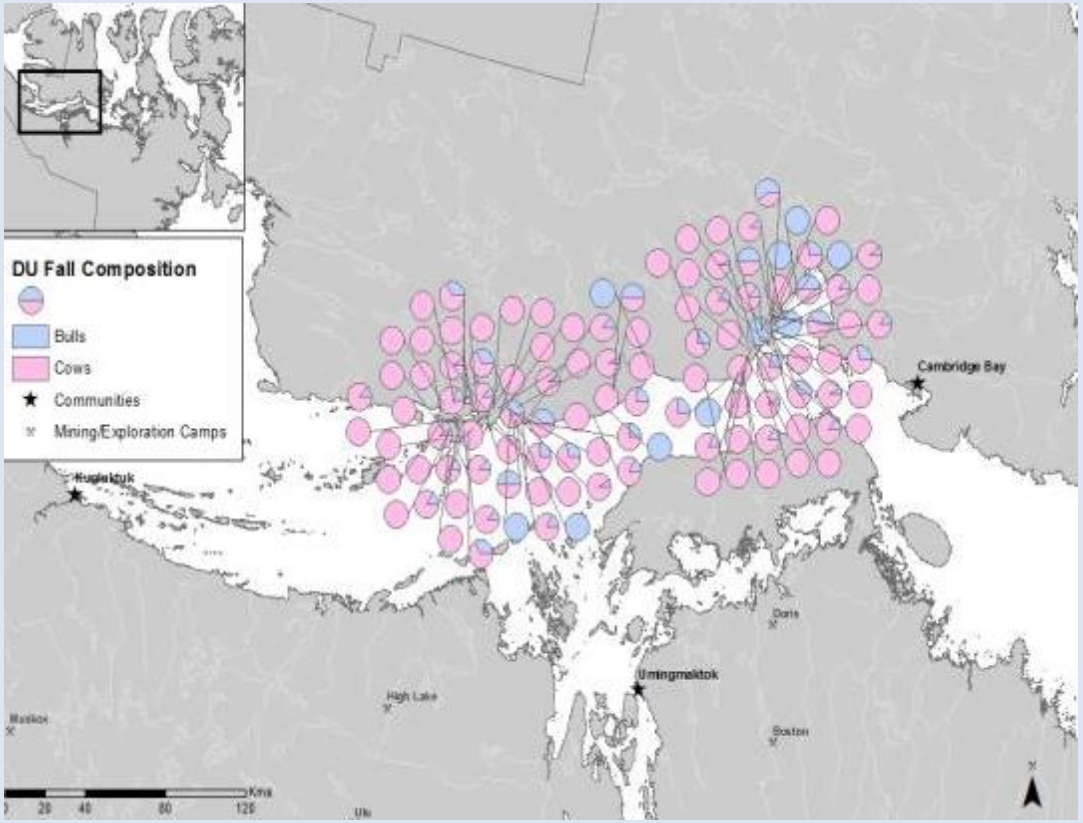
Dolphin and Union composition survey – Fall 2016

Fall 2016:

During this survey, 136 groups were taken into consideration and 1,225 caribou were classified; there were 873 cows, 218, calves, 129 yearlings and 134 bulls.

Both Ross Point and Cape Peel had a low bull:cow ratio (0.15), which suggests a uniform distribution of sex along the shoreline.

The calf:cow ratio was of 0.25



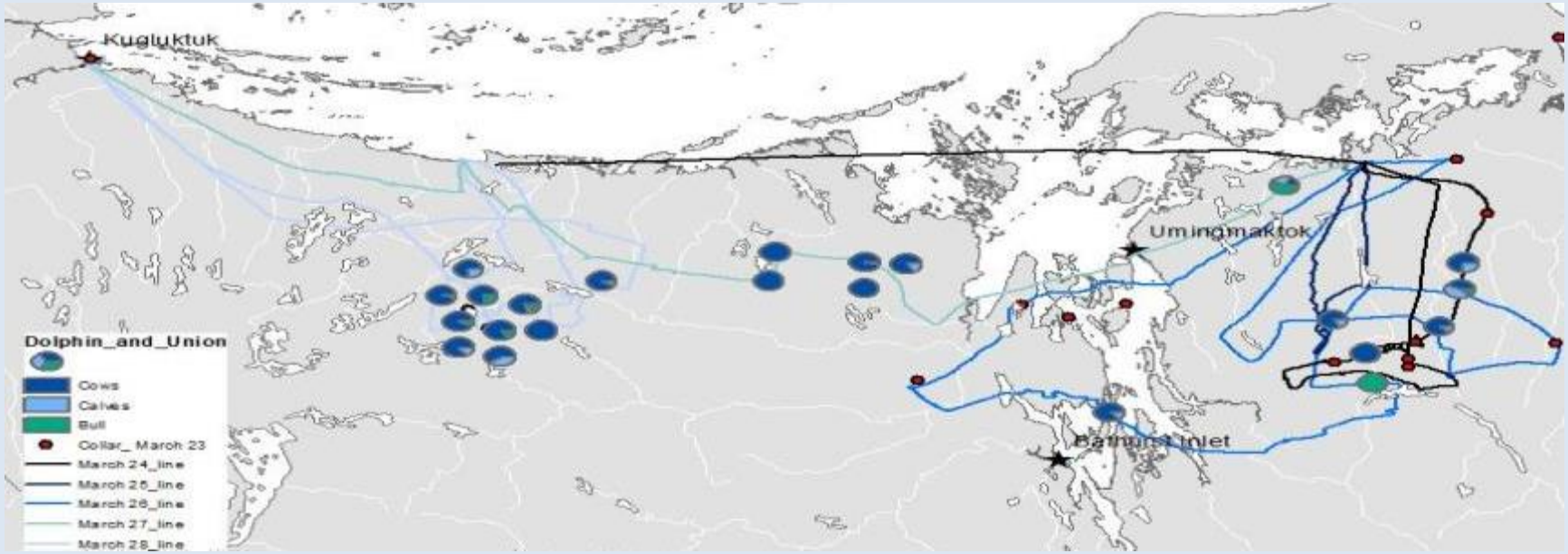
Dolphin and Union composition survey – Spring 2017

Spring 2017:

The spring composition survey was performed from March 24 to 28, 2017 on the Canadian mainland from Tree River to Hope Bay. To help in finding groups of caribou, collar location (red dot) were visited.

From the 17 collar locations in the study area, 15 were visited and only 2 collars were seen. Thus, 24 groups and 229 caribou were classified.

The calf:cow ratio was establish at 0.11.



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Consultation on the Results

- KRWB AGM, 2015: Progress report on fall population surveys
- January 11-13, 2016: Second Joint Meeting in Cambridge Bay, NU, progress report on fall population surveys.
- April 19, 2016: Draft Consultation with the Cambridge Bay HTO and Community of Cambridge Bay, progress report on fall population surveys.
- April 28, 2016: Draft Consultation with the Kugluktuk HTO and Community of Kugluktuk, progress report on fall population surveys.
- KRWB AGM, 2016: Final result on fall 2015 population survey and progress report on the fall 2016 composition survey
- May 25, 2017: Consultation with the Cambridge Bay HTO. Final result on fall 2015 population survey and final results on the fall 2016 composition survey and progress report on the spring composition surveys
- KRWB AGM, 2017: Final results on the demographics indicators: pregnancy rate, fall and spring composition surveys, and sex ratio.
- January 24, 2018: Consultation with the Kugluktuk HTO, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring programs.
- February 1, 2018: Consultation with the Cambridge Bay HTO, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring program.
- February 22, 2018: Consultation with the Cambridge Bay Community, final results on the research program on the Dolphin and Union Caribou herd (2015-2017 population estimate and demographics indicators) and future 2018 monitoring program.
- July 18, 2018: Consultation with the Kugluktuk HTO, Dolphin and Union caribou herd management recommendations base on the report finding.
- September 28, 2018: Consultation with the co-management partners on the report, bring additional clarification, and discuss the management recommendations.

Application of the research results:

- Provided additional insight and confirming the decreases in caribou around the community of Cambridge Bay.
- Some knowledge gaps were filled and the results were used to develop the Dolphin and Union management plan.
- Help in planning and conducting the next population survey.

The Government of Nunavut recommendations

The DOE does not recommend a TAH at this time but due to the declining status of the herd, it is recommended that the DOE follow the approved Dolphin and Union Caribou Management Plan.

SUBMISSION TO THE
NUNAVUT WILDLIFE MANAGEMENT BOARD

FOR

Information: X **Decision:**

Issue: Consultation regarding the possible addition of the Atlantic Walrus (High Arctic and Central/Low Arctic populations) to the *Species at Risk Act* list

Background

Atlantic Walrus were assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a single population of Special Concern in 2006. DFO carried out consultations in Nunavut in 2006 and 2007. None of the 11 Nunavut communities visited supported listing. In April 2017 the Atlantic Walrus was assessed by COSEWIC as two Special Concern populations; a High Arctic and a Central/Low Arctic population. A Nova Scotia-Newfoundland-Gulf of St. Lawrence population, depleted by hunting 150 years ago, was assessed as Extirpated. Existing Atlantic Walrus populations may be limited or threatened by hunting, noise disturbance and industrial activities. Their narrow ecological niche also makes them vulnerable to environmental changes.

The full COSEWIC assessment report for the Atlantic Walrus (High Arctic and Central/Low Arctic populations) is available (in English) on the Species at Risk Public Registry at:

http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Atlantic%20Walrus_2017_e.pdf

Consultations

DFO recently mailed and emailed a request to 23 Hunters and Trappers Organizations (HTOs) in Nunavut to ask them if they wanted to be consulted about the possible listing of Atlantic Walrus. Four HTOs, Grise Fiord, Pond Inlet, Clyde River and Cape Dorset, stated they wished to receive consultation materials. Two HTOs, Cambridge Bay and Kugluktuk, due to their communities being outside the normal range of Atlantic Walrus, declined the consultation. However, due to the recognized importance of the species to Inuit and its widespread distribution in Nunavut, DFO will send consultation materials to all HTOs, excluding the two that stated they did not want materials. We believe including all HTOs in the distribution of consultation materials is proper for a thorough consultation on this species. Once they have the materials in hand, HTOs can then provide a decision on listing or decline to participate.

Listing of Atlantic Walrus as a species of Special Concern would not result in any changes to their management or the current hunting by Inuit, but would require the creation of a SARA management plan or SARA compliant management plans. At this time, we suspect that the recently completed Integrated Fisheries Management Plan for Atlantic Walrus in Nunavut would form a large portion of any SARA management plan.

