

2019 Nunavut Scientific Research License2019 Research License No. **02 034 17N-M**

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Annual report and extension request for 2020**Research objectives**

The current climate is warming, resulting in changes in Arctic biota as ice thins and retreats. The light penetrating the ocean is affecting photosynthetic processes of marine plants such as phytoplankton. The culture, health and economic capacity of northern communities are closely linked to marine resources supported by the phytoplankton spring bloom (PSB). The PSB represents up to 50% of the total annual primary production that is transferred to higher trophic level exported towards the deep ocean or extracted from the marine ecosystem through fishing and hunting.

The GreenEdge-Legacy project builds upon the work of the GreenEdge project (2015 and 2016) to describe the biological, chemical and physical properties of the marine ecosystem in the Baffin Bay. The two main drivers of the marine ecosystems are nutrient and light availability to the ice algae and phytoplankton. During the GreenEdge-Legacy project, a large focus will thus be on the Arctic nutrient distribution and availability to the marine ecosystem as well as a better understanding of its seasonal pattern as a preconditioning of the next year's PSB. The work will also assess the light properties within the sea-ice and the levels and quality of the light that reaches the water column under the ice layer as a source of energy for the basis of the marine food web. This project is conducted near the community of Qikiqtarjuaq, Nunavut.

2019 Accomplishment

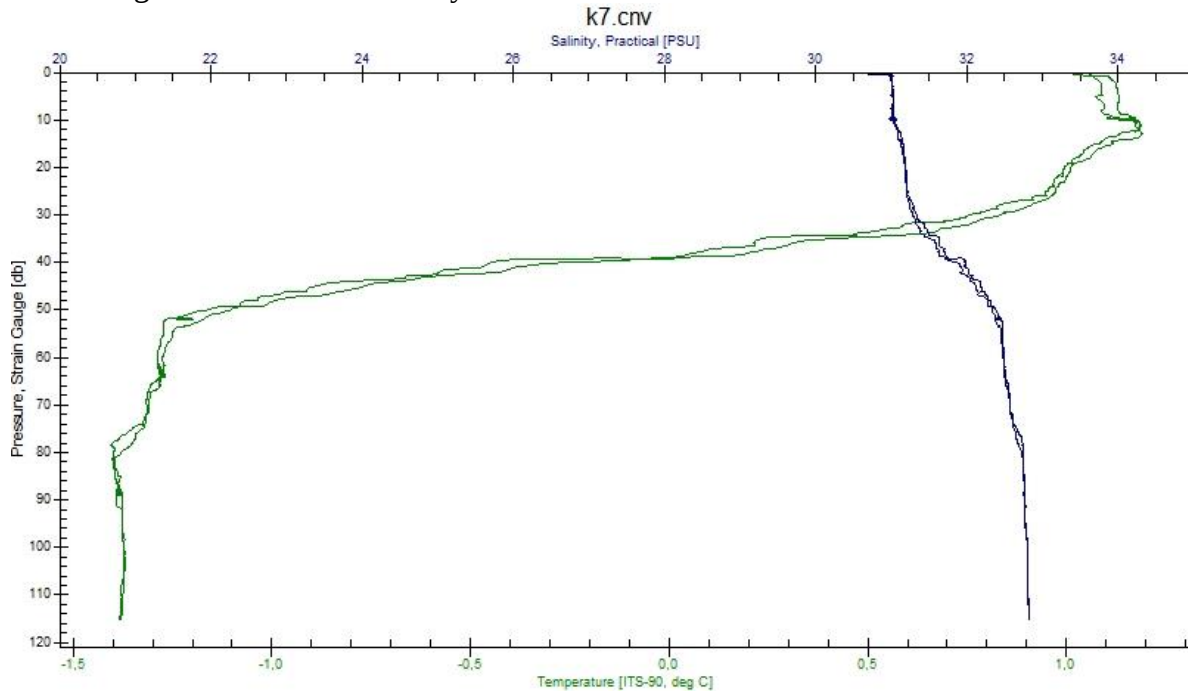
Two main field expeditions took place in 2019, coordinated by Dr. Marie-Helene Forget. First, in May 2019, a team including 1 post-doctoral fellow and 1 graduate student studied the light properties in different types of sea-ice using a new optical instrument designed at University Laval. This team reached their sampling sites by skidoos and were guided by Goatamie Audlakiak.

