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Department of Environment
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Ministère de l'Environnement

DOLPHIN AND UNION CARIBOU

2021 Collaring, Kugluktuk – April 14-26

Field Report

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Kugluktuk, NU

Executive Summary

Steady declines to the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) calls for increased monitoring, and additional research on threats and their impact on long-term conservation and recovery of this population. As this caribou herd is central to Inuit subsistence and culture in several communities in Nunavut (Kugluktuk, Cambridge Bay, Bay Chimo and Bathurst Inlet) and the Northwest Territories (Ulukhaktok and Paulatuk), a better understanding of this population is key to informing collaborative decision-making processes and adaptive management of this herd.

To effectively manage the herd, critical information is required regarding habitat selection, calving, and movement patterns, to better assess potential threats. Real-time location data is required to inform abundance and composition surveys. Also, individual health, stress levels, pregnancy rates, and parasite loads need to be monitored to ensure a complete understanding of factors impacting the herd. To accomplish this, Between April 14th to April 26th, 2021, Dolphin and Union caribou cows were collared along their spring migration in the Kitikmeot region of Nunavut, CA, with Telonics, TGW-4577-4 collars. A total of 36 collars were deployed during the project. During the collaring, samples were taken including blood, feces, and hair samples. Samples from the collaring program will be analyzed for parasites, stress, trace minerals, disease, and pregnancy. Additionally, photos of the body, teeth, antler, and eyes of the animals were taken to compare phenotypic differences, to obtain an approximate age and to ascertain the health of the individual.

Following collar deployment, each cow was monitored remotely for 72 hours to identify any potential issues or adverse effects. No issues were detected during the post-collaring monitoring period. Unfortunately, during collaring, three cows were injured and needed to be euthanized. A fourth cow had a heart attack. Resuscitation was attempted but was unsuccessful. For all four cows, the affected HTO was notified immediately, and the meat was brought to the nearest community (Kugluktuk, NU) and tags were removed from the community's Total Allowable Harvest (TAH) allotment. One cow was harvested by a harvester following the collaring and another cow died due to natural causes.

Data received from these collars is anticipated to continue for three years. Pre-programming of data transmission coincides with a three-years battery lifespan, with the collar release mechanism activating in April 2024 to drop the collar without recapture. Collar data distribution will be used to study change in distribution, habitat selection, and seasonal ranges.

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1.0 Purpose and Objectives

1.1 Rationale

Throughout the coastal survey history of the Dolphin and Union caribou population, the overall trend has indicated a statistically significant and steady decline. The cause of which is largely unknown.

Dolphin and Union caribou herd abundance has declined from 34,558 (95% CI = 27,757 to 41,359; CV = 12%) in 1997 to 4,105 (95% CI = 2,931 to 5,750; CV = 17%) by 2018. These results indicate a considerable drop in population over a relatively short period of time. The results from the most recent 2020 survey (3,815 caribou (95% CI = 2,930–4,966, CV= 13%)) confirmed that a significant decline had indeed taken place but indicated that no significant decline has taken place since 2018 (Campbell et al. 2020, Figure 1).

