What drives micro-plankton (phytoplankton) community structure and species diversity in offshore waters and fjords in Greenland?

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with
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STRUCTURE

micro-plankton on different scales

1) SPATIAL SCALE → species-environment relationship

2) TEMPORAL SCALE → seasonal and annual succession patterns

3) GEOLOGICAL SCALE → palaeoenvironmental reconstruction using microfossils



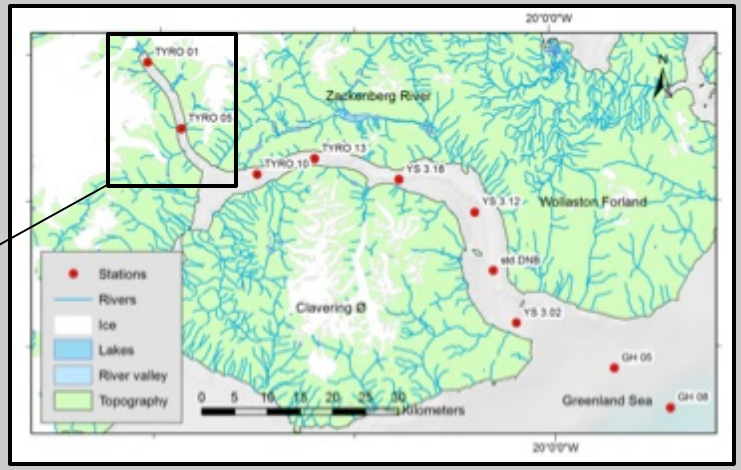

1) SPATIAL SCALE

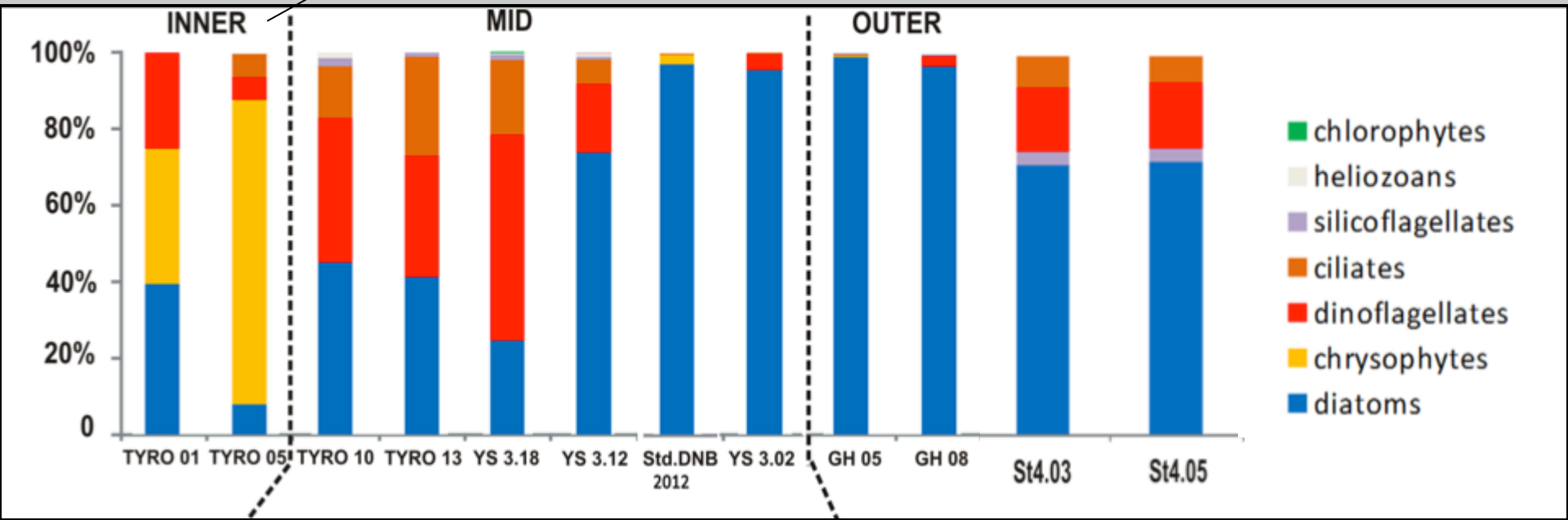
Inner Young Sound

- **strong melting of sea-ice and freshwater input from snow and ice**

(low-salinity water golden algae)