All consultation materials will be prepared in English and Inuktitut and distributed to HTOs and other Inuit organizations prior to the official consultation period. The planned consultation period for Walrus will begin in January 2019 and run for 60 days, coinciding with a similar consultation period in southern Canada. Public notices will appear in *Nunatsiaq News* just after the consultation period has begun to advise the public of the consultation period so that all Nunavut residents have an opportunity to participate in the process using online materials. A reminder letter will be sent to HTOs and stakeholders part way through the consultation period to remind them we are looking for their views on listing.

As per the “Memorandum of Understanding to Harmonize the Designation of Rare, Threatened and Endangered Species under the Nunavut Land Claims Agreement and the Listing of Wildlife Species at Risk under the *Species at Risk Act*”, DFO will forward a consultation summary to the Board once consultations have been completed.

Prepared by:
Sam Stephenson, Species at Risk Biologist, DFO, Central and Arctic Region, Winnipeg

Date: 01 November 2018

SUBMISSION TO THE
NUNAVUT WILDLIFE MANAGEMENT BOARD
December 2018

FOR

Information: X **Decision:**

Issue: Fisheries and Oceans Canada Update – Marine conservation initiatives

Background:

In June 2016, Canada announced a five-point plan to reach its national and international marine conservation targets (MCTs), which includes the establishment of additional Marine Protected Areas (MPAs). The purpose of establishing MPAs is to afford protection to important fish and marine mammal habitats, endangered marine species and their habitats, unique features, and/or areas of high biological productivity or biodiversity. The first step in this process is to identify Areas of Interest (AOIs).

To date Fisheries and Oceans Canada (DFO) has engaged the Regional Inuit Associations to seek support to advance marine protection in their regions. DFO is currently working with the Kivalliq Inuit Association to confirm support for an Area of Interest for potential marine protection.

In addition to ongoing efforts within the land claim areas, Fisheries and Oceans Canada and Parks Canada Agency are now looking to advance protection measures for the high arctic multi-year pack ice Ecologically and Biologically Significant Area called the 'High Arctic Basin'. Protection efforts are directed towards the High Arctic Basin because of the ecological significance of the area, stakeholder and partner interests as well as the potential risks from anticipated increases in Arctic shipping.
DFO and PCA are proposing the following phased approach to protecting this area (see attached proposal for additional information).

- Phase 1 - Use interim protection under the proposed amendments to the Oceans Act to secure the area and provide the time needed to collect additional information and work with our partners and stakeholders.
- Phase 2 - Seeking support for long term protection measures from our partners and stakeholders. Work collaboratively with partners and stakeholders to consider the new information, determining the boundary and conservation tool or tools for the area.
- Phase 3 – Implement long-term marine protection measures if supported by our partners and resources and capacity are available.

Consultations

Kivalliq Region

- At the end of September the Oceans program visited the communities of Coral Harbour, Chesterfield Inlet and Naujaat to confirm support for pursuing an Area of Interest for Marine Protection around Southampton Island. The communities were supportive of the process.
- In October the Ocean Program attended the Annual general meetings for the Kivalliq Inuit Association (KIA) and the Kivalliq Wildlife Board (KWB). The program gave an update on the Marine Protected Area process, including outcomes of the community engagement sessions. At the KIA meeting the Oceans Program requested further direction from the KIA Board and support for advancing Southampton Island as an Area of Interest for an *Oceans Act* Marine Protected Area.

High Arctic Basin

- Letters regarding Marine Protection in the High Arctic Basin were sent in June 2018 to Eastern and Western Arctic Inuit representatives and Territorial Governments (Nunavut Tungavik Incorporated (NTI), Qikiqtani Inuit Association (QIA), Government of Nunavut (GN), Inuvialuit Regional Corporation, Inuvialuit Game Council (IGC), Fisheries Joint Management Committee (FJMC), Government of the Northwest Territories, and Government of Yukon Territory) outlining a proposed phased approach to provide interim protection to a portion of the multi-year ice pack EBSA.
- A proposal to advance marine protection in the High Arctic Basin was sent in September 2018 on behalf of DFO and PCA to other relevant stakeholders including NIWS, Nunavut Fisheries Association, Nunavut Wildlife Management Board/Nunavut Marine Council, Nunavut Impact Review Board, Qikiqtaaluk Wildlife Board, Inuit Circumpolar Council, Qikiqtaaluk Corp., World Wildlife Fund, Oceans North, Canadian Parks and Wilderness Society, Ecology Action Centre and Resolute Bay, Grise Fiord & Arctic Bay Hunters and Trappers Organizations.
- The High Arctic Basin proposal was presented at the June face-to-face meeting of the Nunavut Steering Committee Meeting (June 2018) which NTI, GN, Environment and Climate Change Canada (ECCC) and NWMB attended, QIA (July 2018), IGC (August 2018), NWMB and FJMC (September 2018).
- The Government of Nunavut raised concerns about involvement and engagement in the process as well as potential impacts on economic development for Nunavut. We will be working directly with the GN to resolve this issue. No other concerns were raised.

Recommendation:

The NWMB provide comments to DFO on the Phase 1 of the High Arctic Basin proposal to use proposed interim protection measures under the Oceans Act for the portion of the High Arctic Basin marine region outside of the land claims areas and within the EEZ (see attached map). Comments requested by January, 7, 2019.

Prepared by: Central and Arctic Region – Fisheries and Oceans Canada, Oceans Program
Date: October 26, 2018

Advancing High Arctic Basin Marine Protection

The Government of Canada has committed to protecting a portion of the Canadian High Arctic that is projected to retain multi-year ice in the future and potentially provide important refuge for ice-dependent and culturally significant species in the Arctic. Protecting this area will also help the Government fulfill its commitments to increasing coastal and marine protection to 10% by 2020.

Importance of the High Arctic Basin

Fisheries and Oceans Canada has identified an Ecologically and Biologically Significant Area in the Arctic Basin (Figure 1), which highlights the importance of the area but offers no protection. This area is considered globally, nationally and regionally unique due to the presence of multi- year pack ice. While relatively little is known about the area, it is believed to be critically important habitat that could provide a safe haven for Arctic under-ice communities as well as ice dependent species (e.g. polar bears and seals).

Figure 1. Arctic Basin Multi-Year Pack Ice Ecologically and Biologically Significant Area

A portion of this area has also been identified as a candidate National Marine Conservation Area by Parks Canada Agency. In addition to ongoing efforts within the land claim areas, Fisheries and Oceans Canada and Parks Canada Agency are now looking to advance protection measures for this high arctic multi-year pack ice called the '**High Arctic Basin'**. Protection actions are directed towards the High Arctic Basin because of the ecological significance of the area, stakeholder and partner interests as well as the potential risks from anticipated increases in Arctic shipping. Additional information can be found at: http://www.dfo-mpo.gc.ca/oceans/conservation/higharctic-hautarctique/index-eng.html.

A Fisheries and Oceans Canada science program is underway in the area to collect information on changing sea ice patterns, the sea ice environment, Arctic wildlife and biodiversity, pollutants and emissions, and more. This new information will help inform potential future protection measures. More information on this science program can be found at: http://www.dfo-mpo.gc.ca/science/atsea-enmer/missions/2018/higharctic-hautarctique-eng.html.

Tools for marine conservation

Fisheries and Oceans Canada , Parks Canada Agency and Environment and Climate Change Canada are the federal departments with tools which support marine conservation. A map of existing marine conservation areas can be found at: http://www.dfo-mpo.gc.ca/oceans/maps-cartes/conservation-eng.html.

A phased approach to protection of the High Arctic Basin

Phase 1 – Explore Option for Interim Protection
(Figure 2)

With decreasing sea ice cover in the Arctic, there is an increased interest in marine shipping in the High Arctic. Interim protection may provide protection against potential increased shipping and confirm Canada's interest in the protection of this important area.

The proposed amendments to the *Oceans Act* may provide a new 'interim' option for marine protection. This would temporarily secure an area of interest outside of land claim areas, providing more time to collect additional information and seek support and determine area of interest for long-term protection of the High Arctic Basin.

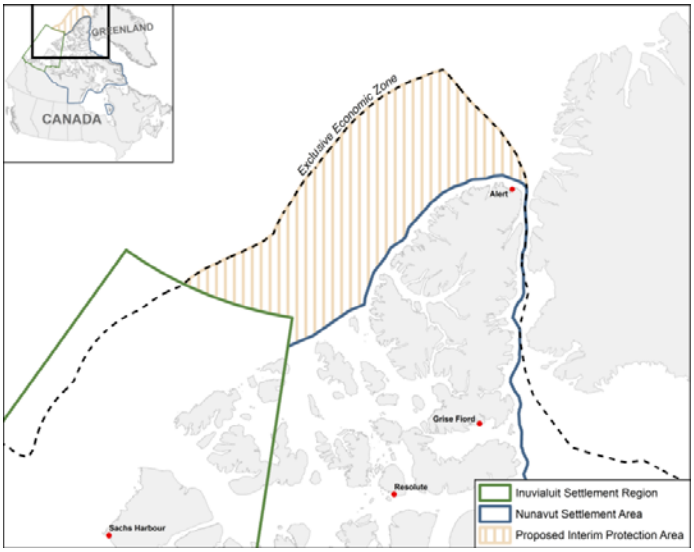

Figure 2. Scope of area for consideration in Phase 1 – Explore option for Interim Protection

Phase 2 – Consider long-term protection options
(Figure 3)

Fisheries and Oceans Canada and Parks Canada Agency believe that long term protection is imperative to conserving this important area and will consult with and seek support for long-term protection measures from key stakeholders and partners.

Fisheries and Oceans Canada and Parks Canada Agency will work with our partners to explore the scope and scale of potential protection and determine appropriate conservation tools. New information collected in Phase 1 will be used to inform protection needs.

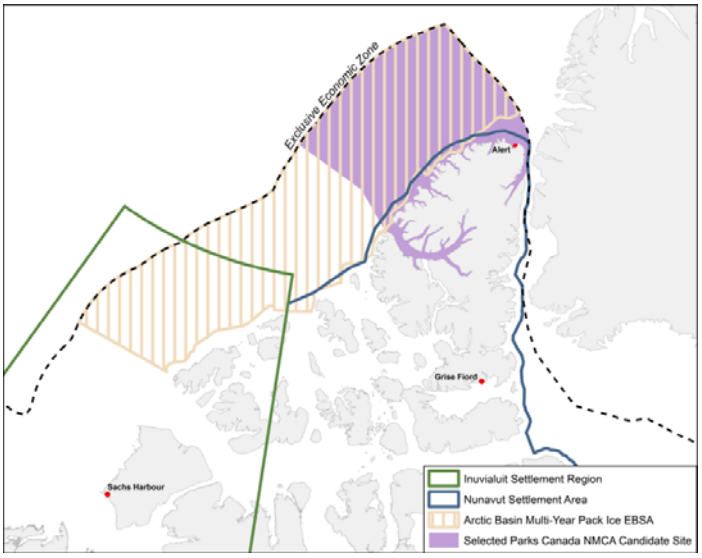

Figure 3. Potential areas to consider for long-term protection options

Phase 3 – Implementation

Implementation of long-term marine protection measures will depend on support from our partners, resources and capacity, and the consideration of new information.