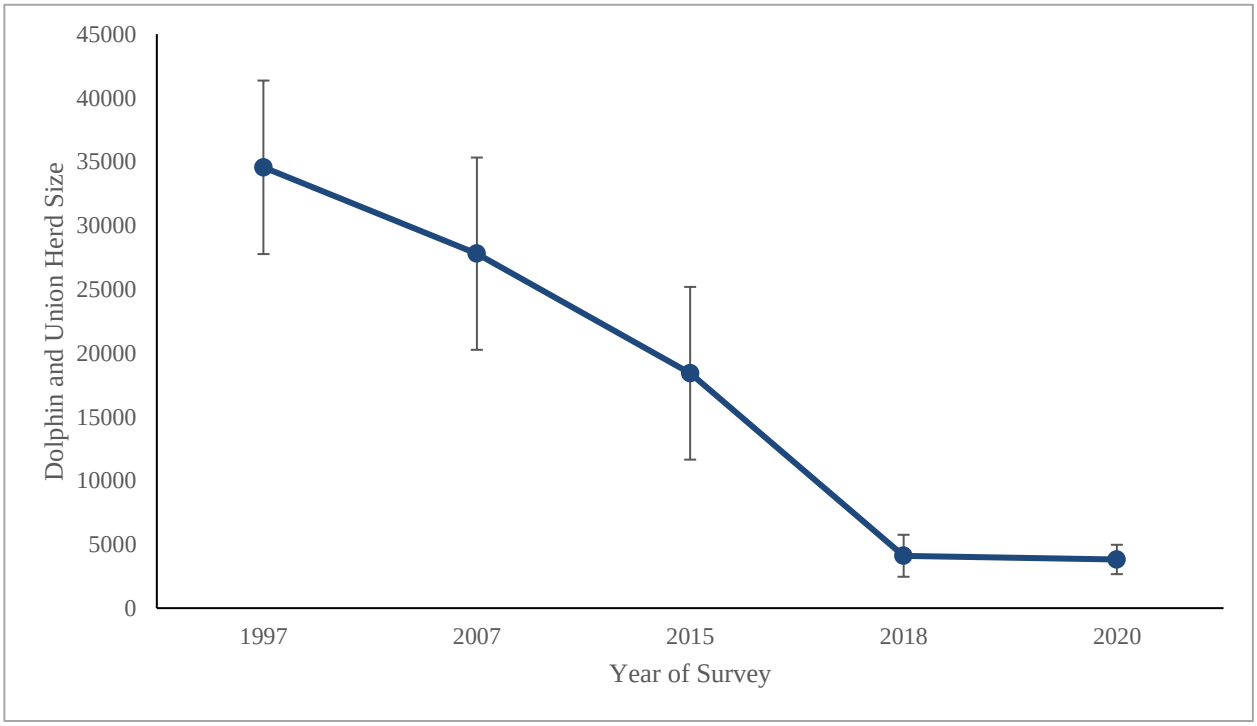

Figure 1- Population estimates and estimated trend for the Dolphin and Union caribou herd. Error bars represent 95% Confidence Intervals.

Collecting information on movements and population trends addresses concerns expressed by communities in both Nunavut and the Northwest Territories. This work will identify any changes in location and timing of migration, in distribution range, and in habitat selection. Furthermore, with increasing anthropogenic disturbance, it is essential to monitor how these factors will impact the herd to mitigate any possible impact.

By directly tracking caribou, we can provide information for real-time management to take place. Furthermore, having collared individuals will reduce overall cost and ensure the reliability and efficiency of abundance survey efforts. Having proportional representation of collared individuals will serve as a guide for where to focus future surveying efforts and will confirm that areas surveyed include the majority of the population. As we continue to monitor the population trend of this herd, having reliable survey information is essential.

Collaring of Dolphin and Union caribou allows for the improved understanding of the areas and time windows that caribou should be protected year-round. Additionally, this knowledge will support decisions made on climate change adaptation and habitat preservation.

1.2 Objectives

The objectives of this project were to:

1. Study the movement patterns of Dolphin and Union caribou over a multi-year program and in a changing climate,
2. Support the deriving of population estimates and trends for the herd,
3. Identify priority and sensitive habitat, and
4. Investigate non-migratory Dolphin and Union caribou that remain on Victoria Island year-round

1.3 Application of the Anticipated Results

The results of this study will be directly applicable to the Nunavut communities of Kugluktuk, Cambridge Bay, Bathurst Inlet, and Bay Chimo, and to the Northwest Territory communities of Ulukhaktok and Paulatuk. This study will provide insight into any changes in movement patterns, in migratory behaviors and migratory routes, and distribution range exhibited by Dolphin and Union caribou. These knowledge gaps have been identified for Dolphin and Union in the management plan and will be addressed by this research.

With the recent implementation of a Total Allowable Harvest (TAH) on Dolphin and Union caribou, it is important to have a thorough understanding of changes in the behavior in the herd, as well as possible threats. Following the 2018 Dolphin and Union survey, a TAH of 42 caribou was set in September 2020. The TAH was increased to 105 based on concerns raised by community members at the October 2020 Dolphin and Union caribou consultation. During this consultation, Hunter and Trapper Organizations (HTOs) brought up concerns that only a subset of the herd has been monitored, and that attention must be paid to non-migratory individuals to ensure information is being garnered for the herd as a whole. Collaring individuals across the species' range ensures that the entire population is being monitored. And by monitoring both migratory and non-migratory individuals it is possible to ascertain behavioral differences between the two, identify habitat use for both groups, and detect possible threats and their potential effect on the population.

To make decisions addressing any conservation concerns, detailed information on population abundance, range, behavior, and threats of Dolphin and Union caribou are required. By collaring

individuals, we'll be able to garner key information on the entire herd, providing insight on how best to manage Dolphin and Union caribou. This project will aid in future abundance surveys and provide vital information on the population.

2.0 Project Personnel

Project Lead:
Amélie Roberto-Charron, GN, Department of Environment, Kitikmeot Regional Biologist

Capture Crew:
Glen Sibbeston, Helicopter Pilot
Gord Carl, Net Gunner

HTO Representatives and Handlers:
Albert Anavilok, Kugluktuk Angoniatit Association
Regan Adjun, Kugluktuk Angoniatit Association

3.0 Materials and Methods

3.1 Study Area, spring 2021

To identify the study areas for the 2021 collaring program, a figure with deployment options was distributed to all the affected HTOs (Hunter and Trapper Organizations) or HTCs (Hunter and Trapper Committees), including Kugluktuk, Cambridge Bay, Bay Chimo, Bathurst Inlet, Paulatuk and Ulukhaktok HTOs and HTCs.

The organizations were asked to provide input on what key areas they were interested in seeing collars deployed and encouraged to provide alternative options. Areas selected by the most organizations were deemed the highest priority for deployment locations, and the remaining areas were ranked accordingly. The proposed areas were derived by reviewing past collaring locations and past collaring data; however, the organizations were encouraged to suggest any additional locations, which were added as potential deployment areas. Five areas on the mainland were identified (ML-1 to ML-5) and four areas on Victoria Island were identified (VI-1 to VI-4) as possible deployment options (Figure 2). Although previous collaring has not taken place on Victoria Island, one of the objectives of this project, in response to community concerns, was to collar on the island as well as on the mainland.

