

NWRT Final Report

NWRT Project Number: 2-21-01

Project Title: Baffin Caribou Health Monitoring

Project Leader:

John Ringrose
Baffin Regional Wildlife Biologist
Department of Environment
Government of Nunavut
Box 400 Pond Inlet, NU, X0A 0S0
(867)899-7576
Jringrose@gov.nu.ca

Summary:

During consultations in January 2019, communities identified their desire for a hunter sample program and concerns over caribou health. The purpose of this project was to establish a hunter-based sample and information collection program that contributes to the monitoring of caribou health on Baffin Island. A similar program was conducted on Baffin Island between 2008 and 2015 but we reduced the number of sample types for 2021 in an attempt to streamline the process and increase hunter participation. Previous study results provided an insight into the prevalence of disease, parasitology and health of Baffin caribou at that time. We provided sampling kits to Hunters and Trappers Organizations (HTOs), Government of Nunavut (GN) wildlife officers and directly to hunters that consisted of sampling instructions, datasheets and the required sampling supplies. The four standard samples were; 1) skin/hair, 2) blood, 3) lower jaw or incisor bar, 4) kidney with the fat attached. Additionally, hunters from Iqaluit collected liver and tissue samples for incorporation into the Northern Contaminants Program, a long-term caribou health monitoring program across North America.

During the 2021-2022 Baffin Island caribou harvest season we received samples from hunters in Iqaluit, Igloolik, Sanirajak (Hall Beach), Kimmirut and Kinngait (Cape Dorset). Substantial delays at laboratory facilities and government offices have occurred due to issues associated with the Covid-19 pandemic. Samples have been sent to the labs for analysis but unfortunately, at the time of reporting we have minimal results to present due to delays outside our control.

Project Objectives:

The Baffin Island Caribou Health Monitoring Program was designed in partnership with communities and created to assess the overall health, determine presence of disease and parasites, and increase harvest reporting effectiveness in Nunavut. The program is also designed to engage academia in the continued study and understanding of disease prevalence in barren-ground caribou.

The main research objectives were to;

- 1) Continue to build on baseline values for health-related parameters.
- 2) Monitor long-term health and disease to detect future changes.

- 3) Increase the capacity of community members, including youth, in research.
- 4) Increase reporting of caribou harvest on Baffin Island.
- 5) Determine the seasonal age and sex structure of the harvest.
- 6) Determine the relationship between body condition and herd productivity when compared with parallel demographic studies.

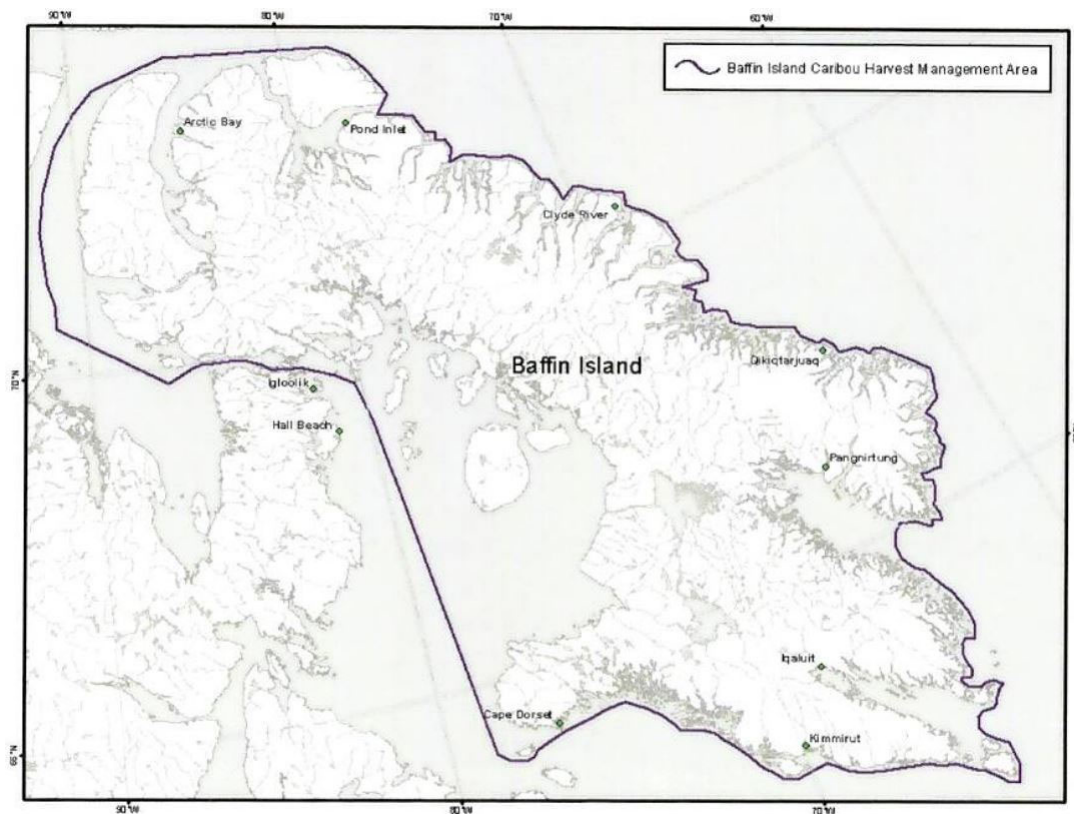
Materials and Methods:

