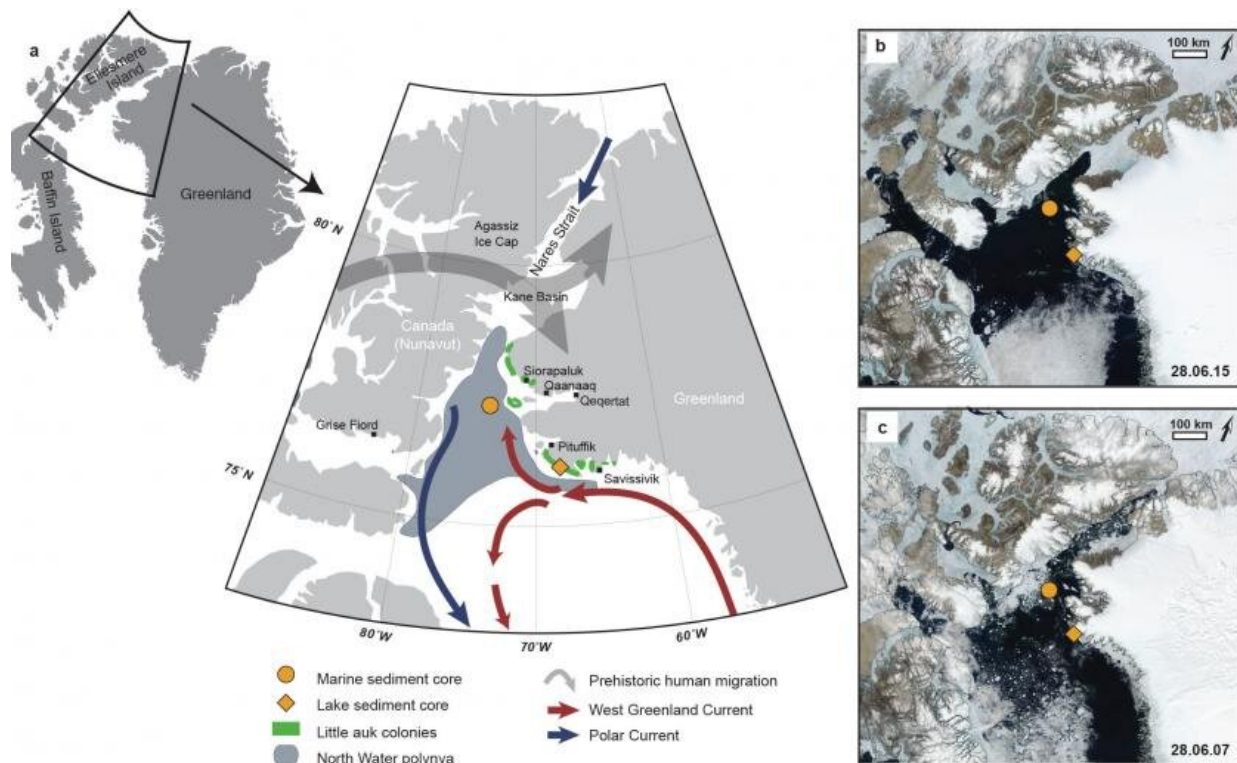


Global warming threatens the existence of an Arctic oasis

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Research area. Credit: University of Helsinki

The University of Helsinki's Environmental Change Research Unit (ECRU) took part in an international study investigating the millennia-long history of the most important oasis in the Arctic and the potential effects of climate change on its future.

The North Water Polynya is an area of year-round open water located between northwest Greenland and Ellesmere Island, Canada, in northern Baffin Bay, which is otherwise covered by sea ice roughly eight months of the year. The area is known as an Arctic oasis, and one of the main migration routes of Greenland's original population runs just north of the area.

In the study, microfossils and chemical biomarkers preserved in marine and lake sediments were analyzed as keys to the past, exposing historical variation in the North Water Polynya in the past 6,000 years.

The polynya's high rate of primary production, for which, in marine environments, diatoms and other microalgae are responsible, maintains a diverse and unique ecosystem that serves as a safe haven for a range of species in Arctic conditions, which are otherwise harsh. Keystone Arctic species, such as the polar bear, the walrus and the narwhal, also thrive there. For the indigenous populations reliant on hunting and fishing, this area, the largest polynya in the northern hemisphere, has been a lifeline.

According to the study, the polynya was stable and its primary production was high roughly 4,400–4,200 years ago, at the time when people arrived in Greenland from Canada over the frozen Nares Strait.

A millennium of instability and new heat records

However, the polynya's stability has varied over the last millennia: during the warmer climate periods 2,200–1,200 years ago, the area was unstable and its productivity fell drastically. When primary production rates are low, significant reductions are seen in the populations of organisms in the upper levels of the food web, such as zooplankton, fish and marine mammals.

"According to archaeological finds, there were no inhabitants in the area

during this period. It's a mystery that can potentially be explained, in light of the research findings, by conditions that were unfavorable to people reliant on hunting and fishing," says researcher Kaarina Weckström from the Environmental Change Research Unit, University of Helsinki.

The researchers point out that air temperatures have never reached the current level in northwest Greenland in the 6,000-year-long period of the polynya's history studied. Global warming and reduction in sea ice caused by human activity have led to the polynya's instability. The area is maintained by favorable ocean currents and winds, and particularly by an ice bridge located north of the polynya, which prevents drift ice in the Arctic Ocean traveling further south. It is the annual formation of this natural block that the warming of the climate is now threatening.

"This area, the Arctic's most important oasis, is likely to disappear if temperatures continue to rise as forecast. It would be important to at least slow climate change down, in order for Arctic indigenous peoples to have some kind of a chance to adapt to their future living conditions. Then again, as the history of the polynya suggests, if we can reduce greenhouse gas emissions and mitigate the rising air temperature, both Arctic sea ice and the polynya can be restored," Weckström sums up.

More information: Sofia Ribeiro et al, Vulnerability of the North Water ecosystem to climate change, *Nature Communications* (2021). [DOI: 10.1038/s41467-021-24742-0](https://doi.org/10.1038/s41467-021-24742-0)

Provided by University of Helsinki

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