(sea-ice/ice diatoms)



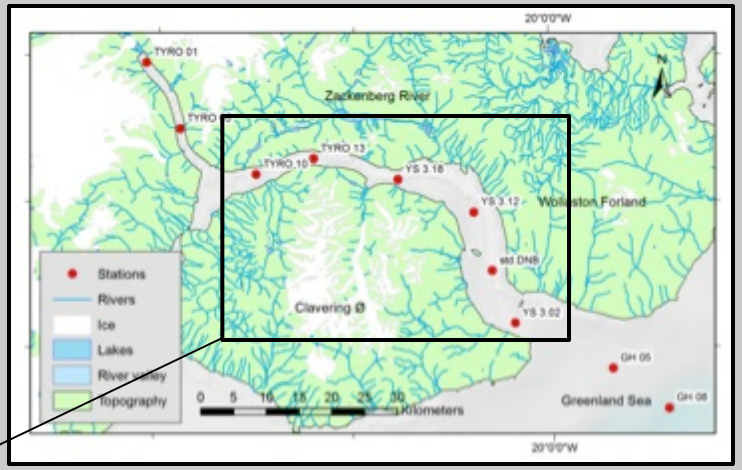


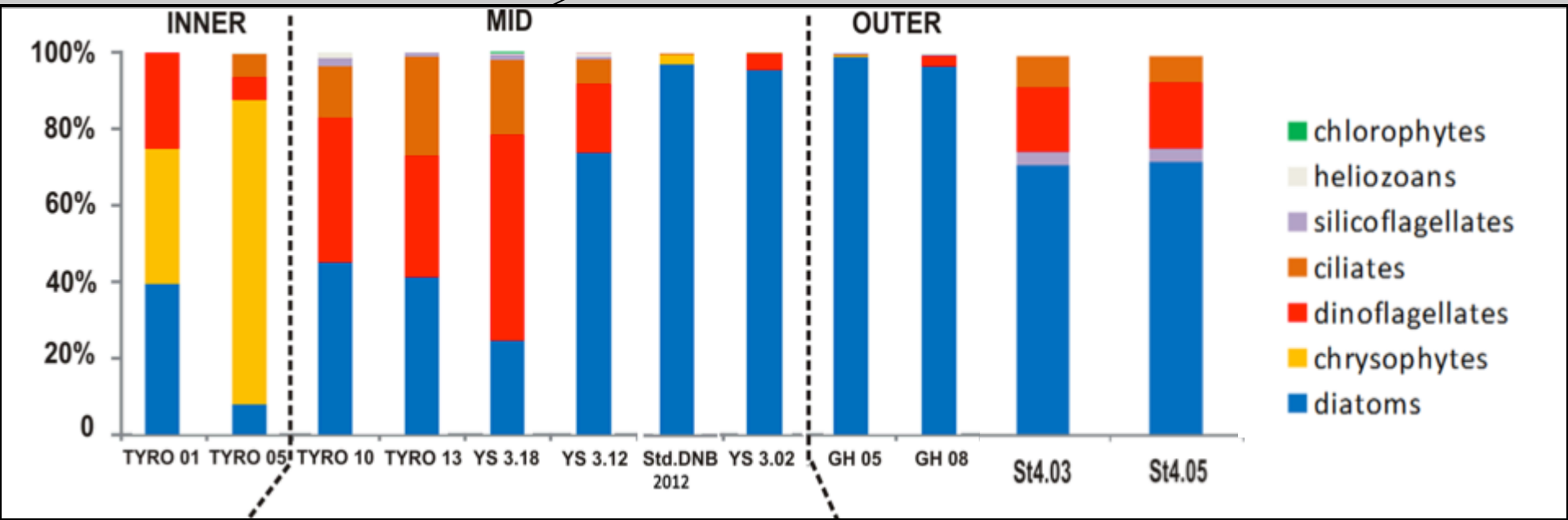
Mid Young Sound

- typical summer water stratification with low salinity but elevated surface water temperature

