Stuckberry Valley Lakes

Sentinels of Environmental Change at Canada's Extreme Northern Limit

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Introduction

On the north coast of Ellesmere Island, four lakes were submerged sea floor depressions when glaciomarine environments first appeared following glacial retreat ~11,400 years ago. Isostatic uplift later sequentially separated the lakes from the ocean.

Project objectives

- Understand the ecological and microbial evolution of lakes in a remote High Arctic region
- Study past sea-ice dynamics throughout the Holocene
- Develop long-term, high-resolution multiproxy reconstructions of past environmental change

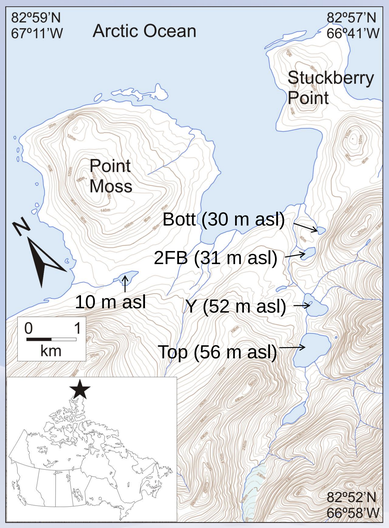

Fig. 1. Location of Stuckberry Valley lakes on northern Ellesmere Island and their elevation above sea level (asl).

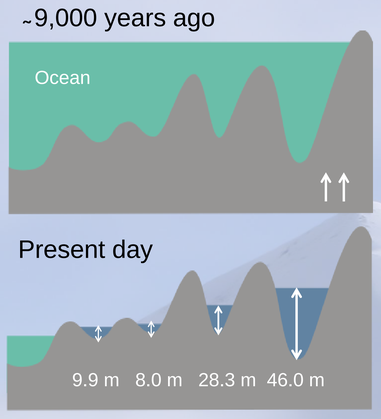

Fig. 2. Illustration of landscape evolution from submerged postglacial marine depressions to the present day isostatically uplifted Stuckberry Valley lakes.

Multidisciplinary analytical approach

Paleolimnology
- Computed tomography scanning
- Hyperspectral imaging spectroscopy
- Micro XRF analysis
- Diatom assemblage analysis
- Genomic microbial analysis
- Lipid biomarker analysis
- Paleomagnetic analysis
- ^{14}C dating

Limnology
- Water column profiles (dissolved O_2, pH, temperature, specific conductivity)
- Phytoplankton analysis (HPLC, microscopy)
- Genomic microbial analysis (bacteria, Archea, protists and viruses)