Samples were collected from Baffin Island caribou hunters during the 2021-2022 harvest season on a voluntary basis.

Study area

The study area incorporates the harvesting area for Baffin Island caribou. Communities that harvest caribou from these areas all occur within the study area (Pond Inlet, Arctic Bay, Clyde River, Qikiqtarjuaq, Pangnirtung, Iqaluit, Kimmirut, Kinngait, and Igloolik and Sanirajak) (Figure 1).

Figure 1 Baffin Island caribou health monitoring sampling area.



Sample collection

Hunters were provided sample kits to take with them while hunting which consisted of sampling instructions (in both Inuktitut and English), appropriate pre-labelled sample bags and data sheets. Sample kits included (Table 1) a datasheet to record information about the harvest, (including the hunters name,

date of kill, harvest location, sex of animal harvested, and a section to provide notes), a hair/skin sample (1x3" strip), and blood (collected on filter strips), liver, lower jaw/incisor bar and kidney with fat attached. Liver and tissue samples were collected in collaboration with the Northern Contaminants Program for contaminant analysis and incorporation into their long-term monitoring of North American caribou herds.

Table 1. Sample types and inputs proposed for the 2020/2021 Nunavut caribou health monitoring.

Sample Type	Reason for Sampling
Hair/skin	Genetics, stress, hormones, parasites, minerals
Blood	Disease, genetics
Lower jaw or incisor bar	Age, body condition
Kidney with fat	Body condition, contaminants
Liver*	Contaminants
Tissue*	Genetics, contaminants
Demographic info.	Herd characteristics, general health

*** Samples collected only in Iqaluit as part of the Northern Contaminants Program*

Hunters received monetary compensation for the samples of \$15 per sample (\$60 for a complete kit of 4 samples). Hunters from Iqaluit were asked to collect an additional 2 samples (liver and tissue) for analysis by the Northern Contaminants Program and were provided an additional \$30 per sample (\$120 total for 6 samples). The kits were designed so that it would only take a few minutes for harvesters to collect the required samples. Each sample kit was designed to be used for a single caribou but hunters were able to provide kits from multiple caribou.

When caribou were harvested, hunters would collect the samples and information required then provide it to the Government of Nunavut wildlife officer or Hunters and Trappers Organization. Samples were kept frozen and shipped to the Department of Environment regional laboratory in Pond Inlet.

Sample Analysis

Samples were processed in Pond Inlet and sent to the appropriate laboratory for analysis (Table 2). Once analysed the data was provided to the GN and any remaining portions of samples were sent back to the lab in Pond Inlet for archiving purposes. Contaminant analysis was done by ALS' lab in Burlington, Ontario where they were analyzed for a suite of 34 elements. Additional analysis completed by Dr. Susan Kutz at the University of Calgary (Table 2).

Table 2. Sample types, location and type of analysis.

