

Field Report 2023 – 02 015 23R-M

Project Title: Northern Ellesmere Island in the Global Environment (NEIGE)

Permit Numbers:

- Nunavut Research Institute Scientific Research License: 02 015 23R-M
- Parks Canada Research Permit: QUT-2022-42119
- Nunavut Impact Review Board (11YN025)

Principal Investigator:

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Field Research Team:

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Total Person Nights:

- PCSP facility in Resolute Bay: 43
- Northern Ellesmere Island:
 - o Ward Hunt Island: 25
 - o Markham Lake: 25
 - o Thores Lake: 20
 - o Lake C2: 15

Fieldwork Locations

- PCSP facility in Resolute Bay: N74° 43' 14.2" W94° 59' 28.0"
- Northern Ellesmere Island:
 - o Ward Hunt Island: N83° 05' 07.3" W74° 08' 52.1"
 - o Markham Lake: N83° 02' 58.6" W70° 53' 32.5"
 - o Thores Lake: N82° 39' 59.0" W73° 43' 22.0"
 - o Lake C2: N82° 49' 37.7" W77° 59' 21.3"

Accomplishments on the field

We conducted two field campaigns in 2023. In May, we sampled lakes around Resolute Bay (Meretta Lake, Char Lake, Resolute Lake, Small Lake) to understand under-ice processes and microbial communities, prior to ice-off. In July, we returned to the Resolute Bay lakes, and also travelled northward to Northern Ellesmere Island, where we continued our environmental monitoring program, and collected samples to understand the ecology of four lakes in the region (Ward Hunt Lake, Markham Lake, Thores Lake, Lake C2). More specifically, we worked on the following:

1. Environmental monitoring. We continued our long-term measurements from climate stations, permafrost monitoring and automated cameras on Ward Hunt Island. We are making these data available to all stakeholders including northern communities by publication in the online, open access data report series Nordicana D (available [here](#)). We also retrieved another 1-year record of lake temperatures and underwater light at Ward Hunt Lake and reinstalled the instruments for retrieval next year. We downloaded the high-resolution automated camera at Ward Hunt Lake to track the changes in ice cover. These data support our monitoring efforts on Ward Hunt Island, and provide the opportunity to follow the consequences of environmental change on a single lake, using multiple parameters (weather data, ice cover, lake water temperature and oxygen content, etc.).

2. Lake profiling. We continued our measurements tracking water column change, with profiling of Northern Ellesmere Island lakes (Ward Hunt Lake, Markham Lake, Thores Lake and Lake C2). These data will be made available through Nordicana D (the record available [here](#) will be updated in the coming months), and will provide further insight into how lakes on Northern Ellesmere are responding to environmental change.

3. Microbiological research. We sampled the microbial communities of lakes on Northern Ellesmere (Ward Hunt Lake, Markham Lake, Thores Lake and Lake C2) and on Cornwallis Island (Meretta Lake, Char Lake, Resolute Lake, Small Lake). We collected samples for environmental viruses and other microbes and made physico-chemical measurements. These samples are currently being processed. In the coming months, we will obtain genetic information from these samples allowing us to describe the composition and functional roles of microbes in these lakes.

4. Ice sampling. To assess the microbial populations that are released from melting lake ice into freshwater environments, we collected ice samples from lakes on Northern Ellesmere (Ward Hunt Lake, Markham Lake, Thores Lake and Lake C2) and on Cornwallis Island (Meretta Lake, Char Lake, Resolute Lake, Small Lake), as well as lake water from directly under the ice. We also collected surface samples from glaciers in the Markham Lake watershed. Ice cores were melted on the field and processed for microbiological characterization and physico-chemical analyses.

5. Biogeochemical cycling. We sampled sediments and the water column from both basins of Meretta Lake (Cornwallis Island) to measure fluxes of major and trace elements, to understand microbial productivity in this lake impacted by human activity.

Community Consultation: We work closely with the Resolute Bay community and collaborate with an elder for work on Cornwallis Island. We also consult with Resolute Bay and Grise Fiord (with Inuktitut translations) via our permitting applications and reports for Parks Canada (Nunavut Field Unit, Iqaluit), and our involvement in the Management Plan for Quttinirpaaq National Park.

Future Plans: We would like to return to Cornwallis Island in June of 2024 to continue our work on the lakes around the community of Resolute Bay.