

North America's northernmost lake affected by global warming

Analyses conducted by researchers from Université Laval's Center for Northern Studies reveal that the continent's northernmost lake is affected by climate change. In an article to be published in the September 28 edition of *Geophysical Research Letters*, the international research team led by Université Laval scientists Warwick Vincent and Reinhard Pienitz reports that aquatic life in Ward Hunt Lake, a body of water located on a small island north of Ellesmere Island in the Canadian Arctic, has undergone major transformations within the last two centuries.

The speed and range of these transformations—unprecedented in the lake's last 8,000 years—suggest that climate change related to human activity could be at the source of this phenomenon.

The researchers' conclusions are based on the analysis of a sediment core extracted in the center of Ward Hunt Lake in August 2003. This 18 centimeter long sediment core containing algae pigments and diatom remnants was used by the researchers as a biological archive in order to determine the diversity and abundance of aquatic life-forms in the lake over the last 8,450 years.

Analysis of the deepest layers of sediment revealed a very small number of algae as well as only minor variations in concentration. However, the top two centimeters of the core, which correspond to the last 200 years, showed abrupt changes in the lake's algae population: during that period, chlorophyll a concentration, a pigment found in every species in the lake, increased by a factor of 500. A type of diatom typical of very cold environments also made its first appearance during the same period. "The absence of diatoms and the low pigment concentration below the top 2.5 centimeters of the core suggest that the lake was permanently frozen in the past," explains lead author and Center for Northern Studies researcher Dermot Antoniades.

Located on the 83rd parallel in the Quttinirpaaq (meaning "top of the world" in Inuktitut) National Park, Ward Hunt Island is completely surrounded by ice. The lake itself is permanently covered by a 4-meter layer of ice, except for a small peripheral zone that thaws out during a few weeks every summer. "This is of course an extreme environment for living organisms, but our data indicate that current conditions make the lake a more favorable location for algae growth than it was in the past," points out Antoniades. "We cannot claim with certainty that these changes were brought on by human activity, but natural variations observed over the last millennia were never so abrupt and extensive," concludes the researcher.

In addition to Antoniades, Vincent, and Pienitz, the article is co-authored by Catherine Crawley from the University of Toronto, Marianne Douglas from the University of Alberta, Dale Andersen from the Center for the Study of Life in the Universe (USA), Peter Doran at the University of Illinois in Chicago (USA), Ian Hawes from the National Institute of Water and Atmospheric Research (New Zealand), and Wayne Pollard from McGill University.

This study was conducted as part of the ArcticNet program, which brings together scientists and managers in the natural, human health and social sciences with their partners in Inuit organizations, northern communities, federal and provincial agencies and the private sector to study the impacts of climate change in the coastal Canadian Arctic.

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