Canada Geese Fall Migration

CHISASIBI, September 3, 2022

EMRWB RESEASRCH FUND 2022-2023 REPORT:

Community-research partnership to assess migratory waterfowl use of habitats of Eeyou Istchee

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February 25, 2023

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RESEARCH CONTEXT & DEVELOPMENT

The project *Community-research partnership to assess migratory waterfowl use of habitats of Eeyou Istchee* was developed from discussions with researchers and Cree land users part of the Coastal Habitat Comprehensive Research Project (CHCRP). Here I present the CHCRP's research questions and a summary of the project's findings. The CHCRP is a Cree-driven research project that prioritizes Cree engagement in all areas and stages of the research, from field data collection to interpretation. The project aimed to address two questions: *What are the main factors affecting the current state of eelgrass along the eastern coast of James Bay? What is the impact of the current state of seagrass eelgrass (Zostera marina) on waterfowl presence and consequently Cree hunting activities?* The research program drew upon Cree Traditional Ecological Knowledge and experience as well as scientific research at every stage of the process. The research team worked right alongside coastal land users from four coastal communities. All the evidence points to an early eelgrass decline in Chisasibi in the 1980s. The onset of very early ice breakup and warm early-summer water temperatures in the late 1990s *accelerated* the eelgrass decline in Chisasibi and triggered declines along the entire coast. Today, eelgrass is struggling to recover, and the eelgrass shoots are much shorter than the 2-m shoots seen in the 1970s-90s. Eelgrass beds are smaller, patchy, and generally only found in shallow waters (less than 2.5 m). Canada geese (short-necks) are not stopping long in the area and Brant geese have become rare north of Chisasibi. Feeding habits and hunting have changed all along their migration routes and in their wintering range. More long-necked Canada geese now undertake molt migrations through east James Bay and may compete for local resources. Chisasibi and Wemindji Cree also attribute change in goose abundance to changes in local hunting practices and more noise pollution associated with the mechanization of hunting and air traffic in the area. These changes in goose behaviour and distribution make the geese less predictable and harder to hunt in the fall. With fewer geese present, more disturbance is caused by efforts to hunt them. Elders are concerned that younger Cree will not see the abundance of geese and waterfowl and experience the traditional fall hunts from a few generations ago.

ACKNOWLEDGEMENTS

I wish to acknowledge Cree Land Users and community-members for authorizing research to be conducted on their traditional hunting territories, for logistical support as guides, boat drivers and helpers provided to the research team. Most importantly, I wish to acknowledge Crees' sharing of valuable knowledge of their lands and ecological processes as an integral part of the research project. This knowledge is collectively owned by the Cree Nation and shared with peoples' consent during fieldwork. I give a special thanks to Harold Whiskeychan (Waskaganish), Danny Whiskeychan (Waskaganish), Merlin Whiskeychan (Waskaganish), Peter Weapenicappio (Eastmain), Sarah Diamond (Waskaganish), Victor S. Gilprin (Eastmain), Clayton Stephen (Waskaganish), Darrel Hester (Waskaganish), Wilfred Cheezo (Eastmain) and Trevor Mayapo (Eastmain).

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PROJECT SUMMARY

Boatswain Bay (Waskaganish), collecting plants, August 2023.

Coastal ecosystems are critical to many migratory waterfowl [1,2,3,4,5]. Changes in migratory waterfowl abundance and distribution are indicators of environmental change, and they have direct consequences for coastal Indigenous communities by disrupting traditional subsistence hunting activities [6]. Yet many northern coastal communities lack the necessary scientific data for wildlife conservation and management. Data collection of migratory waterfowl at stopover sites has been limited by logistical difficulties due to the remoteness of northern coastal ecosystems. Working in partnership with coastal Indigenous communities, the proposed study aims to better understand culturally important migratory game bird species habitat use in Eeyou Istchee.

For Cree living in the coastal region of Eeyou Istchee, livelihood, culture and food security continue to be defined by hunting, fishing, and trapping [6, 7]. Cree that live and hunt along the eastern James Bay coast have long emphasized the importance of eelgrass, the most widespread and common seagrass species in Canada, in shaping migratory routes, stopover durations, and foraging locations of migratory waterfowl [7]. The vast majority of Cree hunters agree that the eelgrass decline that occurred in the late 1990s was massive and unprecedented [7, 8]. Cree hunters also report that since the decline, recovery of the eelgrass has been very slow. Concomitant with the observed eelgrass declines, Cree hunters have witnessed a dramatic decrease in the abundance of waterfowl, notably Canada geese (*Branta canadensis*), along the coast of James Bay [9].

