



We are a scientist team from Université du Québec à Rimouski (UQAR) led by Professors Michel Gosselin and André Rochon. The team also comprises Kaven Dionne (postdoctoral researcher) and Coralie Voyer (student researcher in 2019); another student researcher might join us in 2020 (to be confirmed). As part of the Coastal Environmental Baseline Program of Fisheries and Oceans Canada, we propose to study the microscopic algae in the water of Frobisher Bay, near Iqaluit, Nunavut, in August 2019 and in September 2020. The objective of our scientific project would be to identify and describe the microscopic algae species present in Frobisher Bay, near Iqaluit. This project would help us to complete an algae species database that would be used to detect the introduction of new or toxic algae species in the Frobisher Bay region and in other ports in the Canadian Arctic. We would sample algae from a boat chartered from Alexander Flaherty (Polar Outfitting, Iqaluit) at different locations in Koojesse, Peterhead and Tarr Inlets (23 locations in total). We would not take any sample from protected areas. At each location, we would sample algae from the water column using 1) a small plankton net (mouth diameter = 0.3 m; height = 0.9 m) and 2) a 5 L bottle followed by filtrations. We would also sample algae from the first few centimeters of sediments at the bottom of the water on an area about 0.04 m<sup>2</sup> using a small grab sampler. Each year, our sampling campaign would last about 3 to 4 days, mainly depending on weather, and would involve 2 researchers from UQAR and 1 Iqalummiuq (beside Alexander Flaherty). Sample collection does not involve tagging or fishing, and any bycatch would be released as soon as possible with minimum stress. Because the samples we would take would be very small, we expect that the impact of our project on the environment would be negligible. The 2 researchers from UQAR would perform laboratory analyses and would be lodged at the Nunavut Research Institute of Iqaluit. We would bring back to UQAR filters with algae on them and sediment pellets to be processed at UQAR for further analyses. Our results would be made available to the public through websites and through a public presentation in Iqaluit at the end of the project. We expect to publish the findings of this work in peer-reviewed scientific journals.

▷ΔΛΠ◁: Nous sommes une équipe scientifique de l'Université du Québec à Rimouski sous la direction des professeurs Michel Gosselin et André Rochon. L'équipe inclut également Kaven Dionne (chercheur postdoctoral) et Coralie Voyer (chercheure étudiante en 2019); un autre chercheur étudiant se joindra peut-être à l'équipe en 2020 (à confirmer). En tant que participant au Programme sur les Données environnementales côtières de référence de Pêches et Océans Canada, nous proposons d'étudier les algues microscopiques dans l'eau de la baie de Frobisher, près d'Iqaluit, Nunavut, en août 2019 et en septembre 2020. L'objectif de notre projet scientifique serait d'identifier et décrire les espèces d'algues microscopiques présentes dans la baie de Frobisher, près d'Iqaluit. Ce projet aidera à compléter une base de données qui sera utilisée pour détecter l'introduction d'espèces d'algues envahissantes ou toxiques dans la région de la baie de Frobisher et dans les autres ports de l'Arctique canadien. Nous échantillonnerons les algues à partir d'un bateau affrété auprès d'Alexander Flaherty (Polar Outfitting, Iqaluit) à différents sites de Koojesse, Peterhead et Tarr Inlets (23 sites au total). Aucun échantillon ne serait collecté dans une aire protégée. À chaque site, nous échantillonnerons des algues de la colonne d'eau en utilisant 1) un petit filet à plancton (diamètre de l'ouverture = 0,3 m; hauteur = 0,9 m) et 2) une bouteille de 5 L suivie de filtrations. Nous échantillonnerons également des algues dans les premiers centimètres de sédiments au fond de l'eau sur une aire d'environ 0,04 m<sup>2</sup> en utilisant une petite benne. À chaque année, notre campagne d'échantillonnage durera entre 3 et 4 jours, tout dépendant de la météo, et impliquera 2 chercheurs de l'UQAR et 1 Iqalummiuq (en plus d'Alexander Flaherty). La récolte des échantillons n'implique pas la pêche ou le marquage de poisson, et toute prise accessoire serait relâchée dès que possible avec un minimum de stress. Parce que les échantillons seront très petits, nous prévoyons que les impacts environnementaux de notre projet seront négligeables. Les 2 chercheurs de l'UQAR effectueront des analyses en laboratoire et seront logés au Nunavut Research Institute d'Iqaluit. Nous ramènerons à l'UQAR

Operations Phase: from 2019-08-01 to 2020-09-30

$$\Lambda \subset \mathbb{N} \triangleleft \mathbb{N} \xrightarrow{\sigma} \mathbb{N}^{\mathbb{N}} \supset \mathbb{C}$$
[illegible][illegible]

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ΔᓴᖅᓷΔᕐ	Mosha Côté	Nunavut Research Institute	2019-04-10
ΔᓴᖅᓷΔᕐ	Rick Armstrong	Nunavut Research Institute	2019-02-18
ΔᓴᖅᓷΔᕐ	Jamal Shirley	Nunavut Research Institute	2019-04-30
ΔᓴᖅᓷΔᕐ	Alexander Flaherty	Polar Outfitting	2019-05-11
ΔᓴᖅᓷΔᕐ	Zoya Martin	Fisheries and Oceans Canada	2019-04-30
ΔᓴᖅᓷΔᕐ	Noah Alokie	Hunters and Trappers Association	2019-04-30