A second team participated to a sampling expedition in October 2019. A transect of 7 stations was sampled on October 20th from a boat of the Nunavut Experience Outfitting and guided by Billy Arnaquq. Salinity-Temperature (CTD) profiles and water samples for nutrients were collected with a Niskin bottle by a research associate and a technician from Laval University.

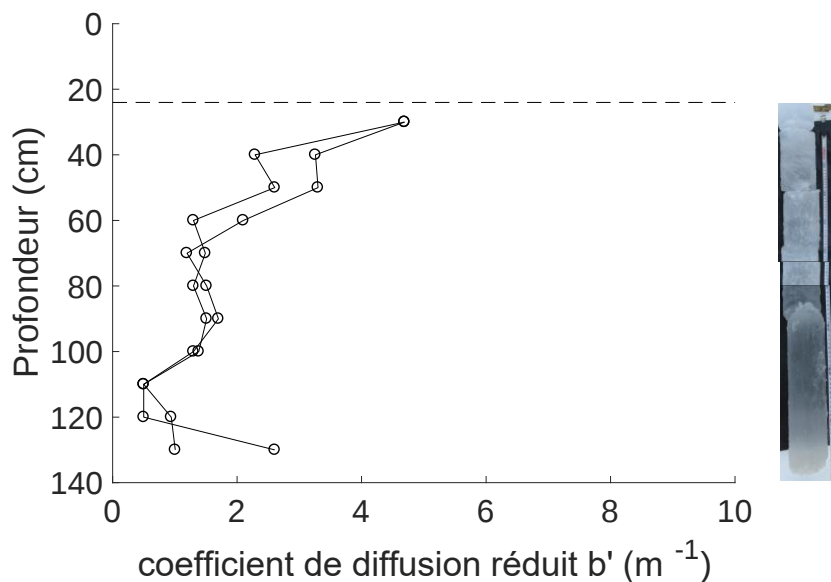
Preliminary results

CTD and nutrient samples collected during the 2019 fall fieldwork are still being analyzed. Preliminary results from the CTD profiles show a stratification of the water column down to about 40 m deep, with higher temperature (~1 °C) and lower salinity (~31 PSU) at the surface than in

deeper waters (respectively -1.4 °C and 32.5 PSU). This stratification of the water column, although not very pronounced, may prevent the mixing of the nutrients and its availability to the marine organisms in the surface layer.



Regarding the sea-ice optical properties measurements using a newly developed optical sensor, results from the observations collected in May 2019 are still being analysed and interpreted. This new sensor allows the measurements of the vertical distribution of the optical properties within the ice layer rather than the traditional approach, which only allowed measurements at the top and the bottom of the ice layer. Preliminary results show a decrease in the scattering coefficient within the ice layer. These observations will allow the estimation of light transmittance and absorption in the sea-ice and provide a better understanding of the link between morphological and optical properties of the sea-ice.