To fill an important knowledge gap regarding migratory waterfowl habitat use, this project aimed to assess the diet and determined important food resources of Canada geese during the fall migration working in partnership with the Eeyou Marine Regional Wildlife Board and Cree land users. The project approach was designed to maximize community engagement while minimizing impacts on traditional activities without compromising sampling effort.

RESEARCH OBJECTIVES

The project objectives are:

1) determine the extent to which individual Canada geese forage between marine (eelgrass and widgeon grass) and terrestrial habitats (ex. saltmarshes, heaths, bogs) at different locations along the coast,
2) evaluate the relationship between habitats availability and Canada geese diet, and
3) working in partnership with the EMRWB and Cree land users[1], co-develop a habitat suitability map for Canada geese, a vital tool for wildlife management and conservation.

In this progress report, I cover research efforts relevant to the first objective. I present the research approach, fieldwork activities done in 2022 and the 2022 budget. I also discuss fieldwork challenges and suggest an alternative approach to evaluate Canada geese diet and present anticipated research activities for the summer of 2023.

Fresh water pond on small island, Boatswain Bay (Waskaganish), August 19, 2023

[1] Several Cree hunters were interviewed as part of CHCRP regarding their knowledge of migratory waterfowl habitat use and migration patterns. As a result, I did not conduct interviews on goose diet but instead took notes during meetings and fieldwork with Cree land users (with consent). I will collaborate with J. Idrobo, who is leading the Cree Knowledge in the CHCRP.

DESCRIBTION OF METHODS FOR OBJECTIVE 1

Canada geese have a diverse diet and consume plants from different habitats. The diet of Canada geese can therefore be used to evaluate the extent to which individual geese foraged between maritime and terrestrial environments (**Figure 1**).

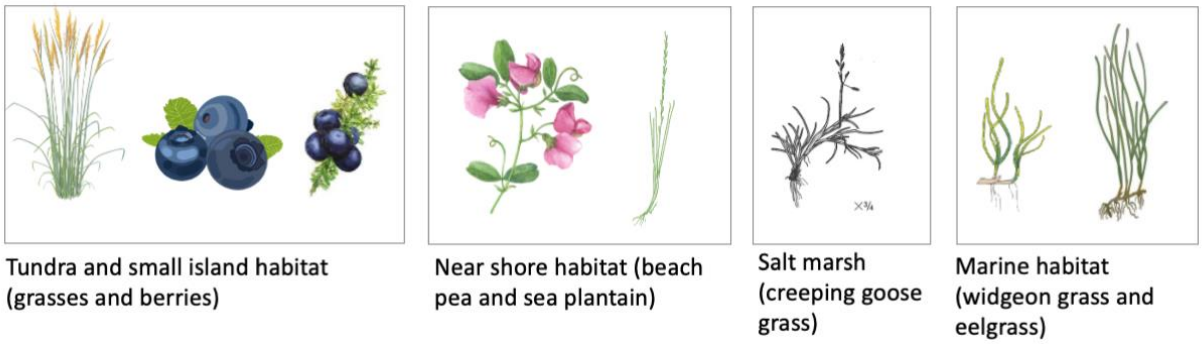

Figure 1 Examples of plants consumed by Canada geese associated to different coastal habitats in eastern James Bay [10].

To determine the diet of Canada geese during the fall migration, I opted to use stable isotope ratios. Stable isotope ratios or isotopic signatures are commonly used in ecology to determine the diet composition of animals. Every living organism has a distinct isotopic signature (**Figure 2**). When an organism is consumed, the consumer absorbs the isotopic signature of the consumed organism in its tissues (blood, muscle, and bones). Because Canada geese are herbivores, the tissues store isotopic signatures of diverse plants consumed in the last few days to months. As such, we can extract isotopic signatures from Canada geese to assess the diet.

