

# Changes in dinoflagellate cyst productivity in the North Water polynya during the past ca. 4000 years

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Polynyas are areas of open water in a region that is otherwise covered by sea ice. Because they receive more light and the mechanisms involved in polynya formation can enhance nutrient supply to surface waters, polynyas are regions of high primary production that sustain unique food webs.

The North Water (NOW) polynya is located off the northwestern Greenland coast and Canada's Ellesmere Island. It is the largest coastal polynya in the Arctic. There are three main factors that aid the formation of the NOW polynya. The first is an ice bridge that forms in Nares Strait, which blocks drift ice from being exported from the Arctic Ocean into northern Baffin Bay. Second, strong northerly winds remove newly-formed sea ice away from the NOW polynya region. Last, the advection of warm and salty waters from the West Greenland Current into the area further inhibits the formation of sea ice. Due to changes in sea-surface conditions (e.g., sea ice cover, nutrient availability) associated with ongoing climate warming, the physical-chemical conditions that make the NOW polynya biologically productive are subject to change. The rate and magnitude at which such changes will operate in the future are unknown.

Here, we present preliminary results on dinoflagellate cyst (dinocyst) assemblages in a 5.43 m-long sediment core collected in the central region of the NOW polynya (77°17.097'N-74°23.214'W) at a water depth of 700 m. Our goal is to reconstruct changes in the polynya's sea-surface conditions and dinocyst productivity that may be related to climate variations of the past ca. 4000 years. Heterotrophic dinocysts dominated the core assemblages, with *Islandinium minutum* being the most abundant species (62 to 88%). The last ca. 1800 years covered by the core are marked by a decrease in the autotrophic species (most clearly expressed by *Operculodinium centrocarpum* and *Spiniferites elongatus*) and a slight increasing trend in the total dinocyst concentrations. Although in low abundances, cysts of the sea ice species *Polarella glacialis* are present throughout the core. Since the dinoflagellate *Polarella glacialis* completes its entire life-cycle in sea ice, our data indicate that seasonal sea ice was present during the last ca. 4000 years. Our preliminary results suggest: (i) generally more seasonally persistent sea ice in the NOW region between ca. 1800 and 200 years ago; and (ii) increased total dinocyst concentrations during times of higher sea ice concentrations.