Input was received and incorporated from Kugluktuk, Cambridge Bay, Bay Chimo, Bathurst Inlet, and Ulukhaktok HTOs or HTCs. No response was received from Paulatuk. Three additional areas were added based on suggestions from Bathurst Inlet and from Ulukhaktok, adding two deployment areas in NWT (NWT-1 and NWT-2) and a sixth on the mainland (ML-6).

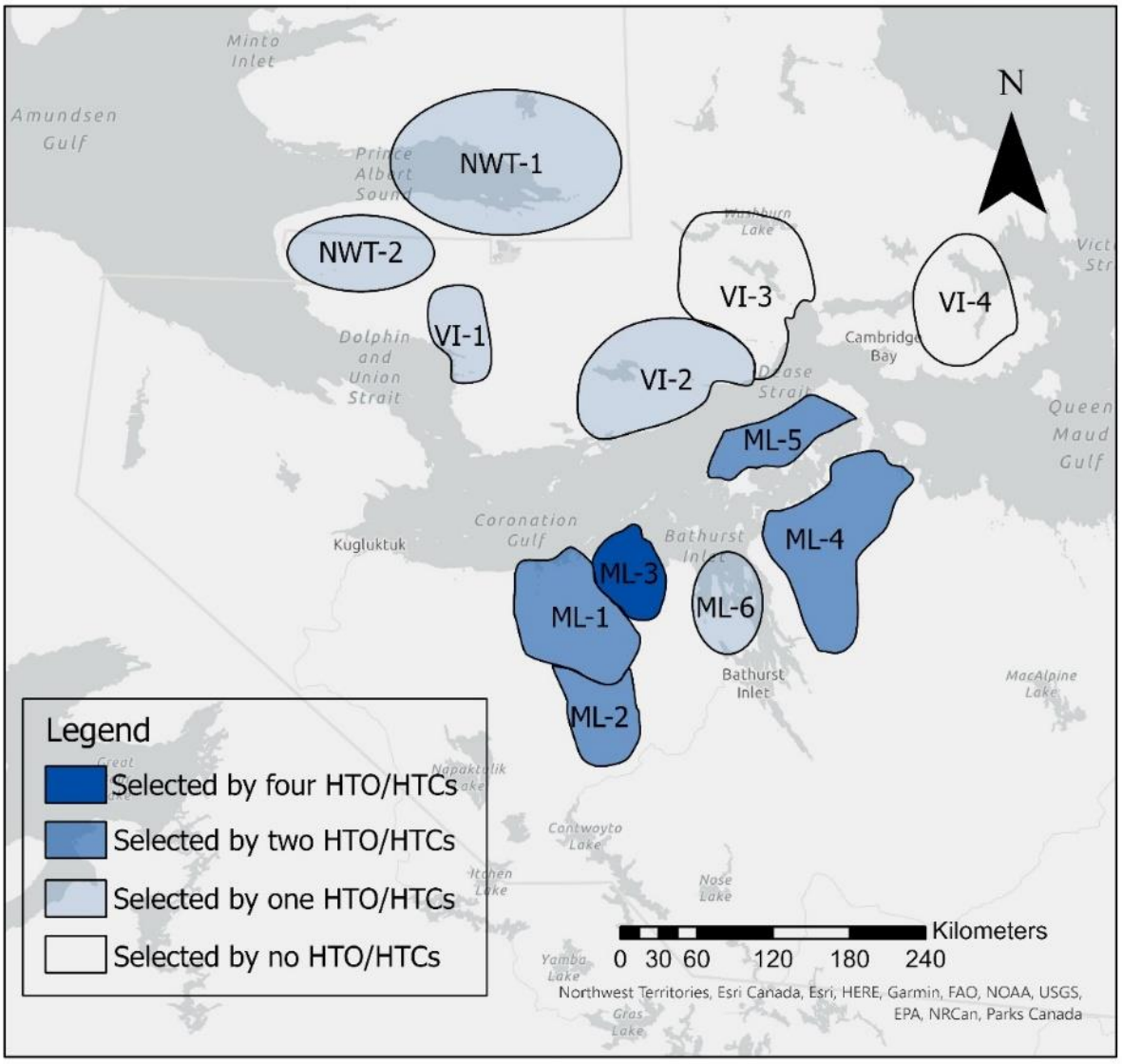

Figure 2- Options selected by affected HTOs and HTCs to identify study locations for the 2021 collaring program. Locations were derived from past collaring locations and collar data (ML-1 to ML-5 and VI-1 to VI-4) or were suggested by HTOs and HTCs (NWT-1, NWT-2, and ML-6). The areas were prioritized by the number of HTOs and HTCs that selected the area.

3.2 Project Design

The areas selected by the highest number of HTOs and HTCs were the highest priority for collaring locations, however, weather conditions and permitting constraints were considered in daily planning. Permits in place to collar in the Northwest Territories were only valid until April 15th, making entry into the territory time sensitive. Unfortunately, it was only possible to spend one day in the territory due to adverse weather conditions. A second day was spent surveying to the south on Victoria Island, but no Dolphin and Union caribou were observed or collared.

The intent of the project was to be based out of Kugluktuk and Cambridge Bay, NU, during an equal amount of time during the program to allow the participation of HTO observers from all the affected Nunavut HTOs. Due to Covid-19 restrictions, it was not possible to have contact with residents from the Northwest Territories. Unfortunately, due to logistical constraints, including poor weather, delayed start, and changes in Covid-19 restrictions during the project, it was not possible to reposition in Cambridge Bay, NU. As such, the entire project was run out of Kugluktuk, NU.