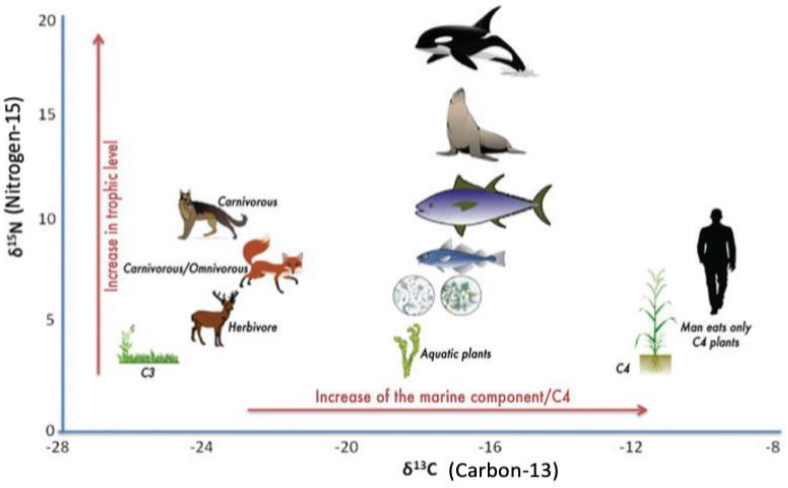

Figure 2 Stable isotopes come in several forms. The figure shows the carbon and nitrogen stable isotopes that differ between species. www.intechopen.com.

Different animal tissue types (e.g. blood, liver, bones, feathers and claws) are replaced throughout time. Certain tissues, such as blood, are replaced more frequently than others (muscles and feathers). Isotopic signatures in tissues with a rapid turnover reflect what the animal ate in the short term (days to weeks), whereas isotopic signatures in tissues with a slower turnover reflect what the animal ate over a longer period (months to years).

According to a recent CHCRP study, fall and spring migrating Canada geese stay 3 to 4 days in the coastal region of Eeyou Istchee [2]. It was therefore critical to choose a tissue with a rapid turnover to assess the diet of birds passing through eastern James Bay. Blood is made up of two parts: red blood cells and plasma. In birds, blood plasma is replaced every 3 to 4 days, while the red blood cells are replaced every two to three weeks [11]. **Because geese spend so little time in eastern James Bay, blood plasma is an ideal tissue to assessing diet using stable isotope analysis.**

Diet composition of birds can be determined by comparing the isotopic signatures of different plants to isotopic signatures in bird tissue (**Figure 3** example of a study conducted in New Zealand, Ferries 2021).

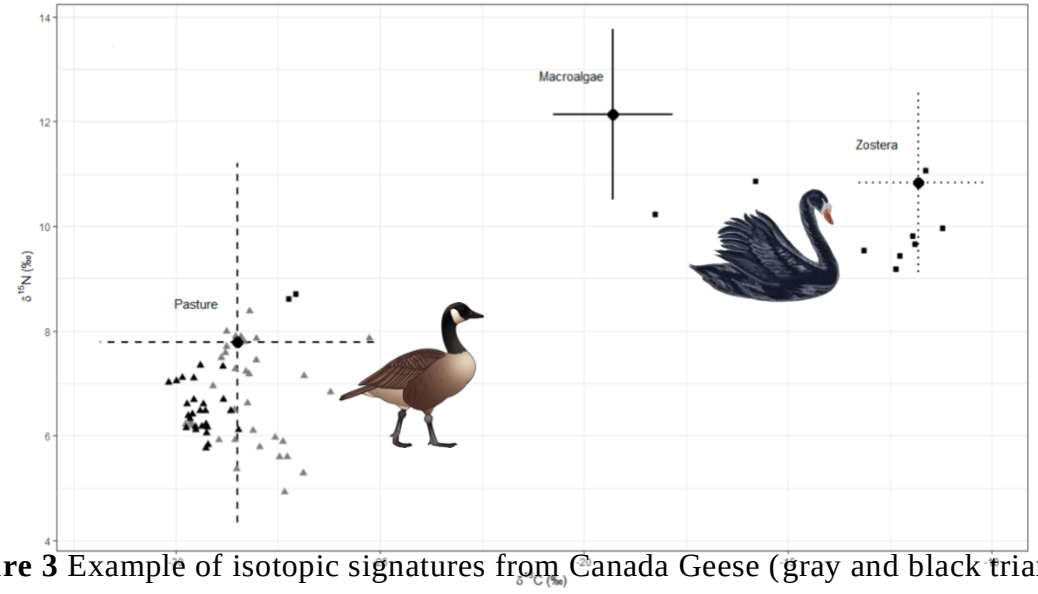

Figure 3 Example of isotopic signatures from Canada Geese (gray and black triangles) and Black Swan (black squares) plasma tissue. The error bars represent the mean isotopic signature of different food items (pastures, macroalgae, seagrass *Zostera*). Canada geese mainly forage in pastures, while Black swain mainly eat seagrass *Zostera* [11].

