

Distribution of living benthic foraminifera in Baffin Bay and Nares Strait

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Context

Benthic foraminifera are often used as bio-indicators of past environmental conditions as they classically reflect surface productivity. Little is known concerning their distribution and ecology in the Arctic ocean. Their response to recent climate warming in a context of rapidly changing sea-ice cover and therefore primary productivity is not well understood. The present investigation illustrates patterns of diversity and density of living benthic foraminifera in surface sediments of northern Baffin Bay and Nares Strait (samples collected as part of the summer 2014 and 2015 ARCTICNET/ GREENEDGE campaigns).

Study area

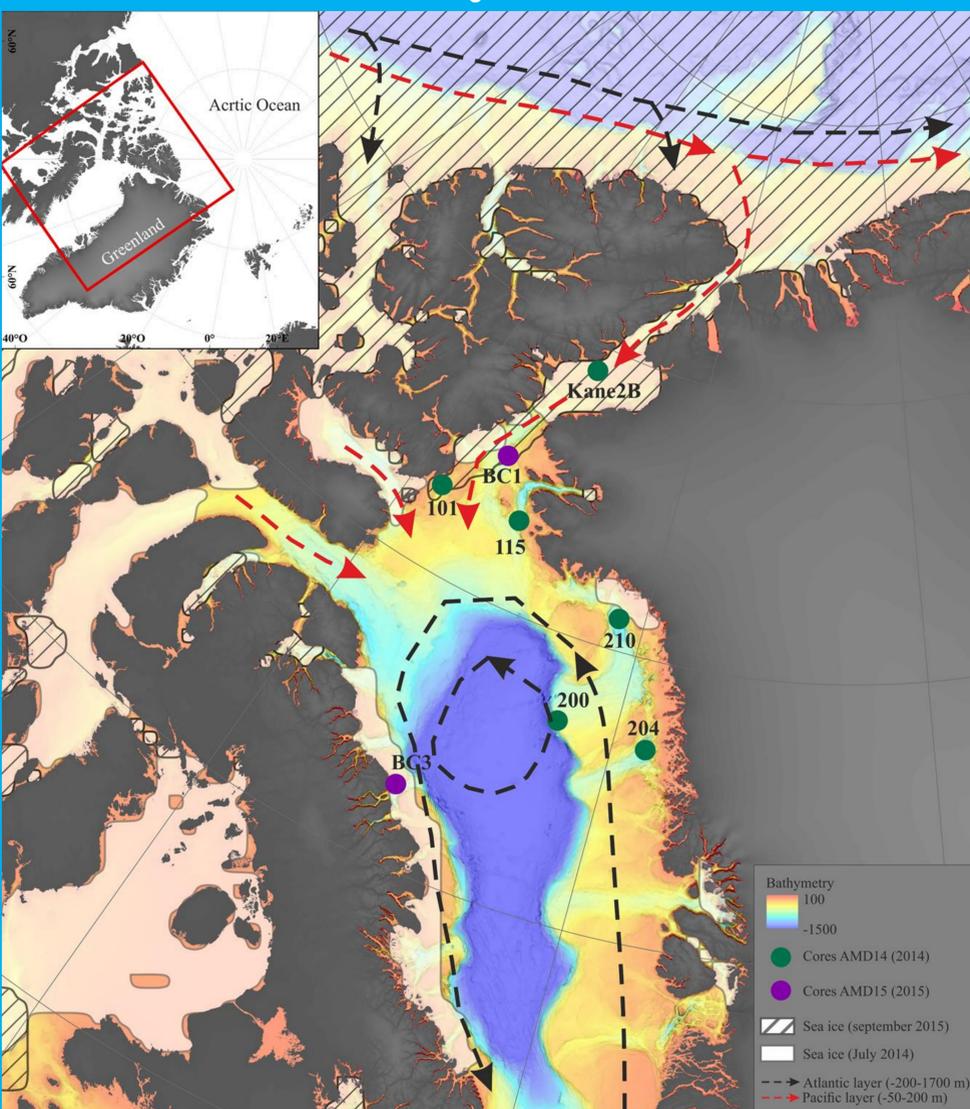


Figure 1: Map of the study area, Baffin Bay and Nares Strait with coring stations (boxcores from cruises AMD14 and AMD15). Extents of sea-ice in July 2014 and September 2015 corresponding to the time period of the cruises are presented (NSIDC). A schematic oceanic circulation is illustrated with surface Pacific water in red dotted line and Atlantic intermediate water in black dotted line, modified after Macdonald and Bowers, 1996.

Results

Proportion of agglutinated foraminifera and carbonate dissolution evidence

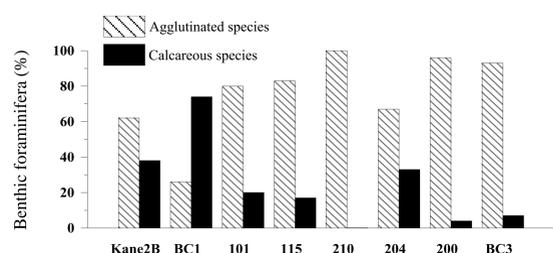


Figure 2: Proportion of agglutinated and calcareous species.

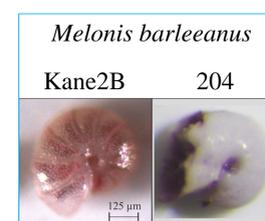


Figure 3: Stained *M. barleeanus*, at stations Kane2B and 204.

- Calcareous species are more abundant in the Nares Strait and northernmost Baffin Bay
- Agglutinated species dominant at deepest stations where calcareous tests present marks of alteration