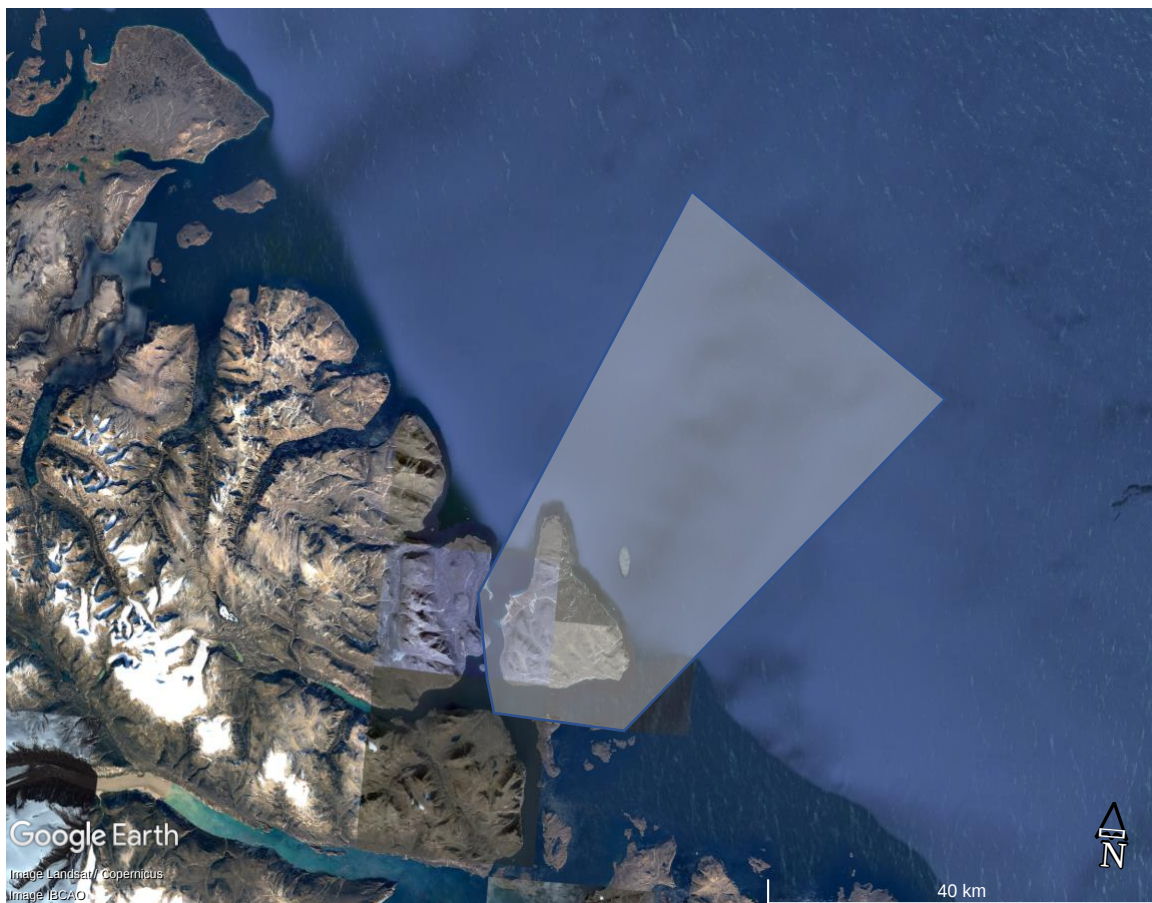


Science research intention for 2020

The operations of 2019 are intended to be repeated. Ice properties are expected to be studied in April or May 2020 whereas the nutrient sampling would ideally take place in May, July and September 2020. The long-term goal of these nutrient campaigns is to create a community-based monitoring program in strategic locations in the Arctic, since major flows are subject to fluctuations within a year. Qikiqtarjuaq provides direct access to the massive outflow that exits the Arctic with the Baffin Land Current.

Sampling Site:

The sampling site for 2020 should include the shaded marine area indicated in the following map.