Getting In-Touch

DFO and PCA will continue engaging northern partners and stakeholders on this initiative. We invite you to send us your feedback and/or seek additional information by contacting Leah Brown at: leah.brown@dfo-mpo.gc.ca or by phone at 204-984-6276.

SUBMISSION TO THE
NUNAVUT WILDLIFE MANAGEMENT BOARD
December 2018

FOR: Information: X **Decision:**

Issue: Development of Nunavut Fishery Regulations

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Updates:

- On July 9, 2018, to celebrate the 25th anniversary of the signing of the *Nunavut Agreement*, the Government of Canada, Nunavut Tunngavik Incorporated (NTI), the Nunavut Wildlife Management Board (NWMB) and the Government of Nunavut (GN) issued a Joint Statement on the Development of Fishery Regulations for the Nunavut Settlement Area (NSA).

- In the statement, all parties confirmed their commitment to co-develop the policies related to the management of fisheries in Nunavut.

- New regulations will replace the existing *Northwest Territories Fishery Regulations* in Nunavut, and will recognize and respect the rights of Inuit and the roles of Hunters and Trappers Organizations (HTOs) and Regional Wildlife Organizations (RWOs) as set out in the *Nunavut Agreement*.

- Phase 1 of the co-development process involves the co-design of the policy framework to support the new regulations. The goal is to finish Phase 1 in early 2019.

- A co-development meeting was held on October 10 and 11 in Iqaluit between NTI, NWMB, GN, Makivik Corporation and Fisheries and Oceans Canada and again on November 20 and 21 in Ottawa. The meetings build on the progress to date and continue policy discussions on the development of the Nunavut Fishery Regulations.

- The proposed scope of the regulations applies to all fish (including marine mammals) and currently includes the areas within the Nunavut Settlement Area (including the Areas of Equal Use and Occupancy). Consideration is also being given to include the Nunavik Marine Region.

- Collaboration and engagement will be key to ensure Inuit rights and government responsibilities are represented. Meetings are being planned to engage with RWOs as well as HTOs, community members and other Indigenous groups as the development continues.

- A day and a half workshop took place on November 27 and 28 in Iqaluit where the RWOs discussed the policy framework and concepts for the proposed regulations.

Handout

- Joint statement on the Development of Fishery Regulations for the Nunavut Settlement Area (Inuktitut)

- Joint statement on the Development of Fishery Regulations for the Nunavut Settlement Area (English)

Further Information:

- http://www.dfo-mpo.gc.ca/acts-lois/rules-reglements/rule-reglement35-eng.htm

- http://www.dfo-mpo.gc.ca/media/statements-declarations/nunavut-eng.htm

- https://www.canada.ca/en/fisheries-oceans/news/2018/07/nunavut-tungavik-incorporated-the-nunavut-wildlife-management-board-the-government-of-nunavut-and-the-government-of-canada-agree-to-develop-fisheri.html

Key Contact:

- Kerry Boak, Central and Arctic Region, Fisheries and Oceans Canada – Kerry.boak@dfo-mpo.gc.ca

Prepared by: Nunavut Tunngavik Incorporated, the Nunavut Wildlife Management Board, the Government of Nunavut, Makivik Corporation and Fisheries and Oceans Canada

Date: October 31, 2018

Joint Statement on the Development of Fisheries Regulations for the Nunavut Settlement Area

July 9, 2018

The *Nunavut Agreement* created a co-management system with defined and complementary roles for the Minister of Fisheries and Oceans, the Nunavut Wildlife Management Board, Regional Wildlife Organizations, and Hunters and Trappers Organizations - while recognizing Inuit harvesting rights, including fishing rights.

To celebrate the 25th anniversary of the *Nunavut Agreement* and in recognition of significant progress in recent months to develop the policies to support the future regulation of fisheries in the Nunavut Settlement Area under the *Fisheries Act*, Fisheries and Oceans Canada, Nunavut Tunngavik Incorporated, the Government of Nunavut, and the Nunavut Wildlife Management Board state that they will:

- Work collaboratively to co-develop the policies that will form the basis of regulations to govern fisheries in the Nunavut Settlement Area (NSA);

- Co-develop policies for the management of NSA fisheries that are consistent with the relevant wildlife management provisions of the *Nunavut Agreement*;

- Co-develop policies that recognize and respect the rights of Inuit, and the roles of Hunters and Trappers Organizations and Regional Wildlife Organizations, as set out in the *Nunavut Agreement*;
- Continue to recognize and respect the Nunavut Wildlife Management Board as the main instrument of wildlife management in the NSA and the main regulator of access to wildlife, having the primary responsibility in relation thereto in the manner described in the *Nunavut Agreement*;
- Continue to recognize and respect the role of the Minister of Fisheries and Oceans in the management of fisheries;
- Co-develop policies that emphasize the importance of conserving and protecting aquatic species and associated ecosystems, and that respect the principles of conservation as set out in the *Nunavut Agreement*;
- Co-develop policies that respect and consider the principles and concepts of Inuit Qaujimajatuqangit;
- Co-develop policies that ensure fisheries are managed to support the economic well-being of Inuit and the Nunavut economy in general;

- Consult and collaborate with Makivik Corporation and the Nunavik Marine Region Wildlife Board to co-develop the policies that will apply to the NSA Areas of Equal Use and Occupancy;

- Consult and cooperate with Inuit, other Nunavummiut, and any other Indigenous groups that harvest inside the NSA with respect to proposed policies that will form the basis of regulations to govern fisheries in the NSA;
- Recognizing that the Governor in Council is the regulation-making authority, co-develop the drafting of the new regulations to the fullest extent possible; and,

Work towards the pre-publication of regulations in the Canada Gazette, Part 1, in 2019.

SUBMISSION TO THE NUNAVUT WILDLIFE MANAGEMENT BOARD

FOR

Information: X **Decision:**

Issue: Brief update on DFO Science Arctic Char Program in Nunavut, 2018-19.

Background:
In the past, Fisheries and Oceans Canada (DFO) Science provided an update on the Emerging Fisheries Program and other Science programs currently operating in Nunavut e.g. Narwhal Aerial Survey, Offshore Trawling Survey. The NWMB Board stated that they appreciated these updates in this format. For this meeting we are providing information on our current Stock Assessment Arctic Char Programs.

Current Situation:

General:

All Arctic Char Stock Assessment research is completed in collaboration with local HTOs and fishers. We have been successful at creating research projects that are beneficial to both local communities, local fisheries and DFO, by collaborating on research from the proposal stage. We have annual face-to-face meetings with the HTOs and communities and we keep in regular email and phone contact throughout the year. We strive to have as many local people trained to conduct research as possible, including hiring Environmental Technology Program (ETP) graduates and students. We hope to continue our efforts in more communities as the desire for Arctic Char fishery development grows across the territory.

Cumberland Sound 2018:

DFO Science has provided Science Advice on 9 stocks in Cumberland Sound. We have two stocks currently undergoing baseline/stock assessment data collection. This year we were able to complete full stock assessments data collection on Anaktuajuit and Kanayuktuk. Both of these stocks are in year 3 of 5 for research and will undergo a review process and Science Advice at the completion of the five years of data collection. All samples have been shipped to Winnipeg for storage and processing.

Kivalliq 2018:

We were able to collect some samples from the fishery this summer through Plant Sampling. We did not reach the target number of samples we wished for, but we have started the conversation and collaboration. We had personnel from Resource Management and Science attend the Kivalliq Wildlife Board Annual General Meeting in Rankin Inlet to start the discussion with HTOs about data collection for the purpose of fishery development.

Qikiqtarjuaq 2018:

The objective of this project is to monitor stocks in Qikiqtarjuaq commercial fishing areas by collecting relative abundance and biological data utilizing the skills and knowledge of the local community and fishermen and provide science-based advice for management. The project is aimed to promote commercial fisheries development while ensuring conservation and sustainability of resources. Last year data was collected in December 2017 and January 2018, 584 fish were sampled from three locations to study their relative abundance and biological indicators including size and age structure and sex ratio. Aging is currently underway and data will be analysed when aging is complete. A consultation meeting with the HTO and fishers is planned in November 2018 to finalise 2018-2019 sampling program.

Cambridge Bay 2018:

Commercial harvesting occurred at 5 sites (Ekalluktok, Paliryuak (Surrey), Halokvik (Thirty-Mile) Jayko, and Lauchlan (Byron Bay) rivers) in 2018. This is the first time the Lauchlan River has been harvested since 2008. The Integrated Fisheries Management Plan (IFMP) working group with support from NWMB agreed upon a conservative quota of 5,000 kgs for this fishery. After five years of data collection, an assessment will be completed to assess the impact of the 5,000 kg quota on that fishery.

Fishery Site (Common Name)	Commercial Quota Kg, round weight	Targeted Quota Kg, round weight	2018 Commercial Harvest Kg, round weight	2018 % Landed
Ekalluk (Wellington)	20,000	14,061	13,808	98
Halokvik (30-Mile)	5,000	5,000	4,997	100
Jayko	17,000	10,433	9,644	92
Paliryuak (Surrey)	9,100	9,100	8,792	97
Lauchlan R. (Byron Bay)	9,100	5,000	3,917	78
Grand Total	**60,200**	**48,493**	**41,158**	**85**

Annual post-season IFMP Working Group meeting is being planned for this fall. The EHTO, DFO, Kitikmeot Foods, commercial fishers, elders and other resource users will review the success of the commercial Arctic Char fishery, and discuss any conservation and compliance concerns. Agenda items will specifically include a review of the Lauchlan River Conservation Harvest Plan discussion, logbook compliance, and the importance of catch-per-unit effort in determining the sustainability of Lauchlan River Char, and DFO Science review and plans for the coming year.

The Cambridge Bay commercial fishing plant sampling program (fishery-dependent sampling) was once again successful providing DFO with biological data and samples from 200 Arctic char for each commercially fished waterbody.

DFO successfully conducted fishery-independent sampling of 200 Arctic char at the Lauchlan River in early July to coincide with the commercial harvest of char from this system. Both fishery-dependent and –independent data will be vital for an assessment of the health of this fishery planned for 2023 (requires minimum of 5 years of data collection).

The acoustic tagging work (part of the Ocean tracking Network) is in its sixth year. This year our marine acoustic equipment was recovered and redeployed and 30 Arctic char were also tagged at the Lauchlan River.

We also employed the Vemco Positioning System (VPS) in two lakes near the community of Cambridge Bay. This system involves the use of many receivers that will triangulate precise fish positions during spawning and overwinter for Arctic Char and Lake Trout and will be key in identifying critically important habitats.