Sample Type	Testing For	Analysis completed by
Hair/Skin	Genetics, parasites, Essential minerals, cortisol	Dr. Susan Kutz, University of Calgary
Blood	Disease, genetics, cortisol levels	Dr. Susan Kutz, University of Calgary
Lower jaw or incisor bar	Age, body condition	GN Internal, Matsons lab
Kidney with fat	Body condition, contaminants	ALS, Mary Gamberg
Liver	Contaminants	ALS, Mary Gamberg
Tissue	Genetics, contaminates, disease	Mary Gamberg, Dr. Susan Kutz, University of Calgary

Demographic info	Herd characteristics, general health	GN Internal
------------------	--------------------------------------	-------------

Results:

Caribou hunters provided less than half of the goal of 250 sample kits; one for each caribou harvested. Sample collection was sporadic and relied heavily on HTO interest and conservation officer presence in the community. In communities where there was no wildlife officer present we relied on officers to do relief trips in order collect samples and send them to the lab in Pond Inlet. This further delayed our ability to process and send samples for analysis.

Table 3. Number of samples provided by hunters for the 2021 sampling season. *Collected in Iqaluit only for the Northern Contaminants Program

Sample Type	Number of samples provided
Hair/skin	67
Blood	47
Lower jaw or incisor bar	55
Kidney with fat	54
Liver*	52
Tissue*	49
Demographic info.	119

See attached report (Appendix 1) for more information on analysis however, due to delays in laboratory processing at ALS the results are pending. To date we have not received the results from University of Calgary due to delays associated with Covid-19.

Discussion/Management Implications:

Many government offices and labs have been plagued with unplanned month-long shutdowns associated with Covid-19. As a result, many laboratory facilities that we rely on for analysis are drastically behind schedule with many as much as 2 years behind schedule. This backlog of analysis increased the costs associated with analysis and delayed the time needed for analysis. Unfortunately, at the time of reporting we have minimal results to present due to delays outside our control.

Although we have limited results to present at this time, we expect to receive final results from our external partners shortly after the submission deadline for this report. All reports will be provided to co-management partners, including the Nunavut Wildlife Management Board.

The implementation of this program relies heavily on HTOs interest and participate to support the program. We have found that in communities where the HTOs are actively engaged in promoting the program to their hunters we receive many more samples than in communities where HTOs show limited interest. For example, the Amaruq HTO, in Iqaluit, actively provided sample kit to each hunter when they received a tag and identified the importance of collecting samples. This resulted in Iqaluit hunters providing samples from almost every caribou harvested. Unfortunately, the amount of analysis we can provide is directly limited by the number of samples we receive. Long-term management of Baffin caribou

relies on the active participation of all co-management partners. Current information gaps exist for Baffin caribou and filling these gaps should be a priority to ensure a quick and successful recovery.

Reporting to communities/resource users:

Some HTO/community consultations took place in early 2020 and throughout 2021. However, Covid-19 related travel restrictions, meeting restrictions and office closures caused many meetings to be cancelled at the last minute. To date we have attempted to stay in contact through email, phone, teleconference and in-person meetings when possible. All HTOS have been provided up-to-date project results and we will continue to provide results to co-management partners when available.

References:

None at this time. Analysis pending.

APPENDIX 1

Title: Arctic Caribou Contaminant Monitoring Program

Project Leaders

Mary Gamberg, Gamberg Consulting, 708 Jarvis St., Whitehorse, Yukon Y1A 2J2. Phone 867-334-3360, e-mail mary.gamberg@gmail.com

Jeremy Brammer, National Wildlife Research Center, Ottawa, ON. Phone 867-966-3261 ext. 222, E-mail jeremy.brammer@canada.ca.

Project Team

Mike Sutor, Martin Kienzler, Yukon Government, Dawson, YT; Joe Tetlich, Porcupine Caribou Management Board, Whitehorse, YT; Erika Tizya, Vuntut Gwitchin Government, Old Crow, YT; Mitch Campbell, Government of Nunavut, Arviat, NU; Arviat Hunters and Trappers Organization, Arviat, NU; John Ringrose, Government of Nunavut, Pond Inlet, NU; Lou Kamermans, Baffinland Iron Mines Corporation, Oakville, ON; Xiaowa Wang and Derek Muir, Environment & Climate Change Canada (ECCC), Burlington, ON; Clive Tesar, Carleton University, Ottawa, ON.