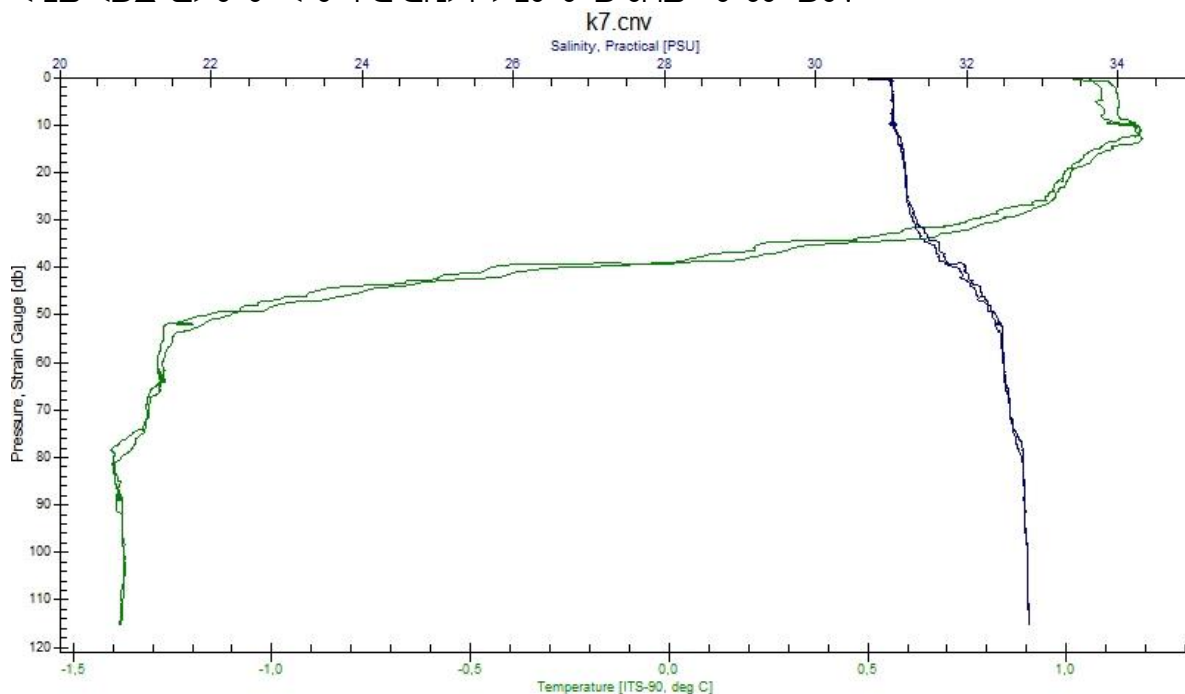
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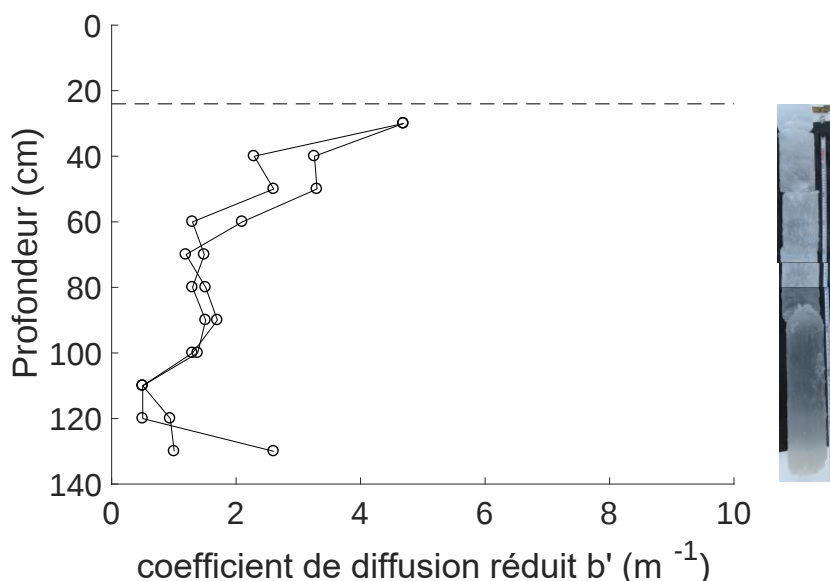
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