For the summer 2022 fieldwork campaign, I had planned two different research activities, plant collection and Canada geese tissue sampling. The first research activity consisted in collecting plants known to be consumed by geese during the fall migration. The plants were identified to the species (when possible), dried and stored. The second research activity involved collecting tissue from harvested geese during the fall goose hunt, which was done in collaboration with Cree hunters. For each goose carcass, we recorded the location where it was harvested. We asked the hunters if the goose was a long- or short neck (see description below) and if the goose was lean or fat and took a blood sample (when possible). We took different morphometric measurements. We collected food items in esophagi and gizzards (when possible). I had intended to collect plants and tissues in Chisasibi, Wemindji, Eastmain, and Waskaganish from August 2022 to September 2022.

FIELDWORK ACTIVITIES SUMMER-FALL 2022

Plant collection

From late July to early September, I collected 94 samples in 65 locations and over 24 different plant species were identified. The plant samples were dried (60°C for 48 hrs) and stored. I was able to collect plant samples in various locations such as small coastal islands, salt marshes, near shore habitats and marine habitats near Chisasibi, Eastmain and Waskaganish (**Figure 3**). Linsday Carlson provided me a few eelgrass samples from Chisasibi. Several plant species, such as sea plantain (*Plantago maritima*), showed signs of grazing, presumably by Canada geese. There was very low abundance of berries during the time of sampling.

Harold Whiskeychan (trapline R2 tallyman) sampling eelgrass in Boatswain Bay (August 19, 2022).

Sea plantain (*Plantago maritima*) (Boatswain Bay, August 19, 2022). This plant grows near the coastline and is consumed by Canada Geese [10]. Many sea plantains showed signs of grazing, presumably by Canada Geese.

Creeping goose grass (*Puccinellia phryganodes*) with geese feces, indicating a probable feeding area (Boatswain Bay, Aug. 19, 2022). This plant grows in salt marshes and is consumed by Canada Geese [10].