A complete summary and review of Science research programs will be presented at the annual post-season IFMP Working Group meeting later this fall.

<u>Pond Inlet 2018</u>:

Currently there is Stock Assessment research happening in Pond Inlet to support the newly developing Arctic Char fishery. We have completed 4 out of 5 years of research on Koluktoo Bay and Satuut. We are working on getting the otoliths aged from both our samples and the fisher's samples, both which are necessary for any analysis and Science advice. We know this is a mixed-stock fishery and to be prepared for the upcoming Science Advice process we are proposing to conduct mixed-stock fishery analysis looking at natal streams. We are proposing to begin this research next summer (2019), but maybe limited by internal resources. We will be working closely with the Mittimatalik HTO and fishers to ensure that is research is collaborative and supportive of fishery development.

Sylvia Grinnell 2018*:*

The Sylvia Grinnell Arctic Char research completed year 4 of 5 in the summer. We collected biological data from 156 fish, conduct a few creel surveys and ran the DIDSON sonar for 9 weeks to capture information on the Arctic Char migration throughout the open ice season. Due to excess rain and thus river swelling in August, we were not able to place the DIDSON sonar in the same location as previous years, this may impact footage analysis. We were able to hire 5 Inuit field assistants through the HTO contract and DFO positions, of which most were Environmental Technology Program (ETP) graduates or current students. We are hoping to complete this research project next summer and attempt to duplicate the DIDSON effort this year.

Consultations:
DFO Central & Arctic Region and Eastern Arctic Area

Prepared by: Z. Martin, Aquatic Science Biologist, DFO Iqaluit; L. N. Harris, Aquatic Science Biologist, DFO Winnipeg; and Dr. M. Janjua, Aquatic Science Biologist, DFO Winnipeg.

Date: October 21, 2018

Environment and Climate Change Canada | Environnement et Changement climatique Canada

Submission to the Nunavut Wildlife Management Board

For

Information: **Decision: X**

Issue: Consultation plan for the proposed downlisting of Common Nighthawk and Olive-sided Flycatcher to Special Concern under the federal *Species at Risk Act* (SARA)

Common Nighthawk

Olive-sided Flycatcher

Canada

- Common Nighthawk and Olive-sided Flycatcher are both small birds that are currently listed unter the federal *Species at Risk Act* (SARA) as Threatened species.
- The range of these species in Nunavut is minimal. They are both present on islands in James Bay during the breeding season.
- Both bird species were reassessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Special Concern (a lower category of risk) in April 2018.
- The rate of decline of these two species has slowed over the past decade.

Request of the NWMB:

That the NWMB considers whether it wishes to be consulted on the proposed downlisting of Common Nighthawk and Olive-sided flycatcher and subsequently make a decision on approving the downlistings under the federal *Species at Risk Act*, or if the NWMB will choose to not perform its decision making function under section 5.2.34(f) of the *Nunavut Land Claims Agreement* with respect to Common Nighthawk and Olive-sided Flycatcher.

That if the NWMB decides to exercise its decision making function on Common Nighthawk and Olive-sided Flycatcher that the NWMB considers whether or not community consultations should occur in Nunavut, and if so which communities ECCC should contact.

Prepared by: Dawn Andrews, Species at Risk Biologist
Canadian Wildlife Service, Yellowknife, NT
Phone: 867-669-4767
Date Drafted: 2018-Nov-1

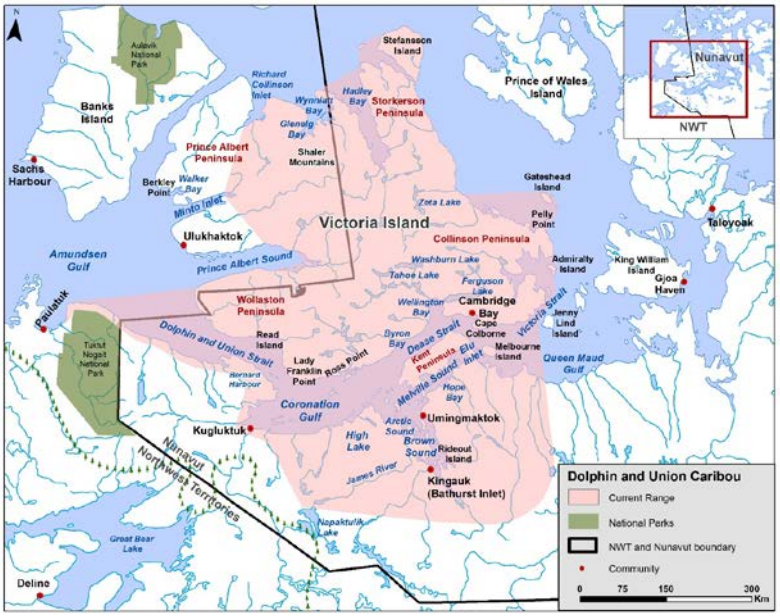
Environment and Climate Change Canada | Environnement et Changement climatique Canada

Submission to the Nunavut Wildlife Management Board

For

Information: **Decision: X**

Issue: Consultation plan for the proposed change in status of Dolphin and Union Caribou from Special Concern to Endangered under the federal *Species at Risk Act* (SARA)



Background:

- Dolphin and Union caribou is currently listed under the federal *Species at Risk Act* (SARA) as a species of Special Concern. A management plan for Dolphin and Union caribou was published in March 2018.
- Dolphin and Union caribou was reassessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered (a higher category of risk) in November 2017.
- In 2015, the herd was estimated at about 18,000 animals. Three survey estimates over the last 18 years and Aboriginal Traditional Knowledge suggest a decline as high as 50-60%, which appears to have accelerated since 2010.
- The population is experiencing multiple threats, including reduced connectivity and disrupted migration between winter and summer range associated with commercial shipping in Dease Strait that is increasingly supported by ice-breakers. Climate change is linked with decreased periods of ice cover and irregularity of sea ice conditions, causing mortality through drowning and delays in migration.

Canada

- For species that are listed as Endangered, a recovery strategy is to be prepared within one year of the species' addition to Schedule 1 and added to the Species at Risk Registry. Recovery strategies are prepared in cooperation with the jurisdictions, wildlife management boards, and Indigenous organizations. The national recovery strategy will identify critical habitat to the extent possible. After critical habitat is identified, CWS will work with partners to find the best method to protect the habitat from activities that would destroy it.

Consultation Plan:

- It is expected that consultations on the proposed change in status will be held between January and October 2019. Organizations such as hunters and trappers organizations (HTOs) and regional wildlife boards will be asked to provide their formal position on the proposed listing (i.e. oppose, support or are indifferent) and with any other comments, concerns or information that they feel should be considered.
- CWS plans to consult with hunter and trapper organizations in the communities of Kugluktuk, Cambridge Bay, Umingmaktok and Bathurst Inlet.
- Consultation packages, in Inuktitut and English, will be sent by mail and email. Packages will include: a letter, a PowerPoint, and a questionnaire. The full COSEWIC Assessment and Status Report will be provided in digital format in English only.
- To support consultations, CWS will extend an offer to provide more information, if requested, in the best means possible. A reminder email and follow-up phone calls, will be made to seek input from as many organizations as possible.
- Following consultations, CWS will summarize the consultation results and present them to the Board at the next quarterly meeting following the consultation period and seek NWMB's decision on the proposed listing of the species.

Request of the NWMB:

- That the NWMB provide Environment and Climate Change Canada with feedback on the proposed consultation process for the proposed change in status of Dolphin and Union Caribou from Special Concern to Endangered under the federal *Species at Risk Act*.

Prepared by: Dawn Andrews, Species at Risk Biologist
Canadian Wildlife Service, Yellowknife, NT
Phone: 867-669-4767
Date Drafted: 2018-Nov-01