Density and diversity of living benthic foraminifera

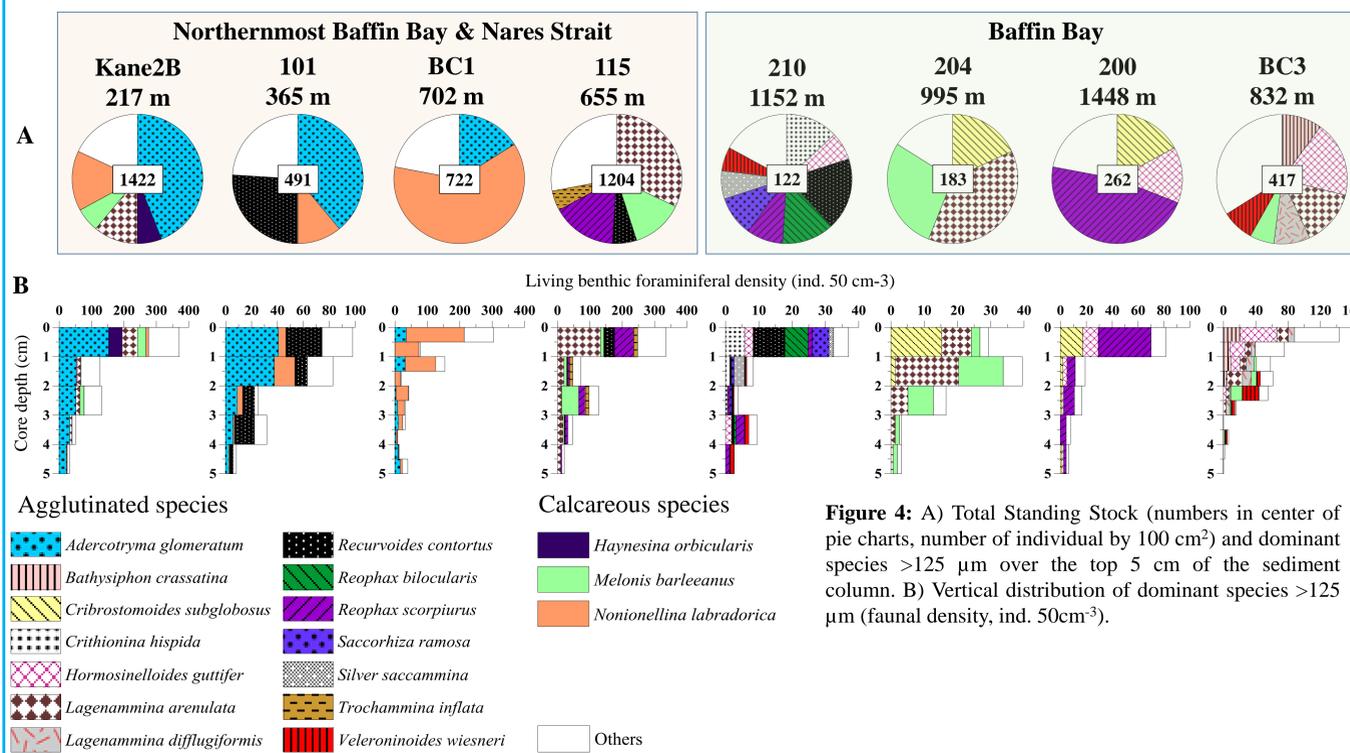


Figure 4: A) Total Standing Stock (numbers in center of pie charts, number of individual by 100 cm²) and dominant species >125 μm over the top 5 cm of the sediment column. B) Vertical distribution of dominant species >125 μm (faunal density, ind. 50cm⁻³).

Interpretations

- Corrosiveness of deep Baffin Bay water masses with regard to carbonates (depth range of Carbonate Compensation Depth = 600 – 900 mbsl ; Aksu, 1983) essentially may explain the proportions of calcareous vs. agglutinated foraminifera as well as (partly) foraminiferal density changes in various sector of northern Baffin Bay.
- Food availability, a function of primary productivity, drives high benthic foraminiferal density in the northernmost NWP-influenced region.
- The relative proximity of the sample stations to the marginal ice zone, a sector where primary productivity is classically enhanced, during summers 2014 and 2015, additionally concurs to the observed spatial pattern of foraminiferal density.