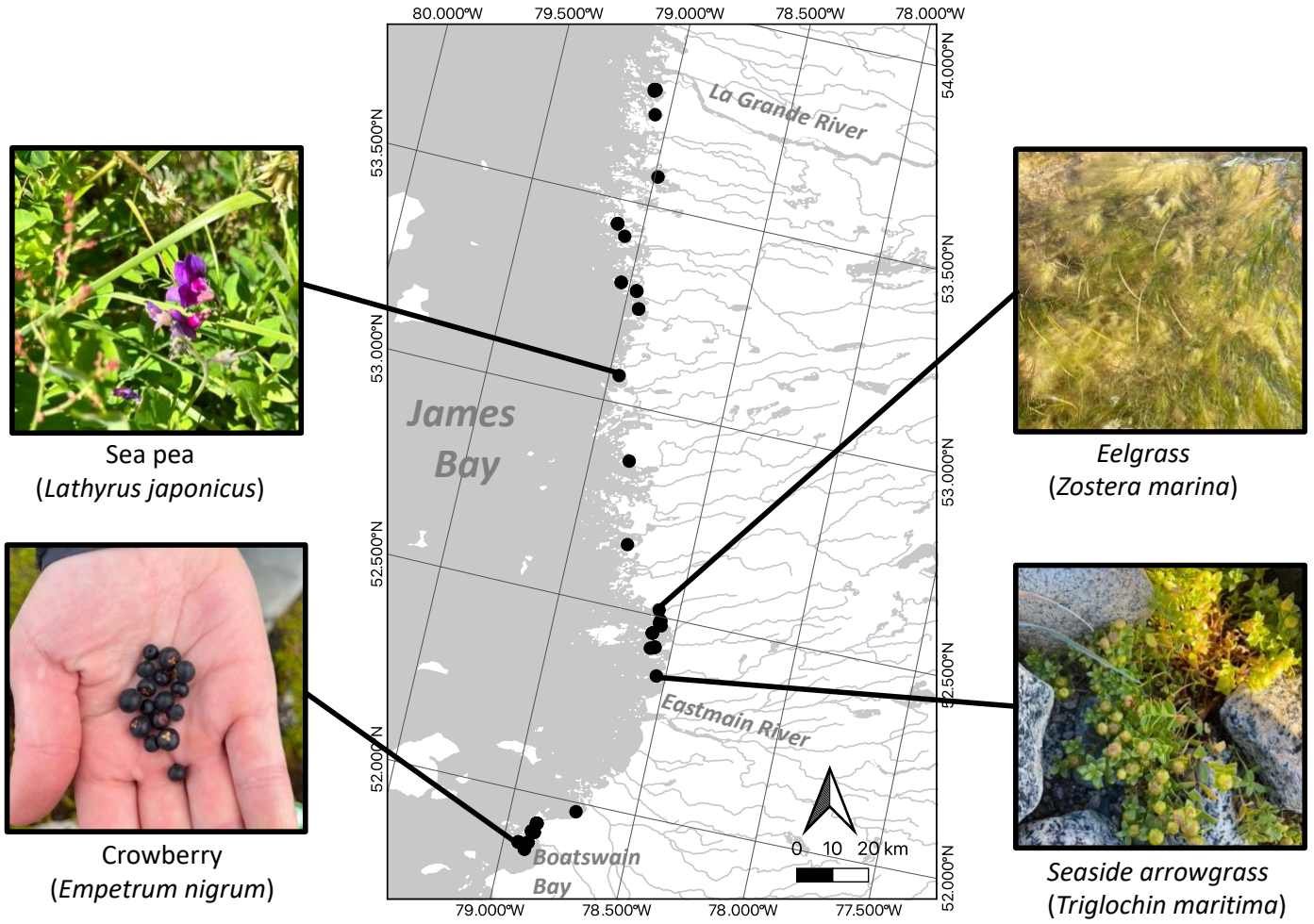

Figure 3 Locations (black circles) where plant samples collected between August to September 2022. Eelgrass, seaside arrowgrass, sea pea and crowberries are consumed by Canada Geese in eastern James Bay [10].

Canada Geese sampling

There are four populations of Canada geese migrating along the eastern James Bay (**Figure 4**). Past surveys report that most of the Canada geese harvested in the 1970s were associated with the Atlantic Population (AP) and a few from the Southern James Bay (SJBP) and Southern Hudson Bay Population (SHBP). Geese from these populations, which breed in the sub-arctic are *Branta canadensis interior* subspecies and are called "short-necks" by Cree hunters [3]. Molt migrant of sub-adults and failed breeders from the Atlantic Flyway Resident Population and Mississippi Flyway Giant Population that migrate in Eeyou Istchee are locally called "long-necks" by Cree hunters [3]. They are largely made up of *B.c. maxima*, which are bigger than *B.c. interior*. For more than a decade, Cree have noted a decrease in the number of short-necks near James Bay's east coast and an increase in long-necks [3]