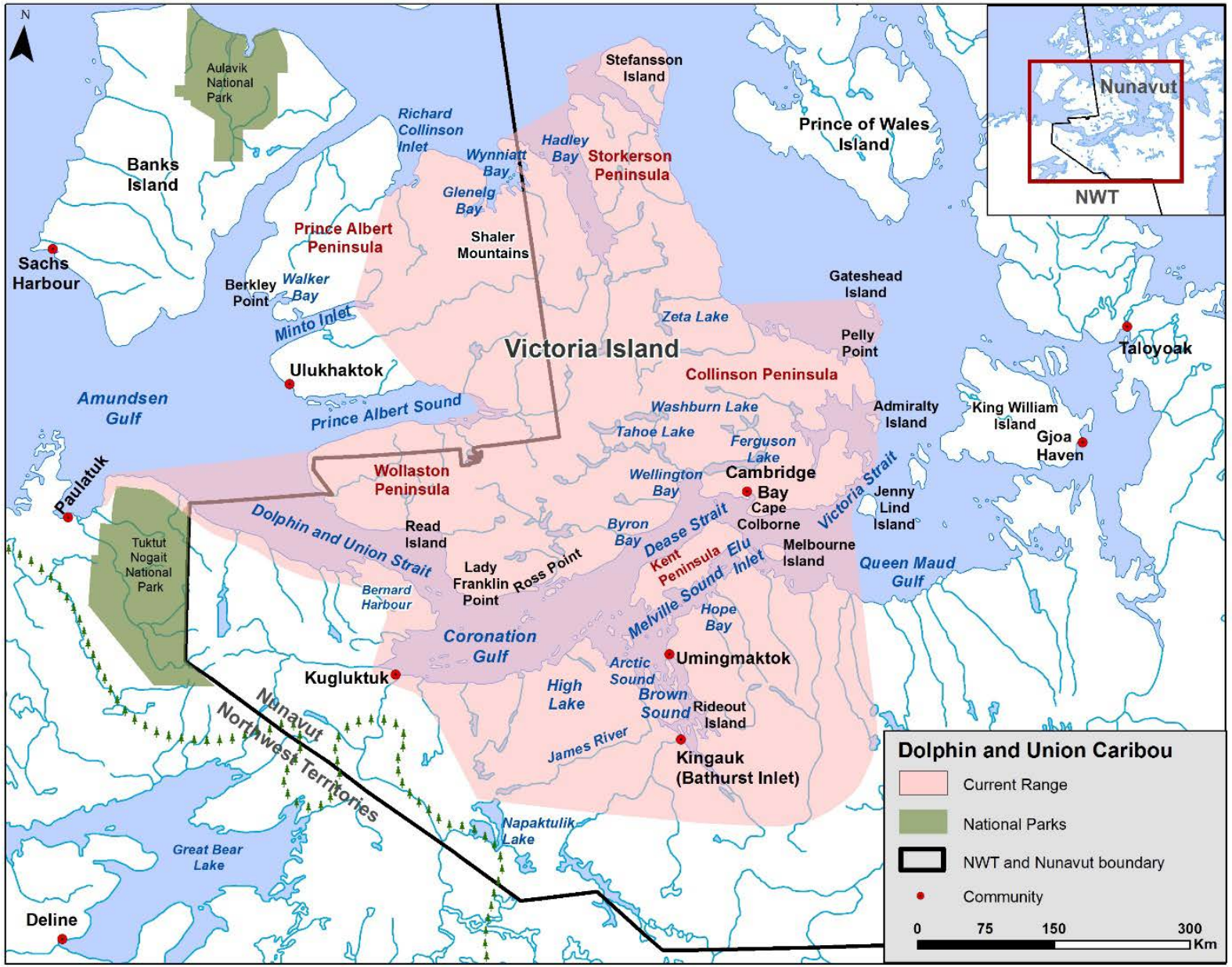


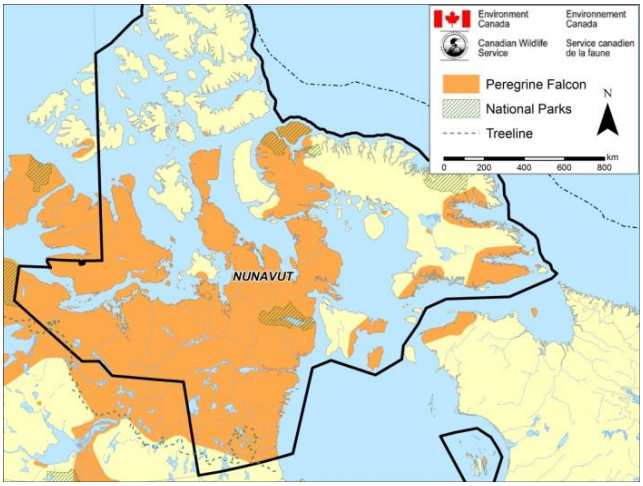
Figure 1 from the COSEWIC Assessment and Status Report 2017. Current range of Dolphin and Union Caribou, including notable place names (NWT Environment and Natural Resources, range data developed for Species at Risk program 2016).

Submission to the Nunavut Wildlife Management Board

For

Information: **Decision: X**

Issue: Consultation plan for the proposed change in status of Peregrine Falcon from Special Concern to Not at Risk under the federal *Species at Risk Act* (SARA)



Background:

- Peregrine Falcon is a medium to large sized falcon that is found in large parts of Nunavut during the breeding season.
- Peregrine Falcon *anatum/tundrius* is currently listed under the federal *Species at Risk Act* (SARA) as a species of Special Concern. A management plan for Peregrine Falcon was published in 2017.
- Peregrine Falcon was reassessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Not at Risk in November 2017.
- The population of this species has rebounded significantly over the past few decades with continued increases in many parts of Canada since the previous status report in 2007.
- Increases in the population of Peregrine Falcon result from reintroductions across much of southern Canada and a ban of organochlorine pesticides like DDT.

Consultation Plan:

- It is expected that consultations on the proposed removal of Peregrine Falcon from the list of Species at Risk in Canada will be held between January and May 2019. Organizations such as hunters and trappers organizations (HTOs) and regional wildlife boards will be asked to provide their formal position on the

proposed listing (i.e. oppose, support or are indifferent) and with any other comments, concerns or information that they feel should be considered.

- CWS plans to consult with hunter and trapper organizations in 25 Nunavut communities: Arctic Bay, Arviat, Baker Lake, Bathurst Inlet, Cambridge Bay, Cape Dorset, Chesterfield Inlet, Coral Harbour, Gjoa Haven, Grise Fiord, Hall Beach, Igloolik, Iqaluit, Kimmirut, Kugaaruk, Kugluktuk, Pangnirtung, Pond Inlet, Rankin Inlet, Repulse Bay, Resolute Bay, Sanikiluaq, Taloyoak, Umingmaktok (Bay Chimo), and Whale Cove.
- Consultation packages, in Inuktitut and English, will be sent by mail and email. Packages will include: a letter, a PowerPoint presentation, and a questionnaire. The full COSEWIC Assessment and Status Report will be provided in digital format in English only.
- To support consultations, CWS will extend an offer to provide more information, if requested, in the best means possible. A reminder email will be made to seek input from as many organizations as possible.
- Following consultations, CWS will summarize the consultation results and present them to the Board at the next quarterly meeting following the consultation period and seek NWMB's decision on the proposed listing of the species.

Request of the NWMB:

- That the NWMB provide Environment and Climate Change Canada with feedback on the proposed consultation process for the proposed change in status of Peregrine Falcon *anatum/tundrius* from Special Concern to Not at Risk under the federal *Species at Risk Act*.

Prepared by: Dawn Andrews, Species at Risk Biologist
Canadian Wildlife Service, Yellowknife, NT
Phone: 867-669-4767
Date Drafted: 2018-Nov-01

Cumberland Sound Fisheries Ltd.
P.O. Box 185
Pangnirtung, NU
X0A 0R0

Mr. Daniel Shewchuk
A/Chairperson
Nunavut Wildlife Management Board
P.O. Box 1379
Iqaluit, NU
X0A 0H0

November 1, 2018

Dear Mr. Shewchuk,

Attached please find our request to increase the **Cumberland Sound Inshore Turbot Quota**.

The full inshore quota (500 MT) was harvested in the 2018 winter fishery plus 10 MT from the summer fishery (2017). Therefore we are requesting that the **Cumberland Sound Inshore Turbot** quota be increased to accommodate the developing summer fishery.

This will benefit the inshore fisherman in Cumberland Sound, specifically Pangnirtung. Indirectly this would benefit the plant workers in Pangnirtung and the inshore fisherman in Pangnirtung and Cumberland sound. As you may be aware, harvesting and processing of turbot has been growing steadily in the last few years.

To support our commitment, CSFL has purchased a 40' inshore fishing vessel, the f/v Pijiuja II with plans to purchase additional vessels to work within this developing fishery. It is anticipated that additional vessels will also be part of this developing fishery.

The FV "Pijiuja II" was commissioned by The Department of Fisheries and Oceans to conduct a scientific assessment of turbot stocks in Cumberland Sound, Nunavut this past summer. Results showed that the stock in Cumberland Sound has grown to a level where an increase is warranted that remains within sustainable quota levels which protects the overall health of the stock in the long term. Hook and line gear fished in various grids in the sound yielded good catch rates mainly in depths between 475 and 600 fathoms. The overall range of small to larger fish was positive given the size of hooks used in the long line gear. By-catch levels were minimal.

To ensure the successful development of the summer fishery and the continued development of the winter fishery, there is a need to increase the TAH in Cumberland Sound. We are proposing that the quota be increased to a least 800 MT from the current level of 500 MT.

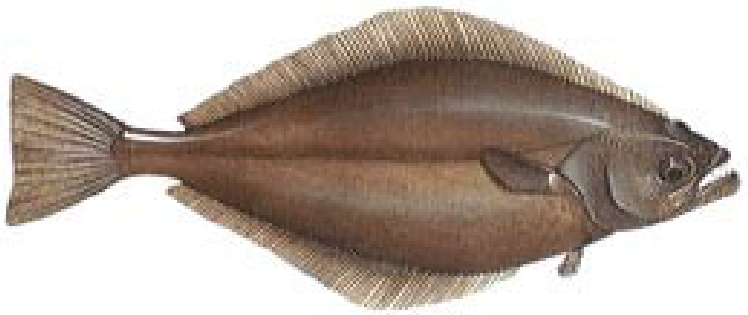
Sincerely,

Joopa Sowdlooapik
Chairman
Cumberland Sound Fisheries Lt

SUBMISSION TO THE NWMB

FOR

An increase to the Cumberland Sound TAH



Submitted By
Cumberland Sound Fisheries Ltd.

NOVEMBER 1, 2018

Cumberland Sound Fisheries Ltd.
P.O. Box 185
Pangnirtung, NU
X0A 0R0

Mr. Daniel Shewchuk
A/Chairperson
Nunavut Wildlife Management Board
P.O. Box 1379
Iqaluit, NU
X0A 0H0

November 1, 2018

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Sincerely,

Joopa Sowdlooapik
Chairman
Cumberland Sound Fisheries Lt

Contents

1. Request

CSFL is requesting that the Turbot TAH in Cumberland Sound be increased from the current level of 500MT to at least 800MT which will be fished during winter ice fishery and the summer fishery using hook and line on the f/v Pijiuja II.

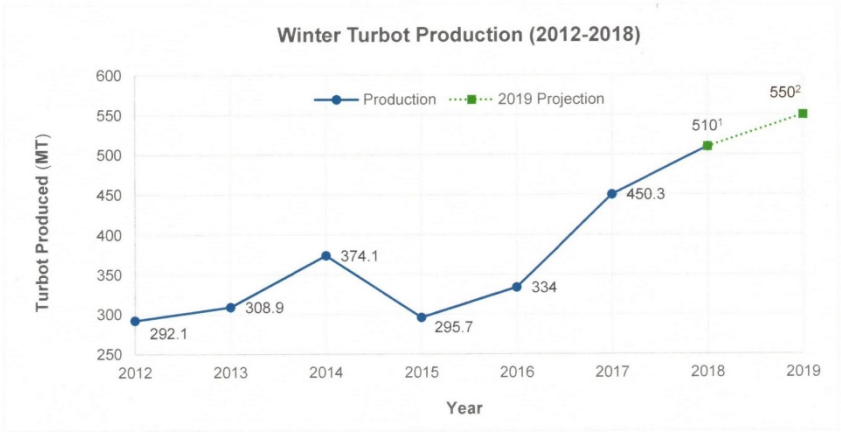
2. Resource

2.1 Winter Fishery

The winter fishery in 2018 has been the most successful to date, with landings of 510MT (from the 500MT Cumberland Sound Allocation). It is estimated (see chart below) that the winter fishery in 2019 will meet the current quota of 500MT for the inshore fishery in Cumberland Sound.

The through the ice fishery is growing as the graph below shows, and a portion of the royalties from offshore allocations are used to support the ongoing operation at PFL. Overall the through-the-ice fishery has been positive for all involved and proven to be an economic boost to the community.