Project Location (s)

- Old Crow, Yukon
- Arviat, Nunavut
- Pond Inlet, Nunavut

Abstract/Plain Language Summary

This project studies contaminant levels in caribou in the Canadian Arctic to determine if these populations remain healthy (in terms of contaminant loads), whether these important resources remain safe and healthy food choices for northerners and if contaminant levels are changing over time. In the fall/winter of 2020/21, samples were collected from 20 Qamanirjuaq caribou, 9 Porcupine caribou and 3 caribou from north Baffin Island. Pandemic-related lab closures resulted in a delay in analysis of both the 2019 and the 2020 sample collections. Once the labs open, homogenized kidney samples will be analyzed for a suite of 34 elements. The kidney, liver and muscle samples from the Baffin caribou will be analyzed for the same suite of elements using the same method, by a commercial laboratory, in order to obtain results in a more timely fashion. Ten liver samples from the Qamanirjuaq herd and all the liver samples from the Porcupine and Baffin caribou will be analyzed for PBDEs (including deca-BDE) and PFASs. Health Canada assessed PFOS concentrations in caribou from the Canadian Arctic in May 2020. The Yukon and Northwest Territories health authorities determined that no health advisories or advice, based on this information, were warranted. The Government of Nunavut Department of Health recommended that adults eat no more than 7 whole Sanikiluaq reindeer livers per year, assuming livers weigh 1 kg each. Results from this project are being communicated through local outreach (lectures and labs at Whitehorse, YT high schools and Yukon University), Contaminants in

Arctic Caribou page on Facebook, and the Northern Caribou website (www.northerncaribou.ca) which hosts all of our reports and plain language summaries.

Key messages

- Levels of most contaminants measured in caribou tissues are not of concern, although kidney mercury and cadmium concentrations may cause some concern for human health depending on the quantity of organs consumed. Caribou meat (muscle) does not accumulate high levels of contaminants and is a healthy food choice.
- Concentrations of PFASs and PBDEs are low with respect to potential toxicity to caribou or those consuming caribou. Adults consuming Sanikiluaq reindeer are recommended to consume a maximum of seven whole livers each year due to PFOS levels in those livers.
- This program will continue to monitor the Porcupine and Qamanirjuaq caribou herds annually to maintain confidence in this traditional food and to better understand contaminant (particularly mercury) dynamics within these ecosystems.

Objectives

This project aims to determine levels of and temporal trends in contaminants in Arctic caribou to:

- provide information to Northerners regarding contaminants in this traditional food so that:
 - they can make more informed choices about food consumption. This includes providing information for health assessments and/or advisories as required;
 - wildlife managers can assess possible health effects of contaminants on Arctic caribou populations;
- further understand the fate and effects of contaminant deposition and transport to the Canadian Arctic.