Preliminary paleolimnological results

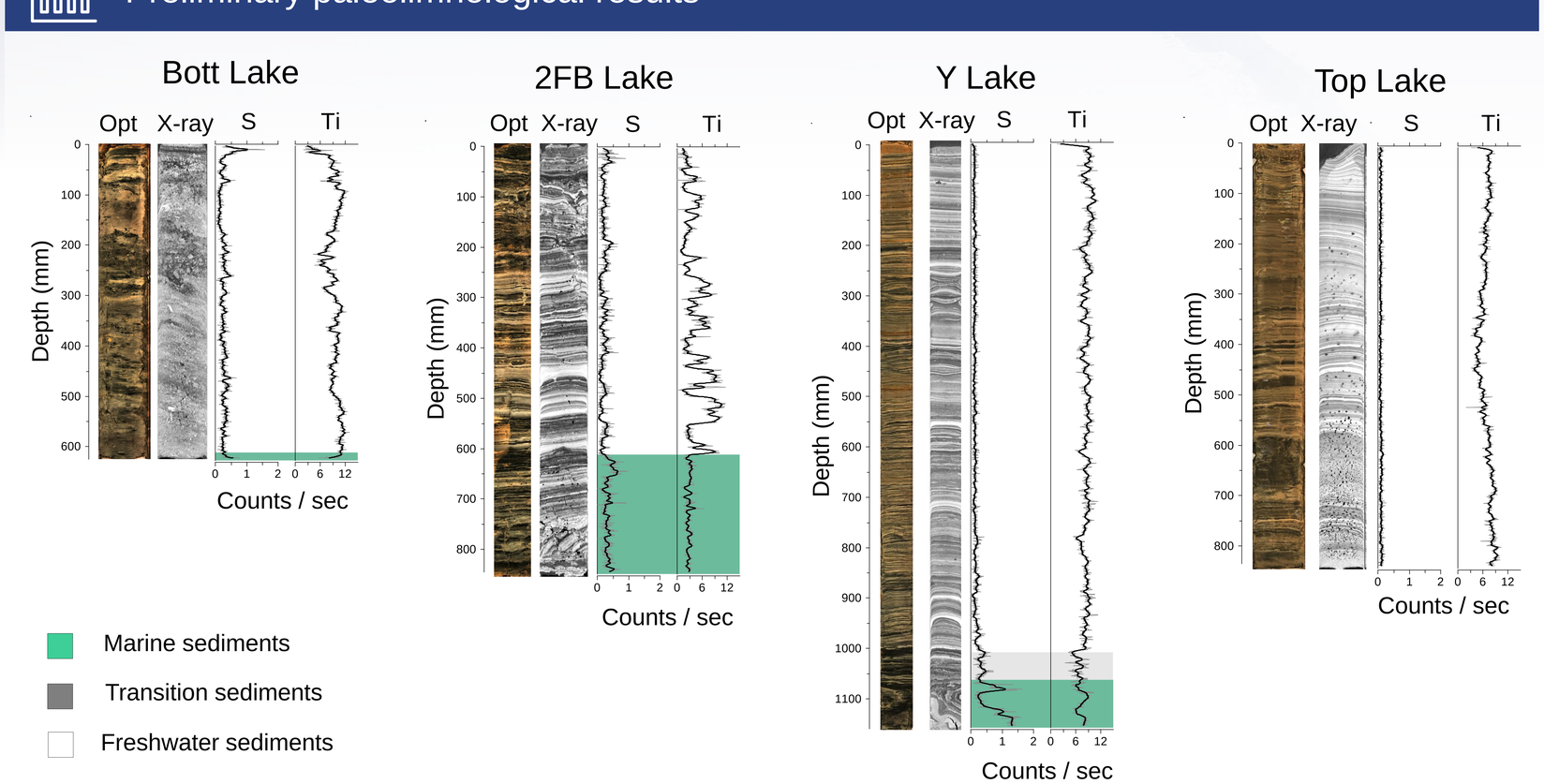

Fig. 3. Preliminary core analyses including geochemistry (S,Ti) and optical (Opt) and CT-scan (X-ray) images. (S: sulfur, Ti: titanium)

Preliminary limnological results

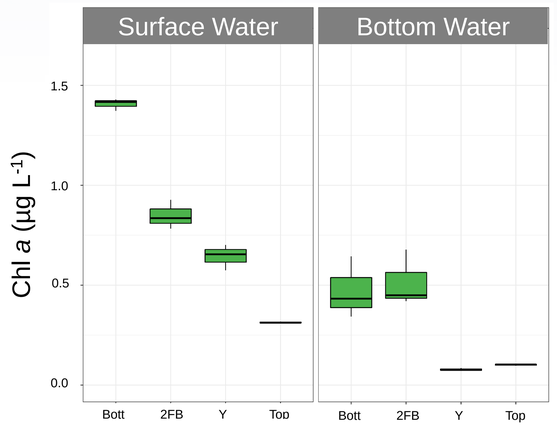

Fig. 4. Phytoplankton chlorophyll *a* concentrations.

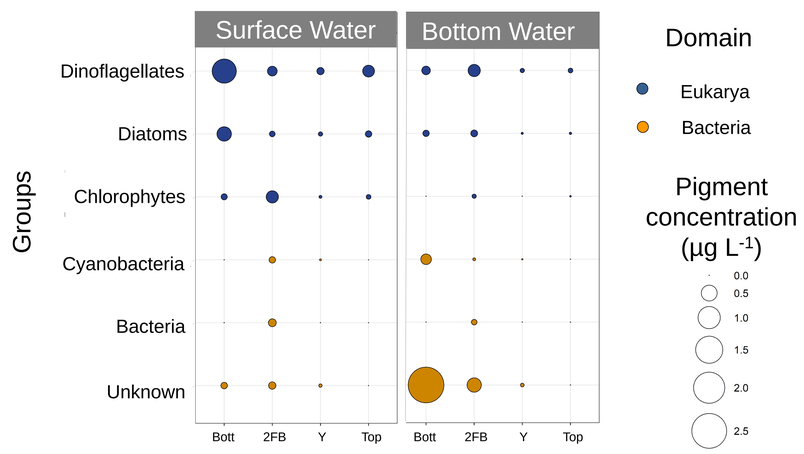

Fig. 5. Major phytoplankton groups according to indicator pigments.

Discussion

Paleolimnology
- Laminated sediments
- Cores in 3 of the 4 lakes reached marine sediments.

Limnology
- Greater pigment concentrations and diversity in smaller and younger lakes.

What's up next?

- Extend the transect to lower elevations by sampling the bay and the 10 m asl lake
- Develop age-depth models
- More detailed limnological studies