Year	Amount Processed (MT)
2012	292.1
2013	308.9
2014	374.1
2015	295.7
2016	334.0
2017	450.3
2018	510.0



Notes:

1) *Total inshore quota of 500 MT plus 10 MT from the summer fishery in 2018*
2) *Assuming all of the 500 MT are caught, and 50 MT caught in summer fishery*

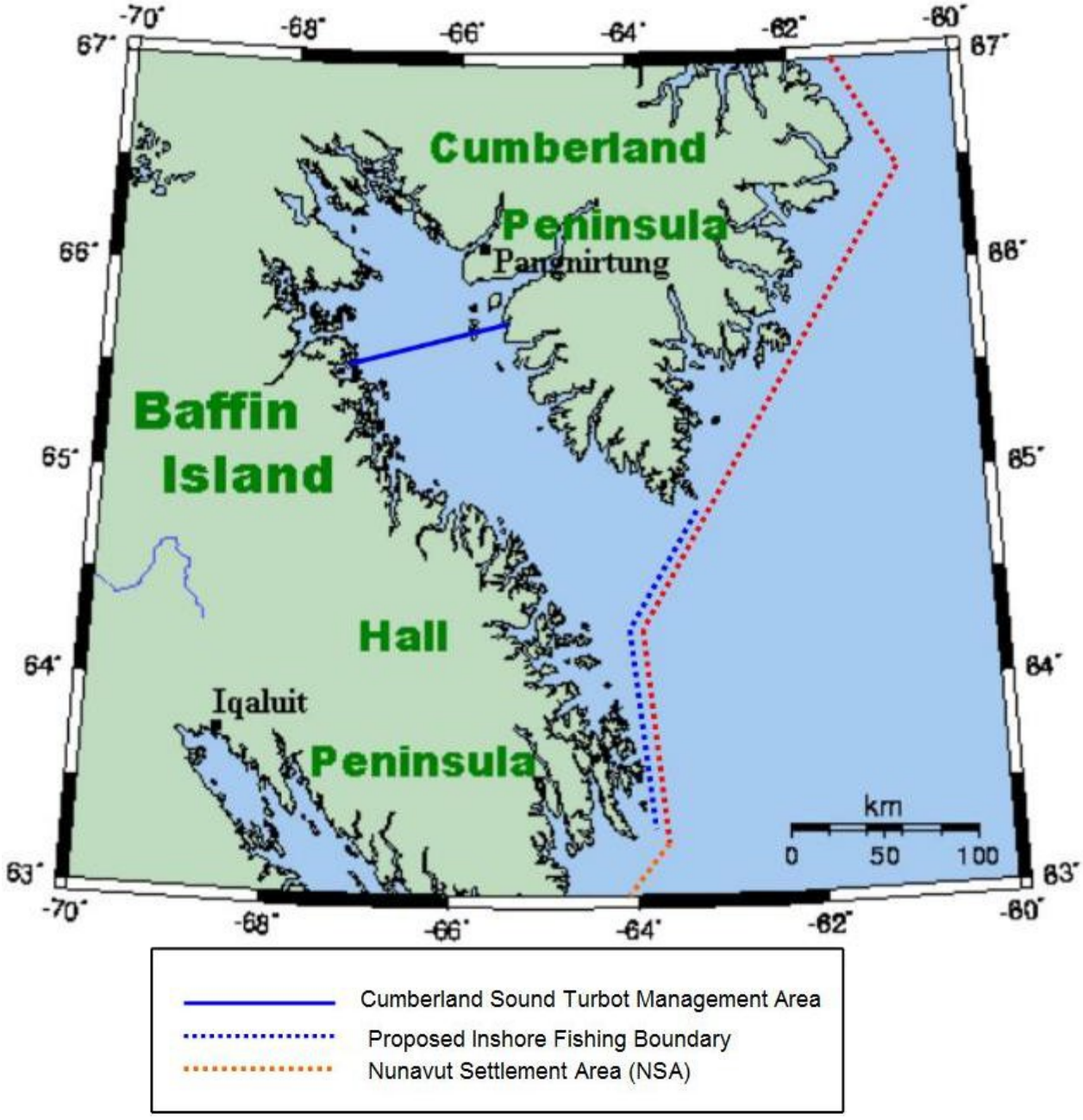
2.2 Cumberland Sound Border

The border for the Cumberland Sound Turbot Management Area (CSTMA) has been moved (see below) as requested by PHTO in May 2013, and approved by The Minister of Fisheries in 2014. The CSTMA now includes all of Cumberland Sound. This move will provide harvesters with more flexibility, and opportunities to pursue other species that may become available.

The move of the CSTMA border is very positive for Pangnirtung's developing fishery, and, the CSTMA border move is in line with NWMB's mission of "conserving wildlife through the application of Inuit Qaujimajatuqangit (IQ) and scientific knowledge", and is in line with the NWMB's vision to make Nunavut 'a world class model for the cooperative management of healthy wildlife populations".

As previously established, harvesting within Cumberland Sound is 'hook and line' only and the use of gill nets is not permitted. The hook and line fishery, whereby the turbot is bled, gutted and bloodline removed immediately after harvest, produces an excellent quality product that can meet or exceed any market requirement. Vessel size is also limited to <85'. These harvesting restrictions contribute to Cumberland Sound being a world- class model of cooperative management, which contributes to a healthy, sustainable resource.

2.3 Map of Cumberland Sound



3. Harvesting

At present, there are 60 active fishers and helpers in the Winter Fishery with a total of 90 licenses issued from DFO. 30+ employees are employed at the plant, Pangnirtung Fisheries Limited with the potential to double the number of employees with increased quota. This quota increase would allow our operation to move from a four months to 10-12 months per year.

To support the Summer Fishery, CSFL's has purchased a vessel, the f/v Pijiuja II (see Appendix #1).

3.1. Harvesting Plan (2019)

- Ice (winter fishery) / Sea (summer fishery) 800 MT
- Cumberland Sound Fisheries has a vessel, f/v Pijiuja II (38'11")
- Gear: Hook and line trawl and long line trawl
- CSFL has a sound waste management plan
- Gear loss reduction
- By-catch reduction

The following is the offshore allocation harvest for 2017/2018.

Species Harvested	Fiscal Year 2017/2018		
	Allocation	Metric tonnes Harvested	% of Allocation Harvested
Greenland Halibut			
NAFO Division 0A	940mt	940mt	100%
NAFO Division 0B	950mt	950mt	100%
CSTMA	500mt	500mt	100%
Northern Shrimp			
SFA 1	744.4mt	744.4mt	100%
SFA 2 (outside NSA)	232.6mt	232.6mt	100%
SFA 2 (inside NSA)	0.0mt	0.0mt	n/a

There were no compliance issues as a result of harvesting efforts regarding The Partnerships allocations in 2017/2018.

4. Research

Results of 2018 Cumberland Sound Turbot Population Research

The FV “Pijiuja II” was commissioned by The Department of Fisheries and Oceans to conduct a scientific assessment of turbot stocks in Cumberland Sound, Nunavut. Discussions with the ship’s captain, John Cabot and Pangnirtung Fisheries board members and management reveal that the stock in Cumberland Sound has grown to a level where an increase is warranted that remains within sustainable quota levels which protects the overall health of the stock in the long term. Hook and line gear fished in various grids in the sound yielded good catch rates mainly in depths between 475 and 600 fathoms. The overall range of small to larger fish was positive given the size of hooks used in the long line gear. By-catch levels were minimal. A few sharks, skate and grenadier were identified in select areas and were able to be released with minimal mortality. Gear selectivity through the use of various size hooks prevented other species from capture. The absence of gill nets further allows avoidance of non-targeted species.

The overall state of the stock from a historical basis has been also very positive given the successful harvesting and processing of 500 Metric tonnes of turbot in Cumberland Sound in recent years. In 2018, fishing was extremely good with record catch per unit efforts and an extensive range of small to large fish. Harvesters caught the quota in record time, less than 3 three months. A summer fishery yielded 10 tonnes of available quota, again experiencing positive catch rates. The overall quality of the fish was excellent given the workmanship on the ice, quick transport time and expedient processing in the Pangnirtung Fisheries plant.

The results of the 2018 survey were positive. The report will not be available until February, findings were very encouraging. While Cumberland Sound Fisheries realizes the research must be analyzed and confirmed, our organization is presenting a preliminary proposal for a quota increase in recognition of the findings this fall.

5. Rationale

Increasing the quota in Cumberland Sound also supports the goal of the Nunavut Land Claims Agreement: to encourage self-reliance. Local harvesters will have more opportunity to fish Turbot, and possibly other species thus benefiting the residents of Pangnirtung.

It should be noted that Cumberland Sound harvesting is already a model for others in that NO gillnets are permitted in the Sound. Only 'hook and line' fishing is permitted.

While enhancing the turbot fishery, the potential to develop new fisheries in Cumberland Sound will also be possible.

Further developing a winter / summer fishery will contribute to the local fish processing operation at Pangnirtung allowing for an extended operating season, considerable increase in local employment and numerous spin off benefits for Pangnirtung and the region.

This request also supports the Goal of Nunavut Land Claims Agreement: To encourage self-reliance.

6. Consultations

6.1 People of Pangnirtung

This request is supported by the Municipality of Pangnirtung and the PHTO as the inshore turbot fishery has been developing over the last few years.

7. Timing 2019

It is anticipated that the turbot inshore fishery will start in January 2019.

8. Investment

- Plant upgrades
- Boats (Fleet improvement)
- Gear
- Quality improvement
- Training in partnership with programs developed through the Government of Nunavut
- Education Opportunities
- Ecologically Sustainable
- Good compliance with DFO and the NWMB

9. Governance Plan Update

The following outlines the current Board members of CSFL and PFL:

A Board of Directors and an Executive Committee (managed CSFL). Currently the Board members are as follows:

- Joopa Sowdluapik - Chairman
- Peter Kilabuk - Vice Chairman
- Sakiasie Sowdlooapik - Secretary Treasurer (Acting Executive Director)
- Paulette Metuq - Director
- Chitee Kilabuk - Director
- Matewsie Manaiapik (HTA Rep) - Director
- Jaco Qaqasiq (Co-op rep) - Director

PFL has a four member Board; one appointed by NDC, one appointed by Niqitac Fisheries Ltd (BFC) and two by CSFL. Currently the Board members are as follows:

- Sakiasie Sowdlooapik - Chairman (Acting Executive Director)
- Jacopee Maniapik - Vice Chairman
- Joopa Sowdlooapik - Director
- Jaco Qaqasiq - Director

A new General Manager of PFL was hired in August 2018, Todd Johnson.

