Ecological impact on Canada's Arctic coastline linked to global climate change

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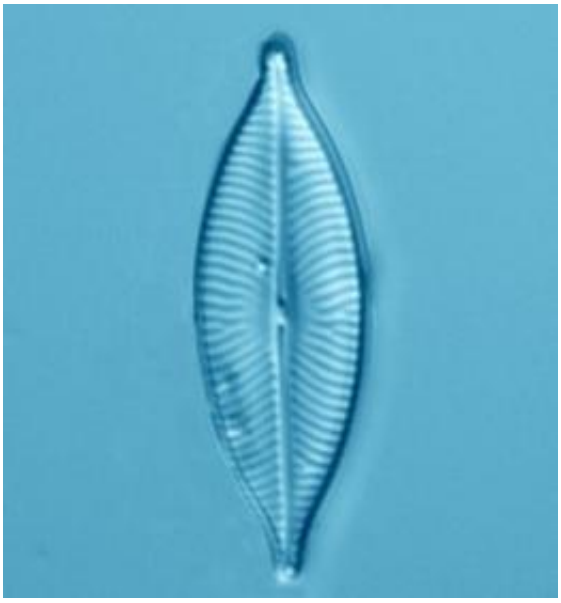

Increases in the *Navicula salinarum* species at the time of the storm surge show that the lake went from a fresh to a saline-water system. (Highly magnified image: more than 3,000 would fit on the head of a pin.) Credit: Joshua Thienpont, Queen's University

Scientists from Queen's and Carleton universities head a national multidisciplinary research team that has uncovered startling new evidence of the destructive impact of global climate change on North America's largest Arctic delta.

"One of the most ominous threats of global warming today is from rising

sea levels, which can cause marine waters to inundate the land," says the team's co-leader, Queen's graduate student Joshua Thienpont. "The threat is especially acute in polar regions, where shrinking sea ice increases the risk of storm surges."

By studying growth rings from coastal shrubs and lake sediments in the Mackenzie Delta region of the Northwest Territories – the scene of a widespread and ecologically destructive storm surge in 1999 – the researchers have discovered that the impact of these salt-water surges is unprecedented in the 1,000-year history of the lake.

"This had been predicted by all the models and now we have empirical evidence," says team co-leader Michael Pisaric, a geography professor at Carleton. The Inuvialuit, who live in the northwest Arctic, identified that a major surge had occurred in 1999, and assisted with field work.

The researchers studied the impact of salt water flooding on alder bushes along the coastline. More than half of the shrubs sampled were dead within a year of the 1999 surge, while an additional 37 per cent died within five years. A decade after the flood, the soils still contained high concentrations of salt. In addition, sediment core profiles from inland lakes revealed dramatic changes in the aquatic life – with a striking shift from fresh to salt-water species following the storm surge.

Dead vegetation killed by the 1999 storm surge is in stark contrast to the vegetation along the edges of waterways that receive regular freshwater (and thus survived the damage). Credit: Trevor Lantz, University of Victoria

"Our findings show this is ecologically unprecedented over the last millennium," says Queen's biology professor and team member John Smol, Canada Research Chair in Environmental Change and winner of the 2004 NSERC Herzberg Gold Medal as Canada's top scientist. "The Arctic is on the front line of climate change. It's a bellwether of things to come: what affects the Arctic eventually will affect us all."

Since nearly all Arctic indigenous communities are coastal, the damage from future surges could also have significant social impacts. The team predicts that sea ice cover, sea levels and the frequency and intensity of storms and marine storm surges will become more variable in the 21st century.

Other members of the team include Trevor Lantz from the University of Victoria, Steven Kokelj from Indian and Northern Affairs Canada, Steven Solomon from the Geological Survey of Canada and Queen's undergraduate student Holly Nesbitt. Their findings are published in the prestigious international journal *Proceedings of the National Academy of Sciences*.

Provided by Queen's University