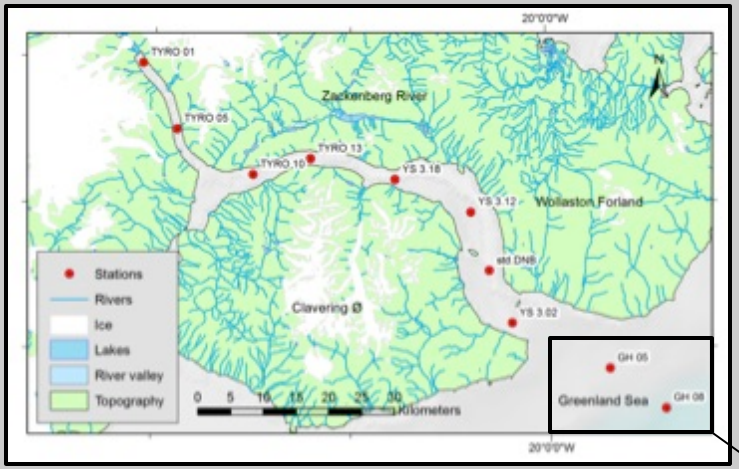
(sea-ice/ice diatoms)

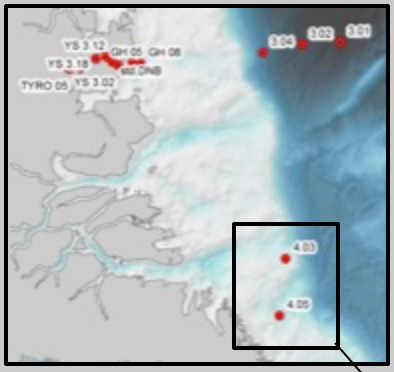
(summer water predators)