10. Benefits Summary

- Increased number of harvesting jobs (Inuit and Nunavummiut)
- Increased number of processing jobs (Inuit and Nunavummiut)
- Benefit for local business
- Increased economic benefit to the community due to longer periods of employment and increased income for both fishers and plant workers
- More independence and less reliant on social programs
- Profitability
- 100% Inuit owned and managed
- Increase quota does not negatively affect neighboring communities
- Stewardship is positive – responsible fishing using hook and line
- Gear selectivity (hook and line and longline trawl)

- Habitat protection

11. Appendices

Appendix I Inspection and Valuation of Fishing Vessel by RCG Marine Consulting

*Note: Formatting and image quality has been changed from the original document

Inspection and Valuation of Small Fishing Vessel: Pijiuja II

Pangnirtung, Nunavut

August 28, 2016

Vessel History

The fishing vessel Pijiuja II is a traditional maritime small fishing vessel, built in 2013 for the owner at Cheticamp Boatyard, in accordance with the Small Fishing Vessel Regulations as outlined under the Canada Shipping Act 2001 (CSA 2001). The owner's intention was to prosecute the exploratory inshore turbot fishery recently permitted by federal regulation in the Cumberland Sound area. The vessel was completed and delivered to the owner in the late summer of 2013. However, as a result of low fish prices and heavy ice coverage in the area, the Pijiuja II did not enter the fishery and has spent the last two seasons laid up, in cradle at Pangnirtung, Nunavut. The vessel has received very little commercial sea going time and as a result has been put for sale by the owner. The vessel is approximately 39' in length and is registered as less than 15 gross tons (GRT) with a traditional "Cape Island" hull design commonly employed in the inshore fishing industry on Canada's East Coast. Although, properly winterized and well attended, the vessel has been subjected to several harsh northern winters, therefore a thorough examination, including the powering of all equipment was undertaken. The results of this inspection process are categorized in this report.

Vessel Particulars

Name Of Vessel	Pijiuja II
Date Of Survey	August 22, 2016
Vessel Type	Small Fishing Vessel
Engine Type and Horse Power	Cummins Diesel- 300hp - 2013

Photo 1 & 2 (Vessel Profiles)

Photo 3: PFL Fishing Vessel – Pijiuja II

SUBMISSION TO THE NUNAVUT WILDLIFE MANAGEMENT BOARD

FOR

Information: **Decision: X**

Issue: Walrus Sport Hunt Application for 2019

Overview: On August 23rd 2018, the Nunavut Wildlife Management Board (NWMB or Board) issued a call for walrus sport hunt applications inviting all Hunters and Trappers Organizations and other interested individuals or organizations to submit applications to the NWMB for approval of walrus sport hunts. The deadline for submission of applications was November 2nd 2018.

Hunt Plans require the NWMB's approval before licences are issued, as per Nunavut Agreement Sections 5.2.34(d)(i) and 5.6.48. In May 1999, the Board approved an interim policy for evaluating requests for sport hunts (Appendix 1). The Board further requested that those conducting hunts report their struck, lost, and landed animals at the time of application the following year.

Hunt applications were received for the Hudson Bay-Davis Strait (AW-05), Foxe Basin (AW-04), West Jones Sound (AW-02) and Baffin Bay (AW-01) walrus stocks. The following table summarizes the walrus sport hunts requested for the 2019 season:

Applicant	Walrus Stock	Hunts Requested
Aaron Emiktowt	Hudson Bay-Davis Strait (AW-05)	4
Danny Pee	Hudson Bay-Davis Strait (AW-05)	5
Darcy Nakoolak	Hudson Bay-Davis Strait (AW-05)	8
Dino Bruce	Hudson Bay-Davis Strait (AW-05)	10
Luke Eetuk	Hudson Bay-Davis Strait (AW-05)	8
Hall Beach HTA	Foxe Basin (AW-04)	15
Igloolik HTO	Foxe Basin (AW-04)	15
Iviq HTO	Baffin Bay and West Jones Sound (AW-01 and AW-02)	8

Foxe Basin (AW-04)

The communities of Hall Beach and Igloolik both harvest from the Foxe Basin walrus stock. Fisheries and Oceans Canada estimates a stock abundance of 12,500 walrus for the Foxe

Basin walrus stock with a Potential Biological Removal[1] between 211 and 422 walrus based on the most recent analysis of aerial survey data. The average reported harvests for Hall Beach based on available data over the past five years for both sport and subsistence hunting indicated that average reported harvests in this area are 7 and 79 walrus per year, respectively, resulting in an estimated average annual removal of 112 if a struck and lost rate of 30% is applied. Based on available data, the average reported harvests for Igloolik over the past five years for sport and subsistence are 0 and 69 walrus per year, respectively, resulting in an estimated average annual removal of 90 if a struck and lost rate of 30% is applied. Fisheries and Oceans Canada's analysis has indicated that the reported harvests do not appear to be having an impact on the population as it appears to have remained stable over the last 60 years.

Hudson Bay-Davis Strait (AW-05)

The community of Coral Harbour harvests from the Hudson Bay-Davis Strait walrus stock. There is currently no scientific estimate of the size of the Hudson Bay-Davis Strait walrus stock; however, Coral Harbour has a community quota of 60 walrus. The average reported harvests near Coral Harbour, based on available data over the past five years, for sport and subsistence hunting indicated that average reported harvests in this area are 8 and 22 walrus per year, respectively, resulting in an estimated average annual removal of 39 if a struck and lost rate of 30% is applied. The Aiviit (Coral Harbour) Hunters and Trappers Organization has provided letters of support for the walrus sport hunts requested by Aaron Emiktowt, Danny Pee, Darcy Nakoolak, Dino Bruce, and Lucassie Eetuk.

Baffin Bay and West Jones Sound (AW-01 and AW-02)

The community of Grise Fiord harvests from both the Baffin Bay and West Jones Sound walrus stocks. The most recent analysis of aerial survey data by Fisheries and Oceans Canada estimates a stock abundance of between 1249 and 1251 walrus for the Baffin Bay stock and between 470-503 walrus for the West Jones Sound stock. The Potential Biological Removal is estimated between 10-11 walrus per year for the Baffin Bay stock and between 8-17 walrus per year for the West Jones Sound Stock. The average reported harvests near Grise Fiord based on available data over the past five years for sport and subsistence hunting indicated that average reported harvests in this area are 0 and 4 walrus per year, respectively, resulting in an estimated average annual removal of 5 walrus per year if a struck and lost rate of 30% is applied.

All seven applications are summarized in Appendix 2.

Prepared By: Jordan Hoffman, Wildlife Management Biologist
Reviewed By: Amber Giles, Wildlife Management Biologist
Date: November 9, 2018

[1] Potential Biological Removal includes removals from the stock from all sources of human induced mortality, including struck and lost animals. Depending on the health and status of a stock managers may choose to use a recovery factor of ranging between 0 and 1.0 to calculate Potential Biological Removal, which results in a range of recommended removals.

Appendix 1 - Walrus Sport Hunt Interim Policy

In deciding the number of sport hunts to approve for a particular community, it is recommended that the NWMB's policy be to ensure, to the extent reasonably possible, that sport hunting in the community develops in such a manner that the following 4 conditions are met:

(i) no conservation concern arises;

(ii) hunter and public safety are maintained;

(iii) humane harvesting takes place and the whole animal is used; and

(iv) the developing industry is healthy and will continue to deliver a quality product, thus serving and promoting the long-term economic, social and cultural interests of Inuit harvesters (See *Nunavut Agreement* Sub-section 5.1.3(b)(iii))

Accordingly, until the Walrus Working Group offers a more detailed analysis and recommendations, it is recommended that the NWMB apply the following 3 criteria in deciding upon the number of sport hunts for a community:

1. In a community that is not subject to a quota (beyond the individual limit of 4), attempt to ensure that the combination of community and sport hunts does not exceed the average total harvest for the previous 5 years (condition i);

2. Ensure that a hunt plan is in place that meets the safety, humane, and other requirements necessary under the *Nunavut Agreement,* the *Fisheries Act* and the Regulations (conditions ii and iii); and

3. Ensure that the community or enterprise starts with a relatively small and closely monitored number of hunts (the "pilot" stage), prior to permitting an expanded sport hunting effort (condition iv).

In addition, the NWMB may wish to consider what percentage of the overall quota or average harvest for the last 5 years should be allocated to sport hunts

Appendix 2 – Summary of Applications

1. Aaron Emiktowt, Siku Tours, Coral Harbour

Number of hunts requested: 4

Does Hunt Plan Address Conservation Concerns: Residents of Coral Harbour harvest walrus from the Hudson Bay-Davis Strait stock (AW-05). Scientific data on this stock are lacking. The Aiviit (Coral Harbour) Hunters and Trappers Organization has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Coral Harbour has a community harvest limit of 60 walrus. An average of 8 animals have been harvested in sport hunts and 22 animals in subsistence hunts, with a total average of 30 animals harvested annually over the last five years[2]. Given the request for 35 sport hunts total for 2019 and an average of 22 animals in subsistence hunts this falls below the community harvest limit of 60 walrus.

Does Hunt Plan Address Safety Concerns: Aaron Emiktowt, Eric Emiktowt, and Malitu Akesuk have all obtained guide training. The hunts will be conducted around Salliq Island, Walrus Island, and Coats Island between July and September 2019. Aaron Emiktowt (Siku Tours) holds the outfitter's license and insurance. Each boat will be equipped with harpoons, lances, buoys, rope, harpoon lines, and safety equipment including CB radios, sport devices, and satellite phones.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be shot then harpooned. The hunter will only have one chance to strike and land a walrus. The hunter can take the skin, cape, tusks, and baculum. The rest of the animal will be distributed to the community.

Letter of Support from the Hunters and Trappers Organization: Yes

Number of Hunts Awarded Last Year: 6

Number of Hunts Conducted Last Year: 5

Number of Landed Animals Last Year: 4

Number of Struck and Lost Animals Last Year: 0

[2] Based on five years of data from 2013/14 to 2017/18 for both sport and subsistence harvests.

2. Danny Pee, Polar Bear Adventures, Coral Harbour

Number of hunts requested: 5

Does Hunt Plan Address Conservation Concerns: Residents of Coral Harbour harvest walrus from the Hudson Bay-Davis Strait stock (AW-05). Scientific data on this stock are lacking. The Aiviit (Coral Harbour) Hunters and Trappers Organization has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Coral Harbour has a community harvest limit of 60 walrus. An average of 8 animals have been harvested in sport hunts and 22 animals in subsistence hunts, with a total average of 30 animals harvested annually over the last five years[3]. Given the request for 35 sport hunts total for 2019 and an average of 22 animals in subsistence hunts this falls below the community harvest limit of 60 walrus.

Does Hunt Plan Address Safety Concerns: Danny Pee is an outfitter and will guide with helpers who are all hunters. The hunt will be conducted around Walrus Island between July and August, 2019. Danny Pee (Polar Bear Adventures) will hold the outfitter's licence and insurance. Each boat will be equipped with guns, harpoons, unaq, avataqs, hooks, survival suits, flare guns, satellite phones, spot devices and first aid supplies.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be shot on land only, and Danny will be on the land when the walrus is shot. The hunter can take the skull and tusks. The rest of the animal will be distributed to the community.

Letter of Support from the Hunters and Trappers Organization: Yes

Number of Hunts Awarded Last Year: 5

Number of Hunts Conducted Last Year: 1

Number of Landed Animals Last Year: 1

Number of Struck and Lost Animals Last Year: 0

[3] Based on five years of data from 2013/14 to 2017/18 for both sport and subsistence harvests.

