BEAVER RESEARCH

BARIN NEWSLETTER

ISSUE 3 | JANUARY 2024 |

BARIN BEAVER PROJECT: UPDATE

By Helen Wheeler (on behalf of the BARIN Team)

It has been a busy winter so far for the BARIN team and collaborators. A highlight was the BARIN and CINUK meetings in the UK. It was exciting to have both Max Kotokak Sr. and Kevin Arey visit us in the UK and to be joined by many Canadian and UK university partners. Thanks to all who were able to come. An enjoyable time was spent discussing how to progress the project and coming up with new ideas for working together. In particular, we are looking to work with EMSA to create a beaver monitoring app that can be used by the community. Thanks to Tyrone Raddi for his support.

In February, a number of us will be attending the Arctic Beaver Observation Network (ABON) meeting, both presenting BARIN research and sharing knowledge about beavers. We will also be providing an update at the FJMC annual meeting. Thanks again to everyone who has and continues to support BARIN, sharing knowledge, providing advice, working together on funding applications to extend the work, and participating in and collaborating on the research. We look forward to further ongoing discussions.

Helen Wheeler

Photo (left): Members of the BARIN team presenting at the CINUK Annual Science Meeting in Cambridge, UK.

Presenters from left to right: Max Kotokak Sr, Helen Wheeler, Georgia Hole, Joseph Culp, Ben deVries, Callum Pearce, Kevin Arey

Photo by Jean Holloway

BEAVER IMPACTS ON COMMUNITIES

By Callum Pearce (Anglia Ruskin University)

In November we hosted Max Kotokak Sr. and Kevin Arey in Cambridge, UK, where we were attending the annual meeting of CINUK: the Canada-Inuit Nunangat-United Kingdom research programme, who are funding our work. CINUK support community-led research across the four regions of Inuit Nunangat (the ISR, Nunavut, Nunavik, and Nunatsiavut). Other groups at the CINUK meeting included people from SmartICE and the Nuna permafrost project who work in Tuktuyaaqtuuq. Between work meetings, we took some time with Max and Kevin to go punting on the river and visit English pubs around Cambridge.

At the start of February, I will be returning to the ISR to speak to people in Akłarvik about environmental change and the impact of beavers. I know that beavers have been a real concern there over the past few years. I'm hoping to find out more about how they have affected the ways people fish, hunt, trap, and move across the land to add to what I learnt in Inuuvik and Tuktuyaaqtuuq over the summer. If you have any advice or suggestions, or want to tell me why beavers are such a big problem, I can be reached at callum.pearce@aru.ac.uk.

I will be in the ISR between 3 and 23 February, after which I will be heading to Alaska for the meeting of the Arctic Beaver Observation Network (A-BON) in Fairbanks. Last year this meeting was held in Yellowknife. It offers a good opportunity for communication between scientists, representatives of Indigenous groups, and environmental monitors from across the Arctic, and I know that some people will be going from the ISR.

Punting in Cambridge, UK. Pictured (left to right): Max Kotokak Sr., Callum Pearce, and Kevin Arey (behind Callum). Photo by Georgia Hole.

Water samples collected from lakes around Trail Valley Research Camp (photo by Katie Bennett)

Lab equipment used to measure nitrogen in water samples (photo by Katie Bennett)

BEAVER IMPACTS ON LAKE CHEMISTRY

By Katie Bennett (University of Montreal)

The lake biogeochemistry team has been hard at work in the lab these past few months. After collecting samples and measurements to assess lake chemistry in the field this summer, we brought many water and gas samples to Montreal for further analysis. Water samples were analyzed to measure the amount of carbon, nitrogen, and phosphorus to help us understand how beavers may influence lake nutrient levels.

We are also more than halfway through analyzing 1000 gas samples that we collected from lakes this summer to determine how much carbon dioxide and methane (greenhouse gases) are emitted to the atmosphere from our study lakes.

Using both water chemistry and gas data allows us to understand what water chemistry is associated with different emissions levels and identify the impact of beavers on nutrients in lake water and greenhouse gas emissions. We are looking forward to assessing our results this winter once the lab analyses are complete!

BEAVER IMPACTS ON HYDROLOGY

By Jackson Seto (Wilfrid Laurier University)

Over this past summer, my research focused on comparing the hydrology of locations with beaver dams and locations without beaver dams. This involved looking at the differences between lake water levels, and streamflow at lakes around Trail Valley Creek research station. Currently, we are processing all our lake water level data as well as validating our streamflow measurements. We have data from 30+ lake sites with some having beaver dams on them, while others do not. Some of our preliminary results which we have seen comparing our two study watersheds (Trail Valley Creek and Hans Creek watershed) is that typically Hans Creek watershed has far more beaver activity, which suggests that lake-rich locations will tend to have more dams than locations with less lakes and more streams.

In terms of influencing hydrological factors, active beaver dams and more recently built dams, will alter the streamflow and water levels of lakes drastically more than old or abandoned dams. Active dams typically were seen to keep lake water levels significantly higher and keep those water levels high for a longer period throughout the entire summer, compared to lakes nearby which had no beaver dams influencing them. By our next newsletter, we are hopeful that the data processing will be complete, and we will be able to present specifics between lake level changes and streamflow changes of the lakes we have studied over the summer.

Beaver sighted at one of the lake study sites (photo by Malcolm Brockett)

Example of an abandoned dam in Hans Creek (photo by Jackson Seto)

Example of a active overflow dam in Hans Creek (photo by Jackson Seto)

Dam in Trail Valley Creek raising lake water levels (photo by Jackson Seto)

BEAVERS, FOOD WEBS AND MERCURY

By Mathew Mervyn (Wilfrid Laurier University)

Since the last newsletter in September, our team has wrapped up our field work and we are now in the middle of processing and analyzing our summer 2023 samples in the laboratory. During the summer 2023 field campaign, we collected water samples to analyze for water chemistry metrics at an Environment and Climate Change Canada laboratory. We also collected sediment from our stream sites, riparian vegetation, aquatic insects, and fish from six beaver impacted streams and nine streams without beaver activity.

