

## **Title: Arctic Caribou Contaminant Monitoring Program**

### **Project Leaders**

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### **Project Team**

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### **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](http://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.

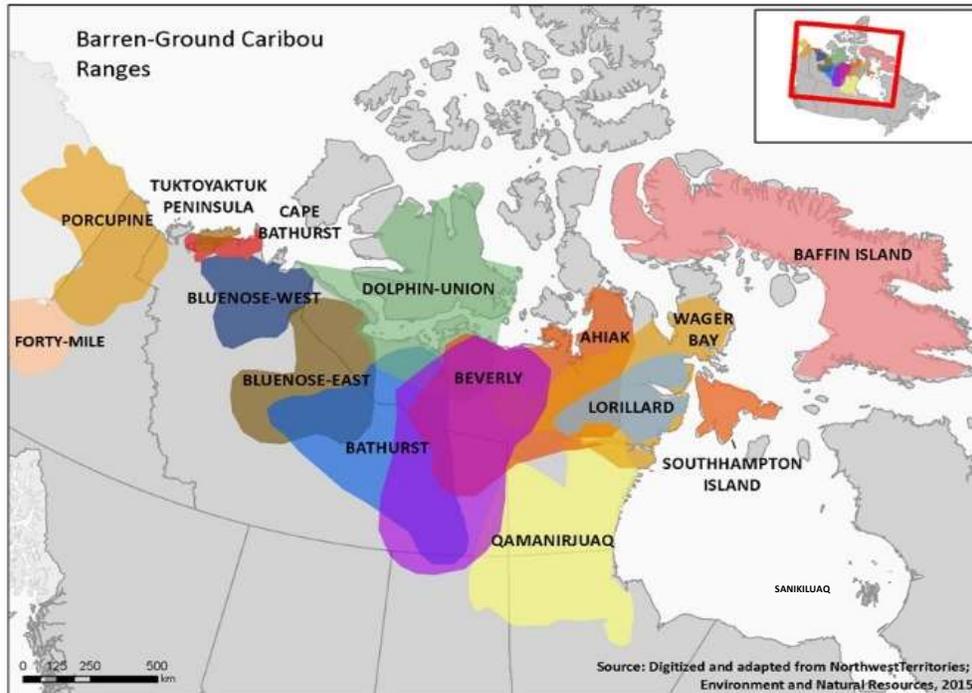
## **Introduction**

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](http://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](http://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.