Outer Young Sound and Greenland Shelf

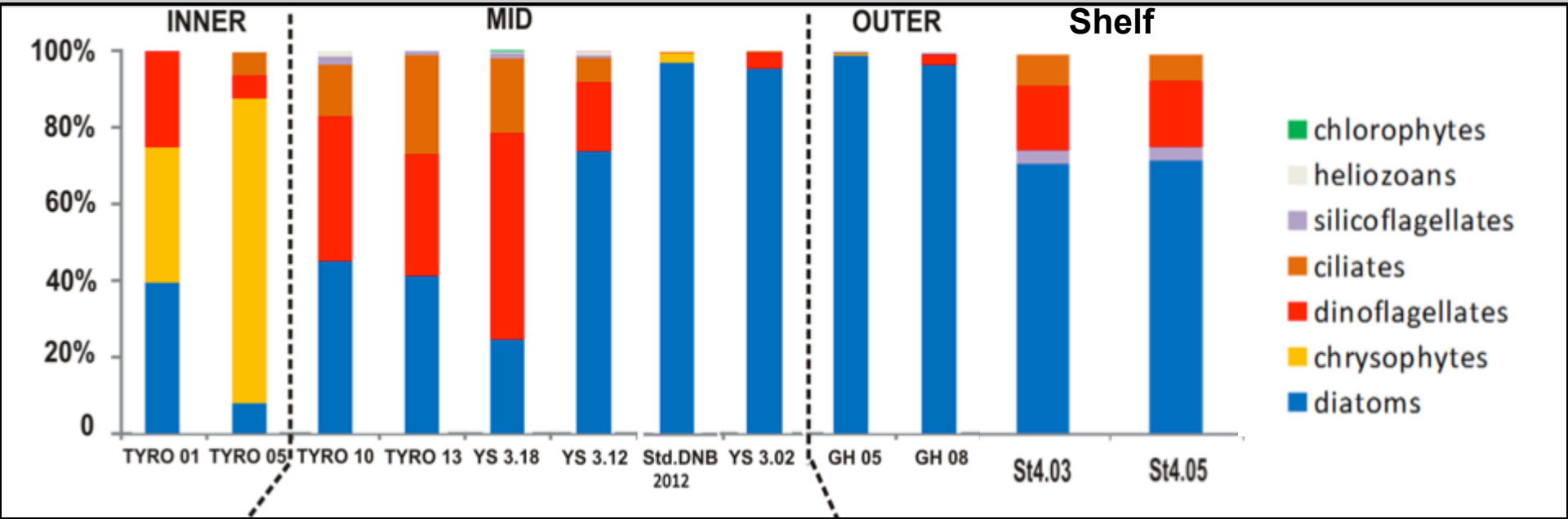




- **cold waters of the East Greenland Current transporting sea ice from Arctic**

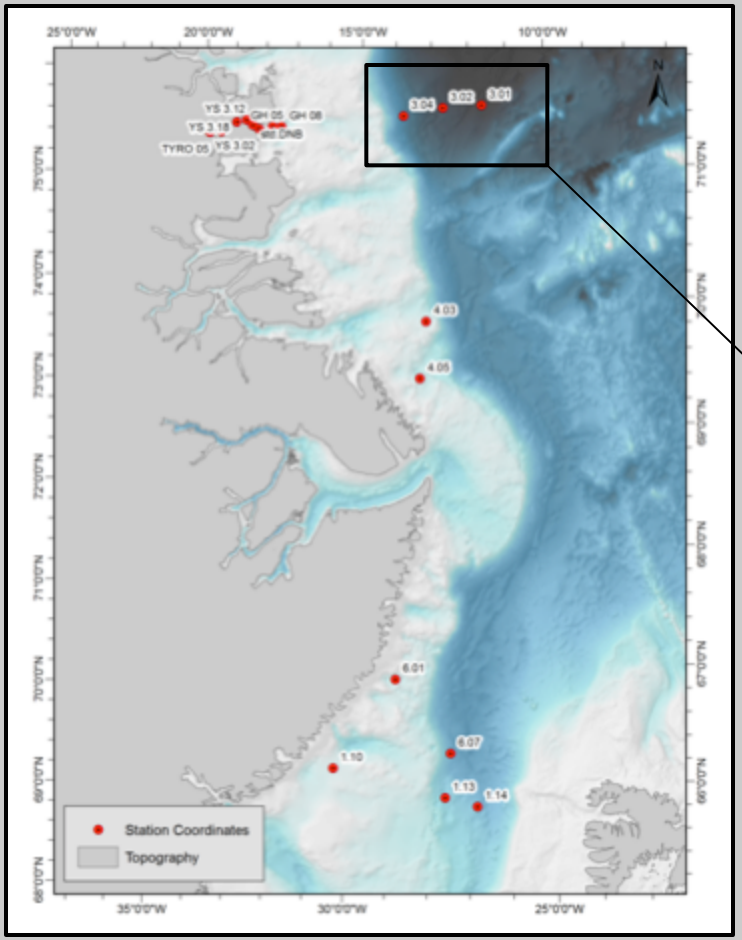
(sea-ice/ice diatoms)

(cold water diatoms)



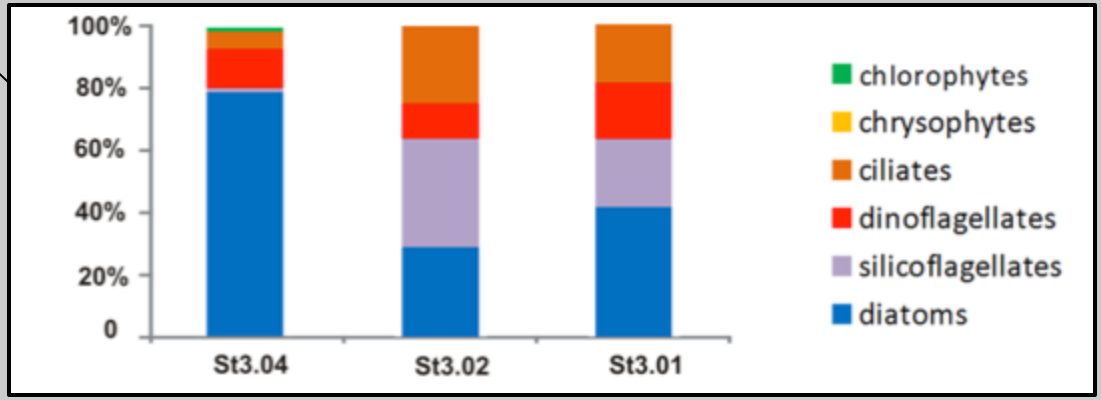
Greenland Sea

- northern oceanic waters with more saline sub-surface waters (Modified Atlantic Water)



(saline water diatoms)

(Atlantic water silicoflagellates???)