3.3 Methods Overview

Forty-two caribou were captured following the capture methods involving tangle net and helicopter net gunning team (TAEM, 1996), and thirty-six were collared using Telonics, TGW-4577-4 collars, equipped with a collar release mechanism that will activate in April 2024 to drop the collar without recapture. Pursuit and capture occurred on smooth, open terrain with good footing, and, whenever possible, in deep soft snow. Final, close pursuit was kept short (less than one minute of strenuous running) and was terminated when the target animal showed signs of fatigue (e.g., panting, stumbling, etc.). Capture took place at temperatures above -25°C. Chases per herd were limited to no more than two chases per group, and a herd was given a rest period of an hour or longer prior to a second chase being attempted.

Once a caribou was immobilized, sex was confirmed as female, samples were taken, and a body condition score was given according to CARMA's Rangifer Health and Body Condition Monitoring Protocol Level II, section 3 for live animals (CARMA, 2008). Handling times were kept short, less than 15 minutes, and sampling was done quickly and quietly. The samples taken included hair samples from two different body locations (shoulder and hip), feces, blood, and photographs were taken of the body, eyes, and teeth. A maximum of 35 mL of blood was taken from the carotid artery and divided into up to 4 tubes and up to three filter papers. Hair samples were taken from the rump and the neck and were placed in a coin envelope. When available, fecal samples were collected and placed into a plastic bag. Following collaring, the samples were processed and sent for analysis. Samples were sent to be analyzed for trace minerals, disease, parasites, pregnancy, stress, and genetic testing to confirm the caribou as Dolphin and Union. All the samples collected were subsampled, kept frozen and were sent to specialized laboratories for subsequent analyses.

Photos of the full body, antlers, animal, incisors, and anything unusual were taken. These photos will provide some insight into the health and age of each animal. Eyes were checked for bensoitia and other disease (das Neves et al., 2010). Photos of the eyes were taken to monitor possible disease outbreak.

Following the Rangifer Health and Body Condition Monitoring Protocol (CARMA, 2008), animals were palpated during collaring as a measure of the body condition of the animal. The ribs, shoulders and hip/spine areas were felt using bare hands to determine the overall fatness of the animal for those areas. Animals were scored on a scale of one through four for each area, with a value of one considered very bony and four considered healthy, fat, and well padded. The values for each key area were then summed to provide an overall score for the individual

Any animal in the field that was injured with an irreversible injury was humanely euthanized via a gunshot to the brainstem. Of the forty-two captured, thirty-six were collared. Of the six caribou that were captured that were not collared, three were euthanized due to injuries that were sustained during pursuit, one sustained a heart attack and two were released without collars due to lengthy handling time during detangling, which did not allow time to collar the animal within the 15-minute handling limit. The caribou capture work was performed by an experienced capture crew, and an HTO representative was present for every capture.

4.0 Project Schedule

The project start was intended to commence on April 1st but was delayed by two weeks due to adverse weather, which prevented the capture crew from positioning in Kugluktuk to start the program. During the collaring program, weather continued to be an issue, with several days with poor visibly and high winds. The collaring program took place over 12 days, four of which were unflyable weather days, and three were partial weather days where a half day was flyable.

The HTO and community consultations started September 2020, prior to the start of the program. HTOs and stakeholders were updated daily throughout the program, and an update on the program was provided at the July Dolphin and Union caribou user-to-user meeting. Further consultation is scheduled to take place September 2021, and collar data sharing with HTOs is ongoing and will continue through to the end of the program in 2024.

Table 1: Project schedule for the Dolphin and Union 2021 collaring program.

Item	Starting Date	End Date
HTO Consultation	September 2020	May 2021
Collaring	April 2021	April 2021
HTO Consultation	September 2021	September 2021
Collar Data Analysis	April 2021	April 2024
Distribution of Collar Data	August 2021	April 2024

5.0 Preliminary Results and Discussion

5.1 Deployment Locations

Two out of the ten areas that were selected by an organization were not visited during the 2021 collaring program (Figure 3). The other eight sites were all visited at least once. Collars were deployed in four of the ten areas (Figure 3).