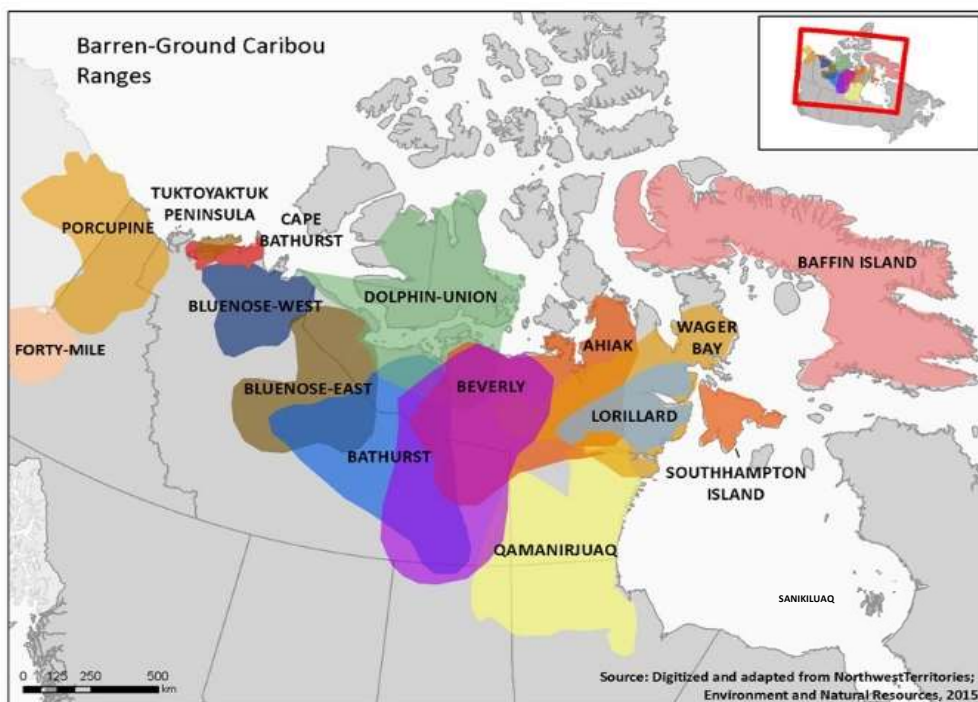
Introduction

Caribou provide an important food resource for Northerners across the Arctic, and the Porcupine and Qamanirjuaq caribou herds have been designated in the NCP blueprint for annual monitoring of mercury, inorganic elements, PBDEs (polybrominated diphenyl ethers) and PFASs (per- and polyfluoroalkyl substances). In addition, the blueprint specifies that one or two other herds will be monitored each year for the same list of contaminants. In 2020/21, we planned to include samples from North Baffin caribou in collaboration with a Government of Nunavut caribou health monitoring program.

Activities in 2020-2021

In the fall of 2020, samples were collected from 20 Qamanirjuaq caribou by local hunters in Arviat, NU. Samples were taken from 9 Porcupine caribou in the late fall and early winter. Although many sample kits were distributed to hunters in the Pond Inlet area of Baffin Island, only 3 samples were submitted. We are hoping to continue that sampling campaign in the coming year in collaboration with the Government of Nunavut).

Figure 1. Home ranges of the major barren-ground caribou herds in Canada.



Pandemic-related lab closures resulted in a delay in analysis of both the 2019 and the 2020 sample collections. Once the labs open, homogenized kidney samples will be analyzed for a suite of 34 elements using ICP-MS by NLET, Environment Canada, Burlington. The kidney, liver and muscle samples from the Baffin caribou will be analyzed for the same suite of elements using the same method by ALS Burlington in order to obtain results in a more timely fashion. Ten liver samples from the Qamanirjuaq herd and all the liver samples from the Porcupine and Baffin caribou will be analyzed for PBDEs (including deca-BDE) and PFASs by Muir's lab (Burlington, ON). Liver and muscle samples will be archived at the National Wildlife Research Centre (Environment and Climate Change Canada). Incisors were used to analyze age of the animals using the cementum technique by Angela Milani (Environment Yukon).

Community Engagement

In 2020/21, community engagement was limited to the sharing of updated plain language summaries to users of the Lorillard and Qamairjuaq caribou and Sanikiluaq reindeer (May 2020) and interacting with hunters actively collecting samples for the current year (Arviat NU, Old Crow YT, Pond Inlet NU [via John Ringrose, GN regional biologist]). No community visits took place this year due to pandemic-related travel restrictions, although PI Brammer is currently based in Old Crow, YT, and is able to communicate with community members on a daily basis.

Capacity Building and Training

Normally, one of the PIs participates in a wildlife contaminants workshop presented to the students of the Environmental Technology Program (ETP) of Arctic College in Iqaluit, providing information on contaminants in the general environment as well as in caribou specifically.

Unfortunately, in 2020/21, this workshop was cancelled due to the pandemic. Although we considered offering it virtually, it was eventually decided that the hands-on and interactive portion was critical to the success of the event, so we are planning on offering it in September 2021.

Communications and Outreach

Although a trip to Sanikiluaq and Baker Lake was planned for the spring of 2020, pandemic-related travel restrictions required postponing that trip until travel is no longer restricted. The following plain language summaries of results were widely distributed in English and Inuktitut in May 2020:

- Report to the Hunters of the Lorillard Caribou May 2020
- Report to the Hunters of the Qamanirjuaq Caribou May 2020
- Report to the Hunters of the Sanikiluaq Reindeer May 2020.

Outreach activities this fall included three classes at Yukon University and three high school classes from Wood St. school. These each involved a lecture on contaminants in general, and then more specifics on caribou and fish. While the follow-up lab focused on fish, those skills in taking samples for contaminant analysis can easily be transferred to large or small game in the future.

