

Annual Report 2023: Impacts of Melting Tidewater Glaciers on Marine Biogeochemical Cycles
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Our goal is to characterize the impact of glacial runoff and meltwater plumes on downstream marine production and carbon cycling. Fieldwork was conducted in the Qikiqtani Region, focusing on the marine region of Jones Sound and surrounding tidewater glaciers on Ellesmere Island (Jakeman Glacier). Prior to conducting our 2023 field season, consultations were undertaken with the local Hunters and Trappers Association (HTA) and the hamlet regarding our 2023 research plans. In accordance with recommendations from the HTA, we tailored our research plans to hire boats from the local outfitter Ausuittuq Adventures as well additional HTA members instead of working with the *S/Y Vagabond*. Permission to enter Grise Fiord to conduct our field work was received directly from the Hamlet. This year, we also worked collaboratively with the Hamlet and the Arctic Research Foundation to bring sea can laboratory to Grise Fiord where we and community members could conduct research activities. We lost Dr. Maya Bhatia, lead of this work, in a tragic accident during on-glacier sampling in 2023. As a result, our field activities in 2023 were cut short and were limited, but are described below.

(i) *Marine-based activities*: In Aug 2023, we sampled using Larry Audlaluk's vessel as well as a small vessel we brought with us, suitable for moving from sea ice to water safely. With community members, we used these platforms to make sensor-based observations of the ocean and take a limited number of samples. We sampled right offshore of the community twice, within Grise Fiord, as well as in proximity to Jakeman Glacier. On both vessels, we measured seawater conductivity, temperature, pressure, photosynthetically available radiation, dissolved oxygen, and turbidity to map the extent of glacial plume discharge in the summer and its potential impact. In total we collected data from nine stations in the summer, with multiple measurements taken at several depths at each of these stations. We also collected and processed roughly 30 samples along these transects to measure dissolved chemical (nutrients, oxygen) properties and biological (chlorophyll content, particulate organic carbon and nitrogen) properties.

(ii) *Freshwater activities*: As a result of community discussions, we enhanced our observations of freshwater quality in the stream and glacier in Ausuittuq this year, as well as in glacier meltwater from marginal streams near Jakeman Glacier. We sampled seven different freshwater locations this year, all near the community or marginal to Jakeman Glacier and examined temperature, conductivity, nutrients, pH, trace elements, and biological properties of these freshwater samples.

(iii) *Community-engagement activities*: Ahead of this past year's field season, we prepared in-depth research products to share with our collaborators and other community members in Ausuittuq. Each of the southern researchers from our team, who have been working with the community or with data acquired from our collaborative work in the region, prepared printed communication tools we called flip books to present to the community and use as a tool for discussion during a community meeting as well as informally during our visit. We shared these in both English and Inuktitut. One example is provided here (Figure 1). These were very well-received, and brought us into a new phase of collaboration with community members in Grise Fiord, fueling discussions about enhancing our activities to be year-round and more community-led. We also brought a very large, wall-sized map of the region which we gave to the hamlet and used to facilitate discussions, both during a large community meeting as well as informal discussions in the gym. This map is still hanging in the gym in Ausuittuq.

I returned to Grise Fiord in Dec of this year to discuss with the community about how and whether they would like to proceed with the research activities that Dr. Bhatia had initiated with them. They indicated continued interest in collaborating to make ocean measurements and observations about changes to the physical, chemical and biological conditions, interest in more community members becoming involved, and interest in enhancing safety protocols around research activities. As a result of these conversations, our group is returning to Ausuittuq in 2024 to work with the community to identify oceanic locations to establish repeat sampling and monitoring stations, and to mourn and grieve together. Surely our work in the region will look different due to the loss of Dr. Bhatia- who was the heart and soul of our program- but we look forward to a re-imagined program in close partnership with the Ausuittuq community.