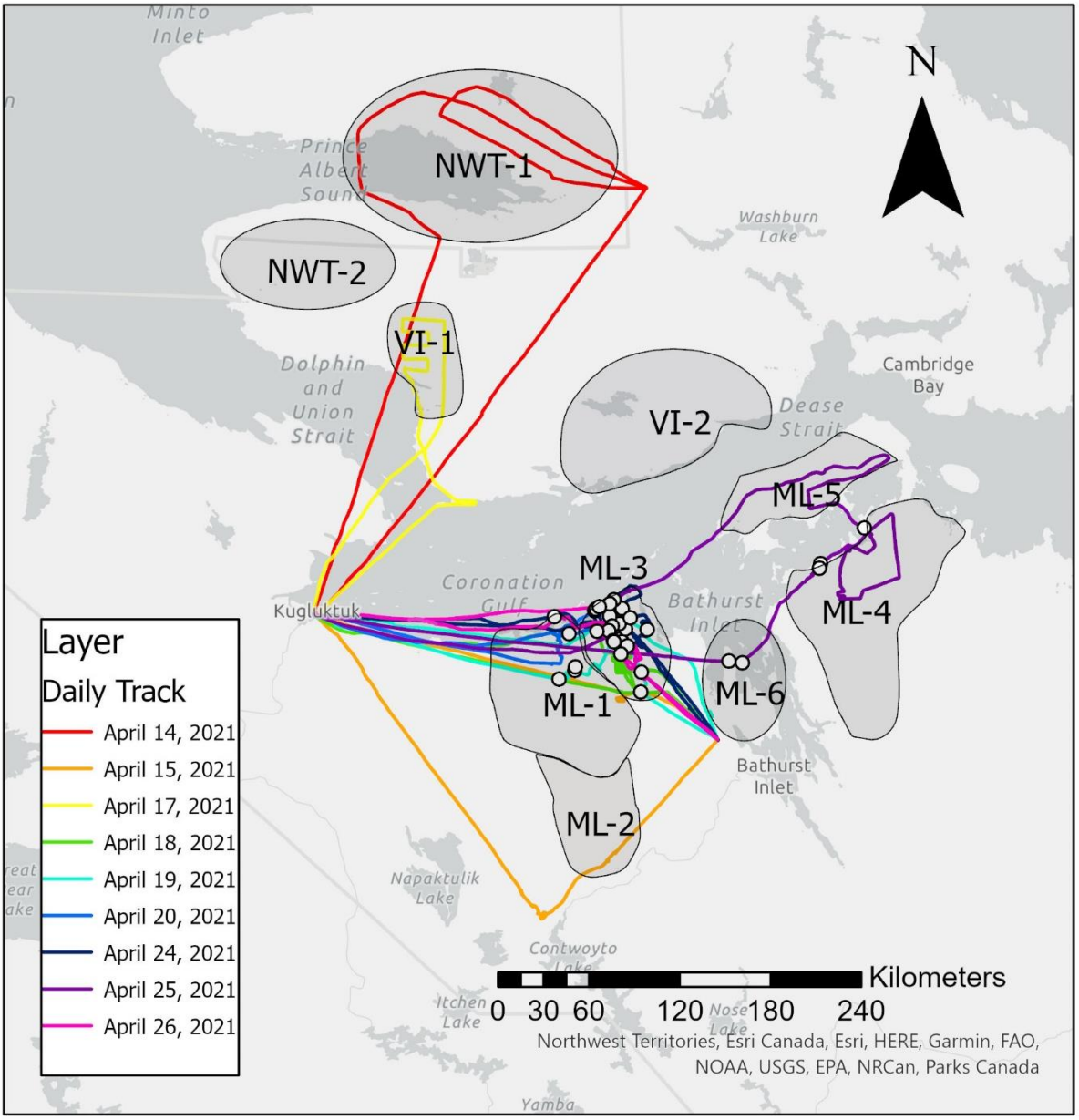

Figure 3- Dolphin and Union caribou 2021 collaring program deployment locations and daily tracks within the survey areas selected by affected HTOs and HTCs. Collar deployment locations are indicated by white circles.

5.2 Deployment Schedule

The project took place over twelve days. Four days of the program were unflyable weather days, and three were partial weather days where a portion of the day was flyable.

On April 14th, 2021, the project commenced, and due to permitting constraints allowing entry into the Northwest Territories until April 15th, NWT-1 was prioritized. The area was surveyed, but no caribou or tracks were spotted. On April 15th, 2021, the weather did not permit return to the Northwest Territories, and the weather was unfavorable along the coast of the Coronation Gulf. Areas that were of interest to the south where weather was favorable, near the north of Contwoyto Lake, were investigated as numerous observations of Dolphin and Union caribou intermixing with barren ground caribou were reported by the Kugluktuk Angoniatit Association. When the weather improved, searching resumed in higher priority areas (ML-3 and ML-2). A cow was collared in ML-3. Weather on April 16th, 2021, rendered it unflyable. Due to unfavourable weather over Bathurst Inlet, on April 17th, 2021, VI-1 on Victoria Island was surveyed. No caribou were observed. The weather improved on April 18th, 2021, a half day was flyable, and two caribou were collared in ML-1. On April 19th, 2021, weather remained good, a full day was flyable, and ten caribou were collared in ML-1 and ML-3. Weather on April 20th, 2021, was marginal, and a half day was flyable. Four cows were collared in ML-3. April 21st to April 23rd, 2021, were weather days and were unflyable. On April 24th, eight caribou were collared in ML-3. On April 25th, another four caribou were collared in ML-4 and ML-6. Although Kent Peninsula (ML-5) was searched, no caribou were observed. On April 26th, the final day of the program, a half-day was flyable, and 6 caribou were collared in ML-3.

Although the intent was to relocate to Cambridge Bay half-way through the program to access sites to the east and to involve observers from the other affected HTOs, this was not possible due to pandemic restrictions. The Minister of Health announced on April 21st that any non-essential travel was not supported due to the escalating Covid-19 situation.

5.3 Body Condition

The mean body condition score was high, with a mean health index of 9.5. The body condition index is not normally distributed, with a left skew indicating a high proportion of caribou with a higher health index (Figure 4). Although this measure is a good indication of the health of the herd, this factor is also biased by sampling. The individuals that were selected during the collaring program were fatter and seemingly fitter animals. No caribou with a health index lower than seven were captured during this program (Figure 4). Figure 4 shows the body condition index for 40 caribou that were captured (including the 36 collared, and the four mortalities).