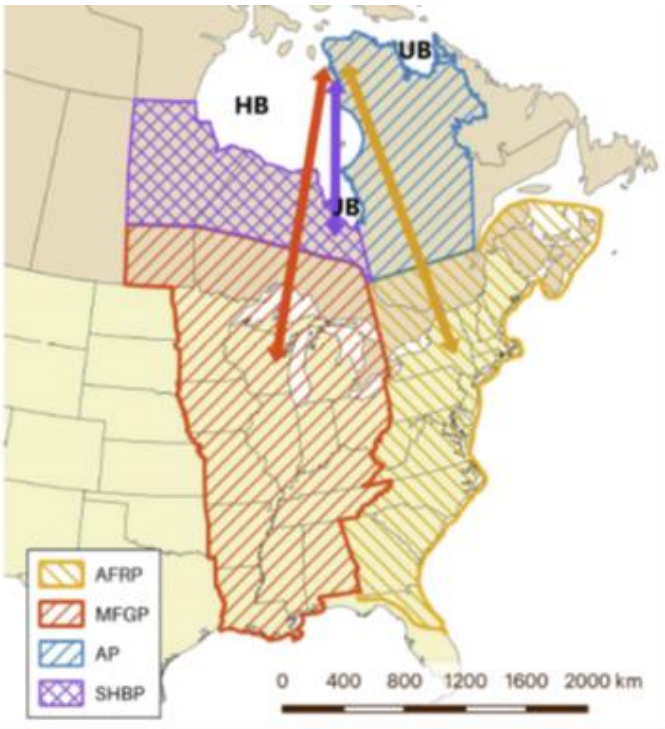

Figure 4 Breeding ranges of the four populations of Canada Geese migrating along the eastern coast of James Bay: AFRP: Atlantic Flyway Resident Population; MFGP: Mississippi Flyway Giant Population, AP: Atlantic Population, SHBP: Southern Hudson Bay Population. Molt migrant movement represented by arrows. Source: Giroux et al. 2022.

I had planned to collect Canada geese blood samples in four coastal communities, but due to scheduling constraints, I was unable to do so. For the fall of 2022, I collected Canada geese samples in Eastmain and Waskaganish. The fall goose hunting season in Chisasibi and Wemindji normally runs from September 4 to September 20 (two weeks after Labor Day). According to Niskamoon Local Officers, most hunters do not stay at camp for the fall goose hunt, but instead go on day outings when the weather is good.

Canada Geese sampling

From September 9 to September 22, we took morphometric measurements on 45 geese (15 from Eastmain; 30 from Waskaganish), collected the gut content from 24 geese (Waskaganish). Based on Cree knowledge, 28% of the harvested geese were long-necks and 37% were short-necks (33 % not identified). Fifty-one percent of the geese were considered lean.

Stephanie Varty taking measurements on a goose, August 2022, Eastmain.

Unfortunately, I was unable to collect blood samples from harvested geese for stable isotopic analysis. Soon after the bird is harvested, the blood starts to clog. When the blood is thick, it cannot be separated into plasma and red blood cells. Without the plasma, it is impossible to assess the diet of Canada geese within the short-term (couple of days). Faced with these challenges, I had to reconsider my approach to evaluating the diet of Canada geese. I describe an alternative method in the following section. The food items in esophagi and gizzards were stored in alcohol.

While I faced some hurdles this summer, I had many great experiences. First, I would like to acknowledge the help I got from Stephanie Varty, who was my first teacher in goose plucking. Stephanie helped me connect with a few hunters in Eastmain. I enjoyed my time at Harold Whiskeychan's camp (4 days). This experience improved my understanding of the fall goose hunt and how to better merge goose monitoring with the Cree fall goose hunt.

Sarah Diamond and myself at Harold Whiskeychan's camp, September 2022, Waskaganish. Sarah Diamond was an excellent teacher – from goose plucking to hunting, I have learned a lot about the Cree Way of Life through her.

BUDGET 2022

The total cost of research for 2022 was around $26,000, which was funded by Wildlife Habitat Canada and Niskamoon. Six thousand dollars were spent on field equipment, nine thousand dollars were spent on fieldwork expenses (accommodations, food, and gas for two months), and nine thousand dollars were spent on community engagement (consultations, compensation for hunters). The EMRWB funds ($20,000) will be used to support fieldwork costs during the summer of 2023.

PLANNED ACTIVITY FOR 2023-2024

I'm now preparing for fieldwork in the summer of 2023. Instead of using isotopic signatures to assess Canada geese diet, I am considering another approach that is conducive to high community engagement. The DNA in wildlife fecal samples is a non-invasive, accurate and cost-effective method to assess the diet [12]. This approach is increasingly being used to analyze diet, and it is appropriate for remote areas because it does not require specific equipment to collect samples, and samples may be obtained by any community member following a simple protocol. After collecting samples, they can be sent to a lab (Centre for Biodiversity Genomics, University of Guelph) for analysis. When compared to isotopic stable isotopes analysis, DNA wildlife fecal metabarcoding is less expensive and does not require the collection of plants. I am in still in the preliminary stages of planning, but I believe this approach is very promising. I hope to complete objective 1 (assess diet) by December 2023 and complete objective 2 and 3 by December 2024.

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