Using a method called Stable Isotope Analysis, these samples will give us the information needed to understand food web structure and connectivity between trophic levels. We will also be able to measure mercury across all food web levels to see if mercury concentrations are accumulating in stream biota such as aquatic insects and fish. Our water quality samples are currently being analyzed for metrics including the levels of nitrogen, phosphorus, and sulfur. We also have water samples and sediment samples being analyzed for mercury and methylmercury.

Currently, I'm working in the lab sorting the aquatic invertebrates that were collected from the streams and classifying them by family. Once sorted, I will conduct stable isotope analysis to determine a family's position in the food web.

In November, we were able to present a poster entitled "Impacts of Beaver Activity on Food Web Structure and Mercury Bioaccumulation" and a short presentation at the CINUK meeting in Cambridge to share our findings thus far. We were thrilled to see everyone who was able to attend and hear all the updates!

We are excited to continue our lab work throughout the winter months and share our progress in the future.

Photos above: invertebrates collected from streams near Inuvik. Top to bottom (by family group): Corixidae, Amphipoda, Nemouridae

Photo (left): Dissecting microscope used to sort invertebrates by family. Photo by Mathew Mervyn.

BEAVER POPULATIONS AND TREE RINGS

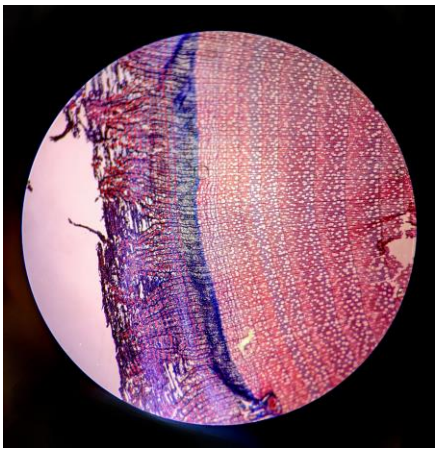
By Georgia Melodie Hole (Anglia Ruskin University)

Since the last newsletter my focus has been on lab work to process shrub samples collected from the ISR in the summer; to produce the data and analyses that will address the question: What is the distribution of beaver populations and how have the populations changed over the recent past?.

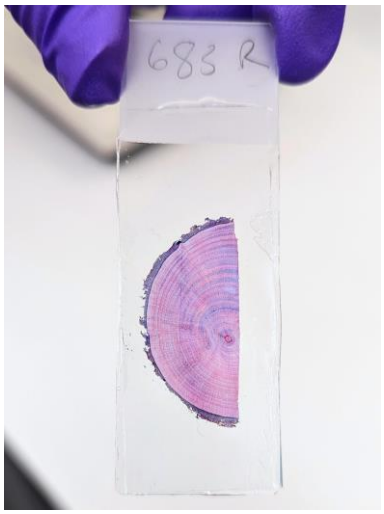
The first step has been to analyse cross sections to reveal the annual growth rings. As Arctic willows can have very narrow and locally absent growth rings, thin sections are made to aid their visibility and measurability. This entails cutting very thin slices of each shrub, which are then stained to increase the clarity of the anatomical features. The yearly growth rings within can then be measured under a microscope, and the resulting time series of growth ring widths provides a 'chronology' of the past growth patterns of that shrub until it was cut. Multiple chronologies can then be carefully crossdated and combined from multiple shrubs, creating a regional chronology that reflects the climatic trends that impacted shrub growth in the region.

Individual samples that have beaver-browsing scars can then also be cross-dated with this regional chronology data, which can then provide a calendar year for when the beaver-browsing scar was made, and hence a calendar year for occupancy by beavers of the site where that sample shrub was collected. As I continue this process for hundreds of samples, this will build the history of beaver occupancy across the sites in the region.

Many members of the BARIN team also came together at the CINUK Annual Science Meeting in November in Cambridge, UK. Helen Wheeler, Callum Pearce, and myself were lucky to be joined by Ben deVries and Joseph Culp, as well as Imaryuk monitors Max Kotokak Sr and Kevin Arey from the Inuvialuit Joint Secretariat. It was a great chance to meet as a team, and to hear about the diverse other CINUK projects, that each align with the National Inuit Strategy on research objectives and actions and include strong Inuit involvement from the outset in their co-development and management.



A stained shrub thin section viewed through a microscope (photo by Georgia Hole)



A stained shrub thin section on a microscope slide (photo by Georgia Hole)

THANK YOU TO OUR FUNDERS AND SUPPORTERS

Thank you to CINUK (Canada – Inuit Nunangat – United Kingdom Arctic Research Programme), Polar Knowledge Canada (POLAR), Fonds de recherche du Québec (FRQ), the International Arctic Science Committee, and UK Research and Innovation (UKRI) for supporting and funding the BARIN project. We are also grateful to the Inuvialuit Game Council and Inuvik, Tuktoyaktuk and Aklavik HTCs for their support.

BARIN research is conducted through a collaboration of the following institutions: Anglia Ruskin University (UK); Wilfrid Laurier University (Canada); Fisheries Joint Management Committee, Inuvialuit Joint Secretariat (Canada), University of Guelph (Canada), University of Cambridge (UK), Université de Montréal (Canada); University College London (UK), University of Kent (UK), Government of Northwest Territories (Canada), Environment and Climate Change Canada, University of Saskatchewan (Canada).

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