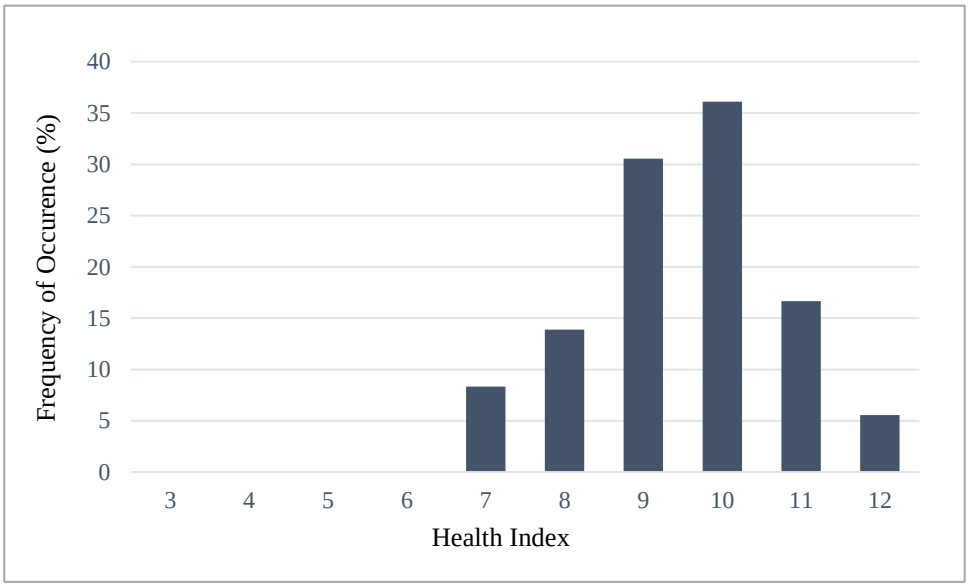

Figure 4- Average body score condition displayed as a frequency of occurrence (%) of the 36 captured caribou. The health index is scored on a scale of 3 to 12, with three indicating a bonier animal and twelve a very fat and healthy caribou.

5.4 Sample Analysis

Pregnancy rates were derived from progesterone levels from fecal samples. The progesterone thresholds were 20-200 ng/g feces non pregnant and >600 ng/g feces pregnant. The pregnancy rate for 2021 was as expected at 87.2%. The 2021 rate was calculated for the 36 animals collared, and the 4 mortalities that occurred during collaring.

Pregnancy rates from genetically confirmed Dolphin and Union caribou collared in 2015, 2016 and 2018 were 87.5%, 100%, and 92.1% respectively (Table 2) and were compared between years using a Pearson's chi-squared test (χ^2) in R (R Core Team, 2021). No significant difference was observed in pregnancy rates between years (2015, 2016 and 2018), χ^2 (2, N = 62) = 1.1278, p = 0.569.

Pregnancy rates from all caribou that are assigned to the Dolphin and Union caribou herd were also compared using a Pearson's chi-squared test (χ^2) in R (R Core Team, 2021). This included individuals that were genetically confirmed and matched the behavioral and physical attributes of Dolphin and Union caribou. Caribou from previous collaring programs (2015, 2016, 2018) were inferred to be from the Dolphin and Union herd based on physiological and behavioral characteristics when no genetic information was available (L. Leclerc 2021, personal communication, September 10). During the 2021 collaring program, samples were collected and submitted for genetic analysis, however, the results are not yet available. Prior to the receipt of the results of the genetic analysis, the 2021 animals have not been genetically confirmed as Dolphin and Union caribou; however, they were all assigned as Dolphin and Union caribou by HTO observers, Albert Anavilok and Regan Adjun. No significant difference was observed in pregnancy rates between years for all animals that were identified as Dolphin and Union caribou

based on genetics and/or assignment (based on physical appearance, or behavior) (2015, 2016, 2018, and 2021), $\chi 2$ (3, N = 118) = 1.2516, p = 0.741.

Additionally, a logistic regression with a binary response (pregnant or not pregnant) and multiple categorical predictors (year and herd assignment method) was conducted with a binomial distribution to determine whether there was a significant difference in pregnancy rate between the genetically confirmed and otherwise assigned Dolphin and Union caribou. Pregnancy rate did not vary between Dolphin and Union caribou that were genetically confirmed and identified by physical and behavioral characteristics (GLM: 1, N=118, p=0.755) and no difference was detected between years (GLM: 3, N=118, p=0.638).

Table 2: Pregnancy rates from collaring programs in 2015, 2016, 2018 and 2021 for genetically confirmed Dolphin and Union caribou and caribou identified as Dolphin and Union through behavioral and physical characteristics.

		Year			
Herd Assignment Method	Status	2015	2016	2016	2021
Genetically Confirmed Dolphin and Union Caribou	Not Pregnant	2	0	3	-
	Pregnant	14	8	35	-
	Pregnancy Rate	**87.5%**	**100.0%**	**92.1%**	-
Identified as Dolphin and Union Caribou through Behavioural or Physical Characteristics	Not Pregnant	0	2	0	5
	Pregnant	1	6	9	33
	Pregnancy Rate	**100.0%**	**75.0%**	**100.0%**	**86.8%**
Both Genetically Confirmed and Assigned Dolphin and Union Caribou	Not Pregnant	2	2	3	5
	Pregnant	15	14	44	33
	Pregnancy Rate	**88.2%**	**87.5%**	**93.6%**	**86.8%**

Additional samples were collected to assess the presence of trace minerals, disease, and parasites. These samples are still being processed; however, the results will be made available when possible.