A manuscript entitled “Perfluoroalkyl substances in circum-Arctic *Rangifer*: Caribou and Reindeer” was developed from this project and submitted to Environmental Science and Pollution Research by Anna Roos (Swedish Museum of Natural History) in February 2021. An additional manuscript exploring the effect of weather-related drivers on mercury concentrations in caribou is being prepared by JR Brammer in collaboration with M Gamberg, D Russell and J Provencher.

Caribou contaminant-related publications, synopsis reports and plain language summaries were included on a new Arctic Caribou website (www.northerncaribou.ca) created by Clive Tesar (Ottawa, ON) which went live in May 2020. The website averages about 600 unique visitors per month and the twitter feed used to promote the site has 198 followers. In the month of March 2021 there were 20 tweets, generating 8,509 impressions. There are plans to expand the site, including the development of relevant educational materials. The ‘Contaminants in Arctic Caribou’ Facebook page is also being used to communicate project results and events to a wide northern audience (<https://www.facebook.com/cariboucontaminants>).

Indigenous Knowledge

This program relies on the Indigenous knowledge when collecting samples from caribou for analysis. Local hunters use Indigenous knowledge when hunting caribou and submitting samples as well as providing food for their families. Meetings (in-person, phone and virtual) between the PIs and local HTOs provide an opportunity for the exchange of Indigenous and western knowledge that enhances understanding of contaminants in caribou and facilitates the implementation of this project.

Results and Outputs/Deliverables

Due to pandemic-related laboratory closures, there are no new results to present at this time.

Although Canada has no provisional tolerable daily intake levels for PFOS, the US EPA and the European Food Safety Authority do have such guidelines. When evaluating PFOS concentrations in livers from the 2018 caribou collections, it became clear that depending on which guideline is used (particularly since the European Food Safety Authority guideline was recently revised to a much more conservative level), there could, potentially, be some concern about the human consumption of these caribou livers. All PFAS data were submitted to Health Canada for evaluation and a health assessment in May 2020. In June 2020, the Yukon and Northwest Territories health authorities decided that no health advisories or advice, based on this information, were warranted. On March 31, 2021, the Government of Nunavut Department of Health provided a letter to the Sanikiluaq HTO recommending that adults eat no more than 7 whole reindeer livers per year, assuming livers weigh 1 kg each.

COVID-19 Pandemic Impacts

Pandemic-related travel restrictions resulted in the cancellation of planned community visits to discuss results of this project. We adapted by ensuring that plain language summaries were distributed widely and that all of the stakeholders have our contact information and know that they are welcome to contact us at any time for questions or discussions. Pandemic-related lab closures mean that no samples were analyzed last year, so we have no new results to present. Although some of the analyses could be done by a commercial lab, it would be prohibitively expensive and some of the analyses (e.g. PFASs) could not be conducted with the same detection limits, making the analysis of temporal trends difficult if not impossible. We have chosen to wait until the designated labs reopen and can analyze these samples.

Discussion and Conclusions

The health assessment on PFASs in Canadian caribou and reindeer is now complete and health advice has been given only for the Sanikiluaq reindeer. The recommendation to limit consumption of Sanikiluaq reindeer liver to 7/person/year may be contrasted with the much older recommendation to limit consumption of Porcupine caribou liver to 12/person/year based on cadmium intake. In practice, harvesters of the Porcupine caribou do not generally find that this recommendation changes their dietary habits, and the same may be true of those harvesting the Sanikiluaq reindeer.

Expected Project Completion Date

This program is ongoing.

Project website (if applicable)

www.northerncaribou.ca

<https://www.facebook.com/cariboucontaminants>

Acknowledgments

Many thanks to Yukon Environment staff: Martin Kienzler and Mike Sutor for supporting sampling of the Porcupine herd, Mary Vanderkop and Maud Henaff for laboratory support, and Angela Milani for aging caribou teeth. I would also like to acknowledge the efforts of all hunters who have submitted samples to this program over the years – without them, this work would not be possible. A particular thank you goes to the Arviat Hunters and Trappers Association who organize collections of the Qamanirjuaq caribou annually.

This project was funded by the Northern Contaminants Program, Crown Indigenous Relations and Northern Affairs Canada.