ICE ECOLOGY IN ARCTIC LAKES

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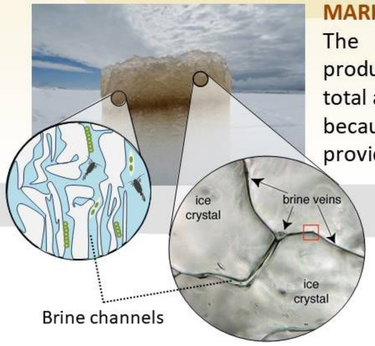
THE UNKNOWN FRESHWATER WINTER ECOLOGY

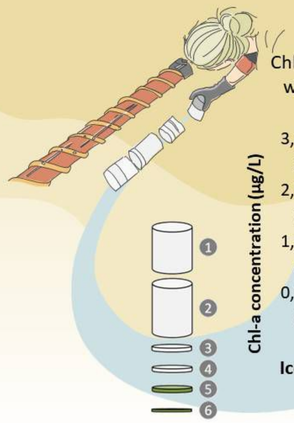
Northern lakes are covered by ice for several months a year contributing to biodiversity, production and carbon budget in the underlying freshwater aquatic environments.

Despite the dominance of ice-covered months, only **2% of freshwater literature includes winter**, and only a few of these report measures of the ice. The paucity of ice-related research in freshwater systems is especially surprising when one considers that **half of the world's lakes periodically freeze**.

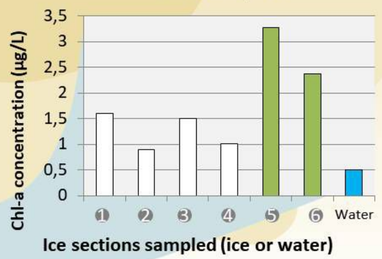


MARINE AND FRESHWATER ICE

The presence of ice in arctic marine systems drives primary productivity; for example, ice-associated algae contribute up to 30% of total annual productivity. **Freshwater ice has been considered lifeless** because it lacks the brine channels that are found in sea ice and that provide the physical space for marine ice algae to inhabit.



Chl-a concentration of different ice sections and water from Simoncouche lake (Saguenay, Qc) March 31, 2017

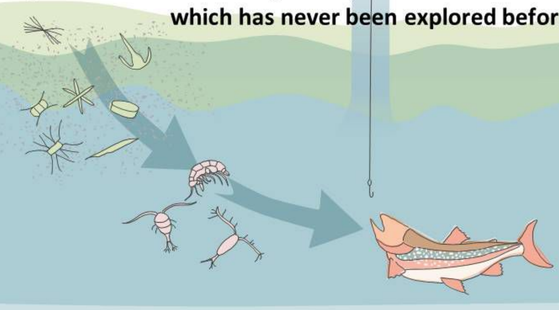


EVIDENCE OF THE PRESENCE OF FRESHWATER ICE ALGAE

Recent studies have, however, found diverse microbial communities within slush layers in Pyrenean lakes, and viable algal cells have been found in **lake Saint-Pierre** (Qc) and in **Lake Baikal** (Russia) ice.

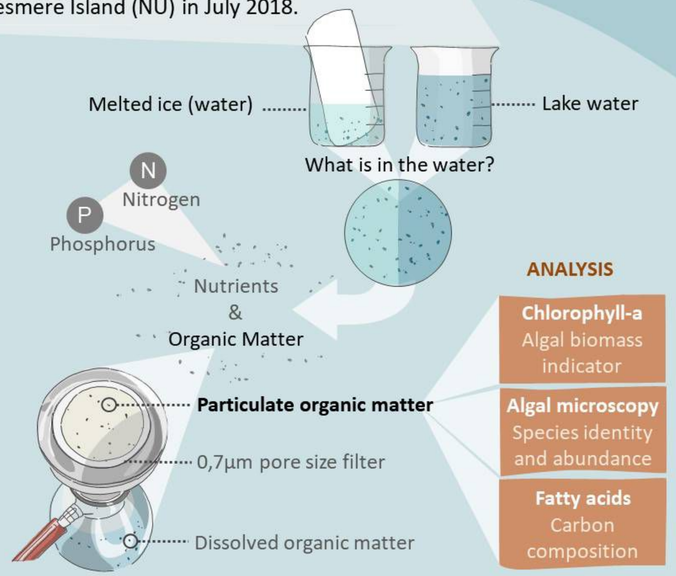
Our measures from March 2017 also show that chlorophyll-a values in ice were as high as those measured in summer water, while values in the winter water column were practically zero.

The **OBJECTIVE** of my MSc project is to study lake ice as a habitat for algae and other microorganisms, and to estimate how lake ice acts as a storage of nutrients and carbon, and an inoculum of organisms, that contribute to the production in lakes, **which has never been explored before**!



METHODS

We sampled **ice and water** from 11 **Boreal** lakes in Saguenay (QC) in February 2018, 6 **Arctic** lakes in Cambridge Bay (NU) in November 2017 and April 2018 and 2 **High-Arctic** lakes in Ward Hunt and Ellesmere Island (NU) in July 2018.

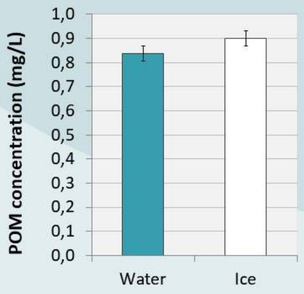


ANALYSIS

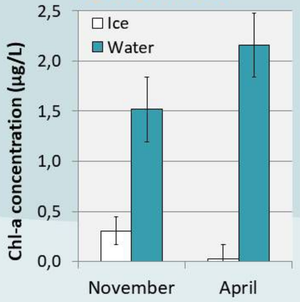
- **Chlorophyll-a** Algal biomass indicator
- **Algal microscopy** Species identity and abundance
- **Fatty acids** Carbon composition

PRELIMINARY RESULTS FROM **CAMBRIDGE BAY**

PARTICULATE ORGANIC MATTER



CHLOROPHYLL-A

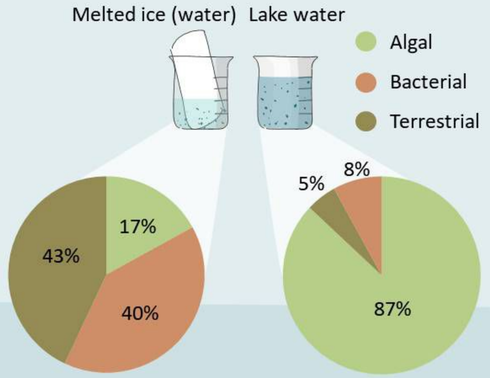


There was much **less chlorophyll-a (chl-a) in the ice than in the water**. We must be careful with the interpretation of these results, because a high concentration of chl-a implies a high presence of algae, but the opposite is not necessarily true. In fact, we know some phytoplankton species lose their chl-a pigments in winter in response to low light intensities and instead, consume bacteria in winter. In cases like this one, the **low chl-a concentration is not related to low algae biomass**.

FATTY ACIDS

The structure of the fatty acids can be used as an indicator of the presence of different **algal groups, bacteria and terrestrial material** in the samples. There is a really different composition in the ice and the water.

This is really interesting because it shows that **the processes happening in the ice are different than the ones in the water**.



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