5.5 Collaring tracks

Location data from all collared Dolphin and Union caribou, from deployment to mid-July, were mapped to visualize the migration routes taken and the timing of migration (Figure 6). One caribou was harvested on April 25, 2021 (indicated on the figure with a red ‘x’). A second caribou died of unknown natural causes on August 13, 2021. This mortality is not visualized on this figure as the mortality occurred following the mid-July limit.

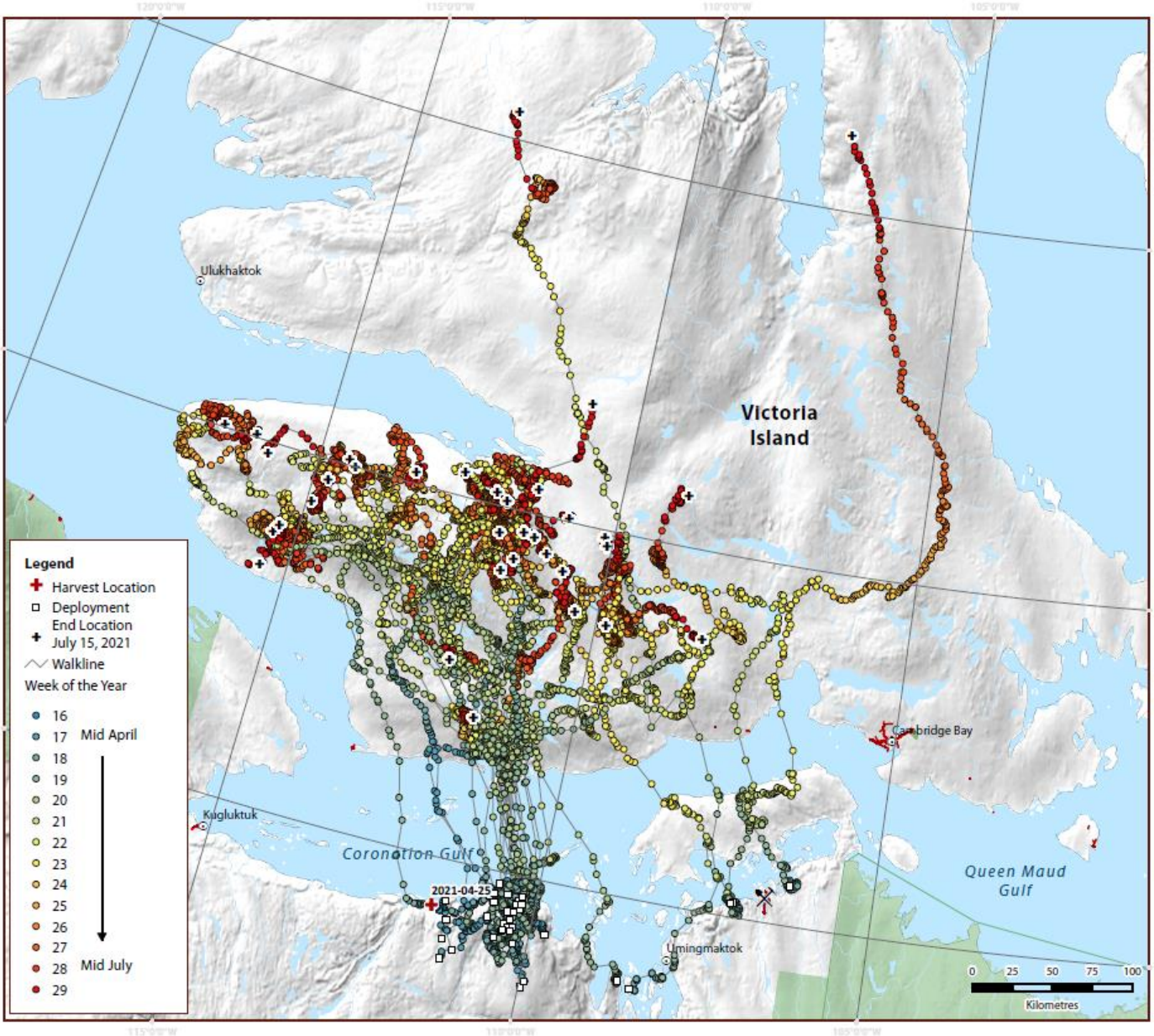

Figure 6- Locations and migration timing of 36 collared Dolphin and Union caribou cows from collar deployment (April 14th to April 26, 2021) to July 15, 2021.

5.6 Mortalities

Four mortalities took place during the collaring program, and one collared cow was harvested after being collared. Of the four mortalities that took place during the program, three were euthanized following unrecoverable injuries, and the fourth animal had a heart attack during capture. Resuscitation was attempted, but the animal did not survive. All four animals died closer to Kugluktuk, NU, and the HTO was notified immediately. The animals were field dressed, quartered, sampled, and brought to the HTO for distribution. The animals were counted towards the Kugluktuk TAH for the Dolphin and Union caribou herd.