[illegible]

$a^b r^c \wedge c^d e^f \vee d^g h^i$  በበፍጋሪ:

## South Baffin

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ᐸᓚᓴᓂᓄᓇ ᐸᓚᓴᓂᓄᓇ ᐸᓚᓴᓂᓄᓇ	SCIENTIFIC RESEARCH LICENCE - Physical / Natural Sciences RESEARCH	Applied, Decision Pending		
ᐸᓚᓴᓂᓄᓇ ᐸᓚᓴᓂᓄᓇ ᐸᓚᓴᓂᓄᓇ ᐸᓚᓴᓂᓄᓇ	LICENCE TO FISH FOR SCIENTIFIC PURPOSES IN THE WATERS OF THE NORTHWEST TERRITORIES, YUKON NORTH SLOPE, AND NUNAVUT TERRITORY	Not Yet Applied		

## Project transportation types

Transportation Type	Transportation Details	Length of Use
Water	Chartered boat (owner: Alexander Flaherty, Polar Outfitting, Iqaluit, Nunavut)	
Land	Pick-up (locally rented)	

### Project accomodation types

$\mu_{\text{C}} \approx 0$

Λ<sup>9</sup>d<sup>c</sup> d<sup>a</sup>r<sup>z</sup><sup>b</sup> d<sup>5</sup>c<sup>d</sup>σ<sup>d</sup>h<sup>z</sup><sup>b</sup> Δ<sup>c</sup><sup>b</sup>r<sup>d</sup>n<sup>z</sup><sup>b</sup>r<sup>c</sup> ΔjCΔ<sup>c</sup>, Γ<sup>c</sup>→dPñ<sup>c</sup>, <sup>b</sup>b<sup>a</sup>LCj<sup>b</sup>, μεr<sup>d</sup>c d<sup>a</sup>r<sup>b</sup>r<sup>c</sup>→

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ΔL<sup>5b</sup> ΔD<sup>5b</sup> CD<sup>5b</sup> ΔL<sup>5b</sup> ΔD<sup>5b</sup>

ᐅᑦᓂ ᑕᑲᑦ ᐱᐅᑦᐅᑦᐅᑦᐅᑦᐅᑦ	ᑦᐅᑦᐅ ᐱᐅᑦᐅᑦᐅᑦᐅᑦᐅᑦᐅᑦ	ᐅᑦᐅ ᐱᐅᑦᐅᑦᐅᑦᐅᑦᐅᑦᐅᑦ
0	N/A	N/A

$\triangleleft^b C d^c$ 
$$\Delta^b C d_c \sim \sigma \Delta^a \sigma^a$$

Inuktitut Name ᐱᑦᓕᓇᓂᔭᓯᒃᓴᓄᓂ	Description ᖅᓄᐸᑐᖅ ᐳᑲᓪᓴᓂ	Weight / Quantity ᖅᓄᐸᓂᓰ ᐳᑲᓪᓴᓂ ᙵᖅᓈᓇᓂᔭᓯᒃᓴᓄᓂ	Disposal Method ᖅᓄᐸᓂᓰ ᐳᑲᓪᓴᓂ ᐳᑲᓪᓴᓂ	Remarks ᙵᓗᓚᖅ ᙵᓯᐸᑲᖅᓴᓂᓄᓂᐳᓄᓂᐳᓄᓂ
Scientific/International Polar Year Research	Packaging materials ᐳᓄᐳᑲᓂᓴᓂᓴᓂᓄᓂ	1 kg	We will bring back any garbage to the Nunavut Research Institute in Iqaluit for proper disposal through the local sanitary service.	N/A

4907D0<sup>c</sup>D<sup>c</sup> 4<sup>b</sup>D<sup>6b</sup>CD<sup>c</sup>LD<sup>c</sup>

This project will improve our capacity to survey, detect and mitigate introductions of new or harmful microscopic algae species in the Frobisher Bay region and in other future ports with high shipping activity. Data collected during this project will contribute to the creation of a comprehensive database containing information on the current and historical distribution of microscopic algae species in the Canadian Arctic, especially in Frobisher Bay. This database will help in determining the status (i.e. native or invasive, new to the region) and the potential origin of novel microscopic algae species in Frobisher Bay.