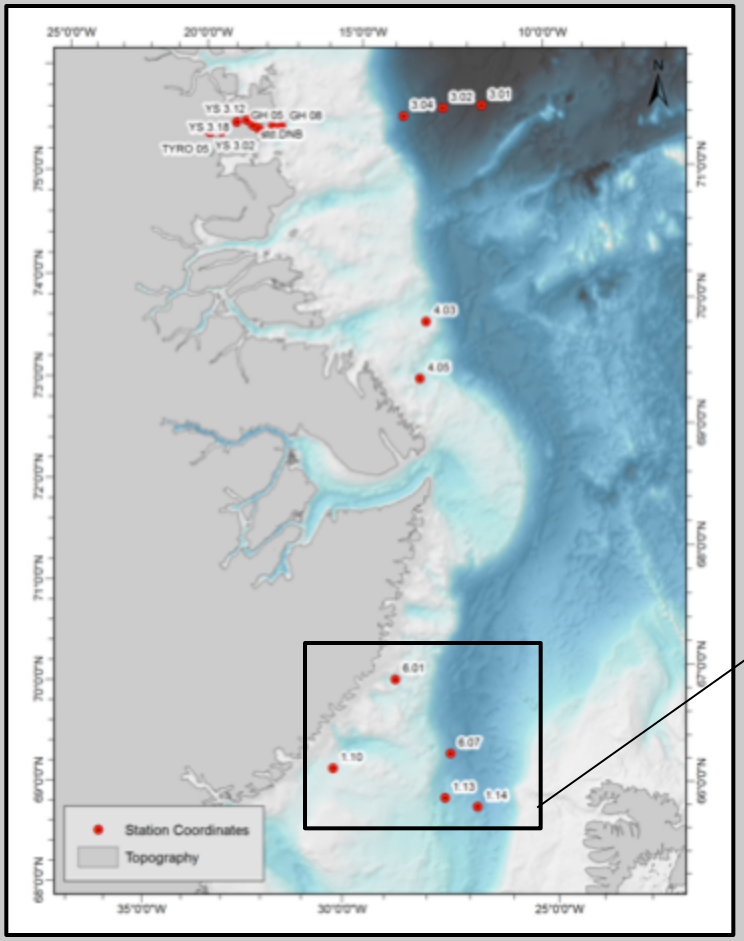


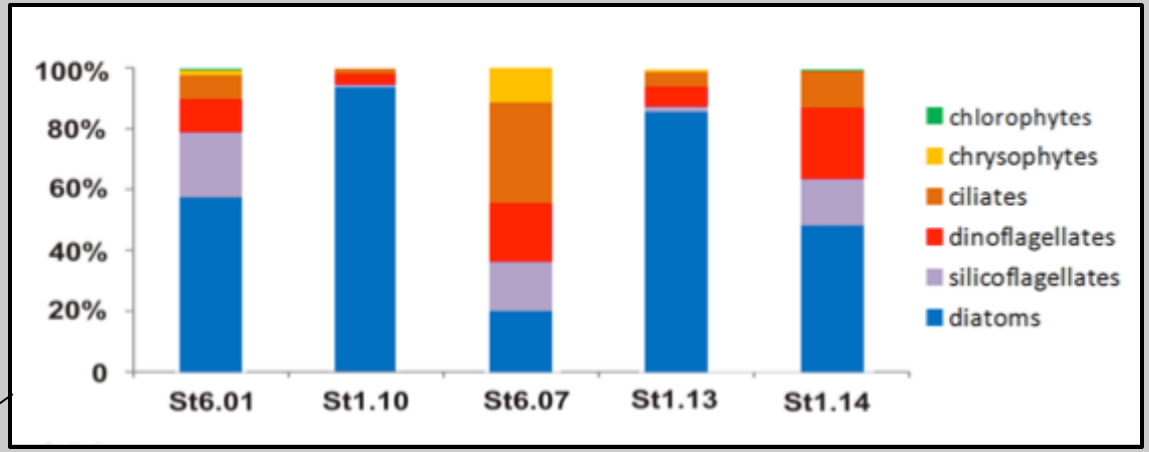
Mid Denmark Strait

- **southern, warmer oceanic waters (Icelandic Irminger Current?)**