Table 3- Summary of mortality events during and after the 2021 Dolphin and Union caribou collaring program

Identification Number	Mortality Date	Mortality Type	Cause
DU-M1-21	April 19, 2021	During Pursuit	Euthanized, broken leg
DU-M2-21	April 20, 2021	During Capture	Euthanized, injured hip
DU-M3-21	April 24, 2021	During Capture	Heart attack
DU-M4-21	April 24, 2021	During Capture	Euthanized, broken neck
DU-206-21	April 25, 2021	Harvested	Harvested
DU-218-21	August 13, 2021	Natural	Unknown

5.7 Program Limitations, Future Recommendations and Next Steps

This program was severely impacted by adverse weather. The program started two weeks later than anticipated due to poor weather. Additionally, 33% of the days during the program were unflyable, and an additional 25% were partial weather days. Poor weather impacted areas that could be surveyed and limited the time available to search.

A major program limitation is that only caribou on the mainland were collared, and only from a concentrated area. It was not possible to collar any individuals on Victoria Island due to logistic constraints. Future collaring programs should focus on distributing collars more evenly, including deployment in Northwest Territories and on Victoria Island on non-migrating Dolphin and Union caribou. As a subset of the population is being monitored, individuals that are on Victoria Island year-round are not being effectively monitored through this program at present. Future programs should focus on addressing this deficit.

Another project shortfall was the number of collars deployed. Only 36 were successfully deployed from the fifty collars that were proposed to be deployed. Having more collars deployed is beneficial in monitoring a higher proportion of the population.

Future collaring programs should continue involving HTOs and HTCs in determining possible deployment locations. On the ground surveys prior collaring have been identified by stakeholders as a possible method to improve collaring efficiency by identifying locations where Dolphin and Union caribou are present, particularly on Victoria Island where limited information is available on the distribution of non-migrating individuals.

Consultations will take place mid-September in Kugluktuk, NU, to discuss this collaring program. Data will be disseminated to co-management partners until the completion of the project in April 2024.

6.0 Acknowledgements

This work would not have been possible without the help and support of the Hunter and Trapper Organizations and Committees from Kugluktuk, Cambridge Bay, Bay Chimo, Bathurst Inlet and Ulukhaktok. Thank you specifically to Amanda Dumond, Larry Adjun, Beverly Maksagak, Bobby Greenley, Connie Kapolak, Peter Kapolak, and Bessie Inuktalik. Additionally, thank you to Albert Anavilok and Regan Adjun. This work would have not been possible without their assistance in the field. Thank you also to Lena Davies, Terry Milton, John Ringrose and Mitch Campbell for their support and assistance with planning and logistics.

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7.0 References

Bates, P. 2006. Knowing caribou: Inuit, ecological science and traditional ecological knowledge in the Canadian North. Ph.D. dissertation, Aberdeen University, Aberdeen, Scotland. 270 pp.

Campbell, M., J. Ringrose, J. Boulanger, A. Roberto-Charron, K. Methuen, C. Mutch, T. Davison and C. Wray. 2021. An Aerial Abundance Estimate of the Dolphin and Union Caribou Herd, Kitikmeot Region, Nunavut – Fall 2020.

Campbell, M, D. Lee, J. Boulanger, A. Kelly, M. Dumond and J. McPherson. 2013. Calving ground abundance estimates of the Beverly and Ahiak subpopulations of Barren-Ground Caribou (Rangifer tarandus groenlandicus)- June 2013. Government of Nunavut, Dept of Env, Tech Rep Ser No: 01-2013.

CARMA. 2008. Rangifer Health and Body Condition Monitoring: Monitoring Protocols Level 2. CircumArctic Rangifer Monitoring and Assessment Network. 54 p.

COSEWIC. 2004. COSEWIC assessment and update status report on the Peary caribou *Rangifer tarandus pearyi* and the barren-ground caribou *Rangifer tarandus groenlandicus* (Dolphin and Union population) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa.

Das Neves, C., S. Roth, E. Rimstad, E. Thiry, M. Tryland. 2010. Cervid herpesvirus 2 infection in reindeer: a review. Vet Microbiol. 134 (1): 70-80.

Gunn, A., D. Russell, and J. Eamer. 2011. Northern caribou population trends in Canada. Canadian Biodiversity: Ecosystem Status and Trends 2010, Technical Thematic Report No 10 Canadian Councils of Resource Ministers. Ottawa, ON. iv+71p.

Pool, K., A. Gunn, B. Patterson and M. Dumond. 2010. Sea ice and migration of the Dolphin and Union caribou herd in the Canadian Arctic: An uncertain future. Arctic 63: 414-428.

TAEM, 1996. 1995/1996 Year One Progress Report. Development and Application of Animal Borne GPS Technology on Woodland Caribou. A report of the Research and Development Committee of Manitoba Hydro.

Thorpe, N.L., S. Eyegetok, N. Hakongak, and Qitirmiut Elders. 2001. The Tuktu and Nogak Project: a caribou chronicle. Final Report to the West Kitikmeot Slave/Study Society. West Kitikmeot Slave/Study Society. Ikaluktuuttiak, Northwest Territories. 198 pp plus maps.