3. Darcy Nakoolak, Southampton Island Adventures, Coral Harbour

Number of hunts requested: 8

Does Hunt Plan Address Conservation Concerns: Residents of Coral Harbour harvest walrus from the Hudson Bay-Davis Strait stock (AW-05). Scientific data on this stock are lacking. The Aiviit (Coral Harbour) Hunters and Trappers Organization has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Coral Harbour has a community harvest limit of 60 walrus. An average of 8 animals have been harvested in sport hunts and 22 animals in subsistence hunts, with a total average of 30 animals harvested annually over the last five years[4]. Given the request for 35 sport hunts total for 2019 and an average of 22 animals in subsistence hunts this falls below the community harvest limit of 60 walrus.

Does Hunt Plan Address Safety Concerns: Darcy Nakoolak, Spencer Saviakjuk, Ricky Nakoolak, and Moses Nakoolak have all obtained level 1-2 guide training. The hunts will be conducted around Walrus Island and Coats Island between July and early September 2019. Darcy Nakoolak (Southampton Island Adventures) holds the outfitter's license and insurance. Each boat will be equipped with harpoons, anguvigaq, niksik, sakku, igimak, guns, survival suits, and satellite phones. Hunts will only be conducted in fair weather.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be harpooned then shot if the walrus is in the water. The hunter will only have one chance to strike and land a walrus. The hunter can take the skin, skull, and baculum. The rest of the animal will be distributed to the community.

Letter of Support from the Hunters and Trappers Organization: Yes

Number of Hunts Awarded Last Year: 4

Number of Hunts Conducted Last Year: 3

Number of Landed Animals Last Year: 2

Number of Struck and Lost Animals Last Year: 0

[4] Based on five years of data from 2013/14 to 2017/18 for both sport and subsistence harvests.

4. Dino Bruce, Sudliq Developments Limited, Coral Harbour

Number of hunts requested: 10

Does Hunt Plan Address Conservation Concerns: Residents of Coral Harbour harvest walrus from the Hudson Bay-Davis Strait stock (AW-05). Scientific data on this stock are lacking. The Aiviit (Coral Harbour) Hunters and Trappers Organization has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Coral Harbour has a community harvest limit of 60 walrus. An average of 8 animals have been harvested in sport hunts and 22 animals in subsistence hunts, with a total average of 30 animals harvested annually over the last five years[5]. Given the request for 35 sport hunts total for 2019 and an average of 22 animals in subsistence hunts this falls below the community harvest limit of 60 walrus.

Does Hunt Plan Address Safety Concerns: Dino Bruce will have Inuit guides with big game guiding licences and small boat operator certifications. The hunts will be conducted around Southampton Island and near Coral Harbour between August 1st and September 15th. Dino Bruce (Sudliq Developments Limited) holds the outfitter's licence and has obtained insurance with Hub International Insurance Company. Each boat will be equipped with harpoons, avataq, rope, satellite phones, spot devices, CSA approved personal flotation devices, CB radios, flares, flashlights, extra rope, extra anchors, and secondary outboard motors.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be shot first then harpooned if it is on the land and harpooned first then shot if it is in the water. The hunter will only have one tag used per strike. The hunter can take the entire skin, skull, and tusks. The rest of the animal will be distributed to the community.

Letter of Support from the Hunters and Trappers Organization: Yes.

Number of Hunts Awarded Last Year: Did not apply.

Number of Hunts Conducted Last Year: 0

Number of Landed Animals Last Year: 0

Number of Struck and Lost Animals Last Year: 0

[5] Based on five years of data from 2013/14 to 2017/18 for both sport and subsistence harvests.

5. Lucassie (Luke) Eetuk, E&E Outfitting, Coral Harbour

Number of hunts requested: 8

Does Hunt Plan Address Conservation Concerns: Residents of Coral Harbour harvest walrus from the Hudson Bay-Davis Strait stock (AW-05). Scientific data on this stock are lacking. The Aiviit (Coral Harbour) Hunters and Trappers Organization has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Coral Harbour has a community harvest limit of 60 walrus. An average of 8 animals have been harvested in sport hunts and 22 animals in subsistence hunts, with a total average of 30 animals harvested annually over the last five years[6]. Given the request for 35 sport hunts total for 2019 and an average of 22 animals in subsistence hunts this falls below the community harvest limit of 60 walrus.

Does Hunt Plan Address Safety Concerns: Luke Eetuk, Ross Eetuk, and Mark Pootoolik all possess level two guide training and will guide the hunts. The hunts will be conducted around Southampton Island, Walrus Island, an Coats Island between mid-July to mid-September 2019. E & E outfitting will hold the outfitter's licence and insurance. Each boat will be equipped with rifles, harpoons, buoys, ropes, Coleman stoves, tents, survival suits, CB radios, satellite phones, flares, and anchors.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be shot then harpooned if it is in the water. The hunter will only have one chance to strike and land a walrus. The hunter can take the entire skin, cape, skull, and tusks. The rest of the animal will be distributed to the community.

Letter of Support from the Hunters and Trappers Organization: Yes.

Number of Hunts Awarded Last Year: 6

Number of Hunts Conducted Last Year: 0

Number of Landed Animals Last Year: 0

Number of Struck and Lost Animals Last Year: 0

[6] Based on five years of data from 2013/14 to 2017/18 for both sport and subsistence harvests.

6. Hall Beach Hunters and Trappers Association, Hall Beach

Number of hunts requested: 15

Does Hunt Plan Address Conservation Concerns: Residents of Hall Beach harvest walrus from the Foxe Basin stock (AW-04). The Hall Beach Hunters and Trappers Association has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Hall Beach does not have a community harvest limit. An average of 7 animals[7] have been harvested in sport hunts and 79 animals[8] in subsistence hunts, with a total average of 86 animals harvested annually over the last five years. The most recent analysis by Fisheries and Oceans indicates that a Potential Biological Removal between 211 and 422 walruses is sustainable for Foxe Basin, with an estimated average removal of 202 if a struck and lost rate of 30% is applied.

Does Hunt Plan Address Safety Concerns: Experienced hunters and qualified guides including Amittuq Services, Andy Quanaq, and Inoki Irqittuq will guide hunts. The hunts will be conducted in Foxe Basin between July and September 2019. Amittuq Services, Andy Quanaq, and Inoki Irqittuq are qualified guides who have necessary business licences and insurance. Each boat will be accompanied by a safety boat and all boats will be equipped with survival suits, first aid, fire extinguishers, satellite phones, CB radios, safety guns, rifles, harpoons, buoys, tools, GPS, spot devices, standard safety equipment, and bailers.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be shot first then harpooned if it is in water. Walrus will be shot for an instant kill if it is on the ice. The hunter will have two chances to land a walrus. The hunter may take the skull, tusks, and cape. The rest of the animal will be consumed by guides, distributed to the community, or used for a community feast.

Letter of Support from the Hunters and Trappers Organization: Not applicable.

Number of Hunts Awarded Last Year: 15

Number of Hunts Conducted Last Year: 9

Number of Landed Animals Last Year: 9

Number of Struck and Lost Animals Last Year: 1

[7] Based on 5 years of reported data from 2013/14 to 2017/18.
[8] Based on 3 years of reported data from 2014/15 to 2016/17.

7. Igloolik Hunters and Trappers Organization, Igloolik

Number of hunts requested: 15

Does Hunt Plan Address Conservation Concerns: Residents of Igloolik harvest walrus from the Foxe Basin stock (AW-04). The Igloolik Hunters and Trappers Organization has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Igloolik does not have a community harvest limit. An average of 0 animals[9] have been harvested in sport hunts and 69 animals[10] in subsistence hunts, with a total average of 86 animals harvested annually over the last five years. The most recent analysis by Fisheries and Oceans indicates that a Potential Biological Removal between 211 and 422 walruses is sustainable for Foxe Basin, with an estimated average removal of 202 if a struck and lost rate of 30% is applied.

Does Hunt Plan Address Safety Concerns: Levy Uttak and experienced hunters from the community will guide hunts. The hunts will be conducted near Igloolik Point in July and August 2019. Levy Uttak is a qualified outfitter and will hold insurance. Each boat will have survival suits, harpoons, rope, buoys, avataq, extra rifles, CB radios, spot devices, GPS, and first aid kits. The Igloolik Hunters and Trapper Organization has specified that proper gun safety will be practiced.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be harpooned first then shot if it is in water. Walrus will be shot for an instant kill if it is on the ice. The hunter may take the tusks. The rest of the animal will be distributed to the community.

Letter of Support from the Hunters and Trappers Organization: Not applicable.

Number of Hunts Awarded Last Year: Did not apply.

Number of Hunts Conducted Last Year: 0

Number of Landed Animals Last Year: 0

Number of Struck and Lost Animals Last Year: 0

[9] Based on 5 years of reported data from 2013/14 to 2017/18.
[10] Based on 2 years of reported data from 2014/15 to 2016/17.

8. Iviq Hunters and Trappers Organization (Qutsitumiut Outfitting), Grise Fiord

Number of hunts requested: 8

Does Hunt Plan Address Conservation Concerns: Residents of Grise Fiord harvest walrus from the Baffin Bay (AW-01) and West Jones Sound (AW-02) stocks. The Iviq (Grise Fiord) Hunters and Trappers Organization has not identified any conservation concerns.

Consideration of Community's Harvest Levels: Grise Fiord does not have a community harvest limit. An average of 0 animals[11] have been harvested in sport hunts and 4 animals[12] in subsistence hunts, with a total average of 4 animals harvested annually over the last five years. The most recent analysis by Fisheries and Oceans indicates that a Potential Biological Removal between 10 and 11 walruses is sustainable for Baffin Bay and between 8 and 17 for West Jones Sound, with an estimated average removal of 5 for the community if a struck and lost rate of 30% is applied.

Does Hunt Plan Address Safety Concerns: Local experienced hunters from the community will guide. The hunts will be conducted in the Jones Sound area between July 1st and September 30th 2019. All hunters will be over 16 years old, will have their own boat or snowmobile, and will be insurable. Hunters who will hold the outfitter's licence and insurance is still to be determined. Each boat will be accompanied by a safety boat and will have hunting equipment, GPS, radio, life jackets, and an extra motor.

Does Hunt Plan Address Humane Harvesting and Wastage Concerns: Walrus will be shot as necessary to kill the animal. The hunter may take the tusks, baculum, and meat. The rest of the animal will usually be shared within the community.

Letter of Support from the Hunters and Trappers Organization: Not applicable.

Number of Hunts Awarded Last Year: Did not apply.

Number of Hunts Conducted Last Year: 0

Number of Landed Animals Last Year: 0

Number of Struck and Lost Animals Last Year: 0

[11] Based on 5 years of reported data from 2013/14 to 2017/18.
[12] Based on 4 years of reported data from 2013/14 to 2016/17.