- Additional work on foraminiferal ecology is still needed in order to use faithfully benthic foraminifera as bio-indicator for reconstructions of paleo sea-ice cover and primary productivity in the arctic/subarctic realms.

Chlorophyll a concentration

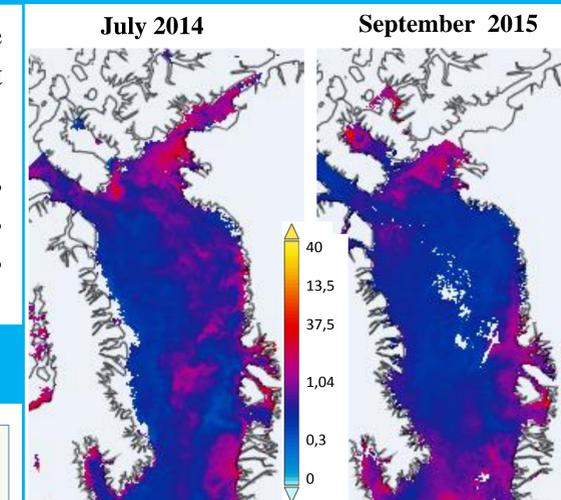


Figure 5: Time averaged map of chlorophyll a concentration expressed in mg.m⁻³, for July 2014 and September 2015 (4 km resolution MODIS-Aqua data; derived from NASA's Giovanni application)

- Highest faunal density in North Water Polynia (NWP)-influenced sector, with *N. labradorica* and *A. glomerata* as index species.
- Classical vertical distribution, showing decrease of density with increasing depth in the sediment, suggesting absence of bioturbation.
- The highly calcified species *M. barleeanus* is the only calcareous taxa present in deepest Baffin Bay stations.