# **Additional Information**

**SECTION A1: Project Info**

**SECTION A2: Allweather Road**

**SECTION A3: Winter Road**

**SECTION B1: Project Info**

**SECTION B2: Exploration Activity**

**SECTION B3: Geosciences**

**SECTION B4: Drilling**

**SECTION B5: Stripping**

**SECTION B6: Underground Activity**

**SECTION B7: Waste Rock**

**SECTION B8: Stockpiles**

**SECTION B9: Mine Development**

**SECTION B10: Geology**

**SECTION B11: Mine**

**SECTION B12: Mill**

**SECTION C1: Pits**

**SECTION D1: Facility**

**SECTION D2: Facility Construction**

**SECTION D3: Facility Operation**

**SECTION D4: Vessel Use**

**SECTION E1: Offshore Survey**

**SECTION E2: Nearshore Survey**

**SECTION E3: Vessel Use**



## SECTION F1: Site Cleanup

## SECTION G1: Well Authorization

## SECTION G2: Onland Exploration

## SECTION G3: Offshore Exploration

## SECTION G4: Rig

## SECTION H1: Vessel Use

## SECTION H2: Disposal At Sea

## SECTION 11: Municipal Development

[illegible]

This project involves collecting samples in Koojesse, Peterhead and Tarr inlets, near Iqaluit. Work will be done from a small boat chartered from Alexander Flaherty (Polar Outfitting). During each sampling day, the boat will be leaving from and coming back to Iqaluit's port. We will collect phytoplankton samples from the water column using a small phytoplankton net and a 5L Niskin bottle, and sediment samples at the bottom using a small grab sampler. Sediments will be collected up to a depth of 50 m. Tides in the region have a 10 m range, and we will adapt our work hours depending on their cycles for travel safety. Peterhead Inlet is next to Sylvia Grinnell Territorial Park and near Qaummaarviit Territorial Park. However, we will not take any sample from protected areas. Our collaboration with Alexander Flaherty from Polar Outfitting and a Iqalummiuq to be hired through contract to the Amaruq HTA will help us to avoid disturbance of local activities and environment.

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During our project, we will collect microscopic algae, mainly diatoms and dinoflagellates, from the water column and from bottom sediments in Koojesse, Peterhead and Tarr inlets near Iqaluit, Nunavut. The species we will collect are at the basis of the local marine foodweb. The size of our samples will be negligible compared to their concentration in the water and sediments (e.g., million of cells per liter). The main fish species present in the sampling region are Arctic Char, Atlantic Cod, Arctic Sculpin, Capelin and Leatherfin Lump sucker. The main invertebrate species present in the sampling region are Clams, Whelk, Arctic Moonsnail, Barnacle, Crayfish and Deep Sea Kind Crab. The main mammal species present in the sampling region are Ringed Seal and Belugas. We note that we are not planning to collect any animal during our project. Any bycatch will be released as soon as possible with minimum stress. We also note that we will not interfere with any Species at Risk Act (SARA) listed species or their habitats. That is, there is a very low likely-hood of harm or encounters with a SARA species. Our collaboration with Alexander Flaherty from Polar Outfitting and a Iqalumiut to be hired through contract to the Amaruq HTA will also help us to avoid disturbance of animals.

$\dot{L}^{\infty}_{\tau} \nabla_{\theta} \partial_t \psi^{(0)} + \dot{L}^{\infty}_{\tau} \nabla_{\theta} \partial_t \psi^{(1)} = A_{\theta} \psi^{(0)} - A_{\theta} \psi^{(1)}$

Sampling locations in Koojesse, Peterhead and Tarr inlets will be near Iqaluit and Apex, Nunavut. Iqaluit is the capital of Nunavut and is a fast growing city. The inner part of Frobisher Bay near Iqaluit is an area that is affected by shipping activity, which will increase in the future when the deep sea port, currently in development, will become operational. There are fishing and touristic activities in the region. We will confirm with the Amaruq Hunters and Trappers Association whether our sampling locations

### Miscellaneous Project Information

$a \rightarrow b \Delta^{\text{fb}} CD\sigma^{\text{fb}C} \quad d(b)_{\text{fb}} CDPLL^C \quad \text{'fb}\Delta^C) \sigma^{\text{fb}C} \quad < cD\Gamma'LL^{\text{fb}} CD\sigma d^{\text{fb}} \sigma^{\text{fb}C}$

## Cumulative Effects

N/A

## Impacts

$\mathcal{L}(\mathcal{A}) \subseteq \mathcal{L}(\mathcal{B})$

[illegible]

( $P = \langle b \rangle \Delta_P \Gamma \Delta^a \mathbf{e}^{fb} \rangle^c$ ,  $N = \langle b \rangle \Delta^b \Gamma^b \Delta \langle D \rangle \Delta^a \mathbf{e}^{fb} \rangle^c \langle \Delta D \Gamma^b \Delta \Gamma^{fb} \rangle^{fb} \langle D \rangle \Delta^a \mathbf{e}^{fc} \rangle^c$ ,  $M = \langle b \rangle \Delta^b \Gamma^b \Delta \langle D \rangle \Delta^a \mathbf{e}^{fb} \rangle^c \langle \Delta D \Gamma^b \Delta \Gamma^{fb} \rangle^{fb} \langle D \rangle \Delta^a \mathbf{e}^{fb} \rangle^c$ ,  $U = \langle b \rangle \Delta \Gamma \Delta^a \mathbf{e}^{fc} \rangle^{fb}$ )

1	polygon	Koojesse Inlet sampling area
2	polygon	Peterhead Inlet sampling area
3	polygon	Tarr Inlet sampling area