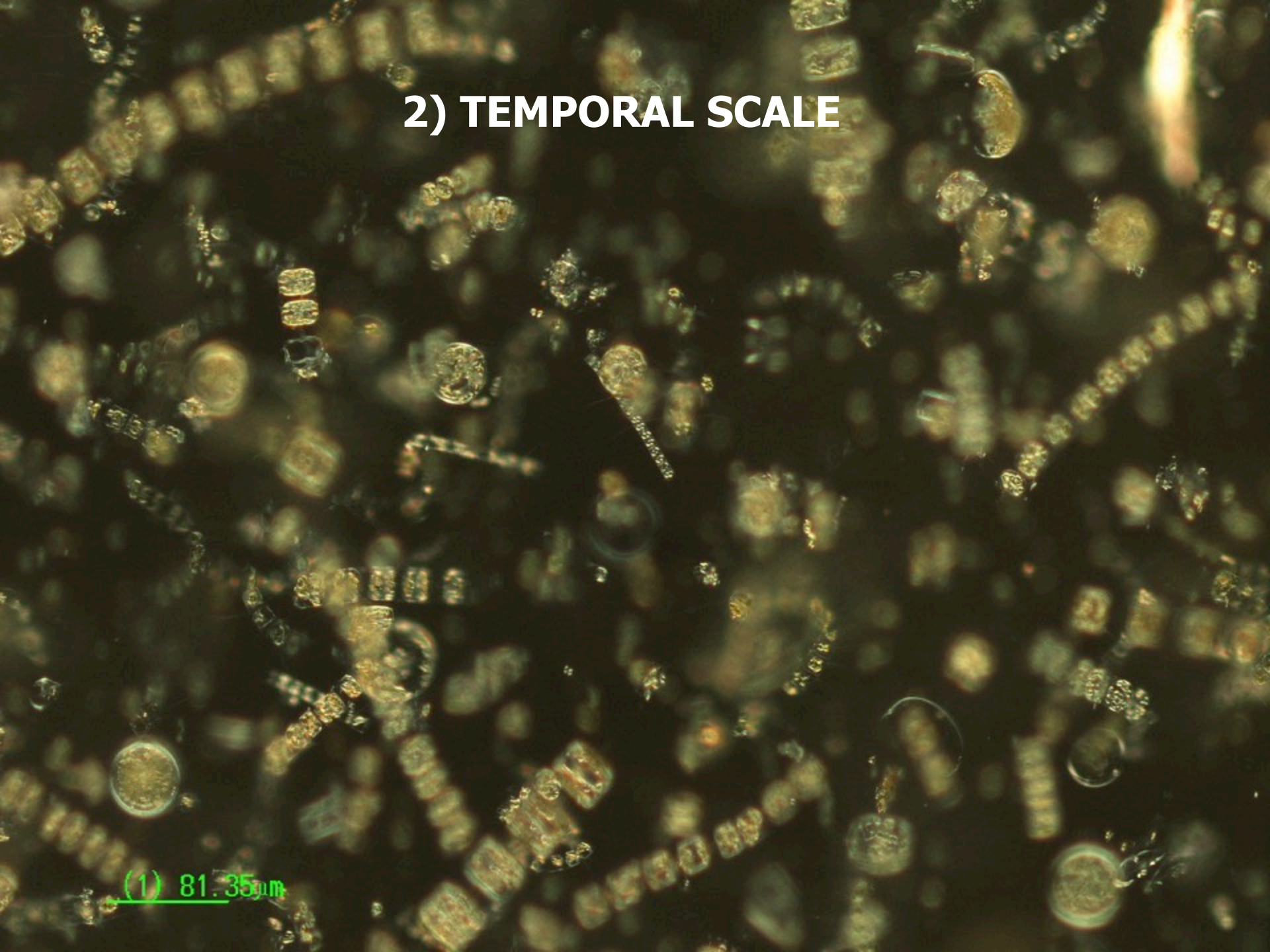
(warmer water diatoms)

(summer water predators)





2) TEMPORAL SCALE



Daneborg station

2009

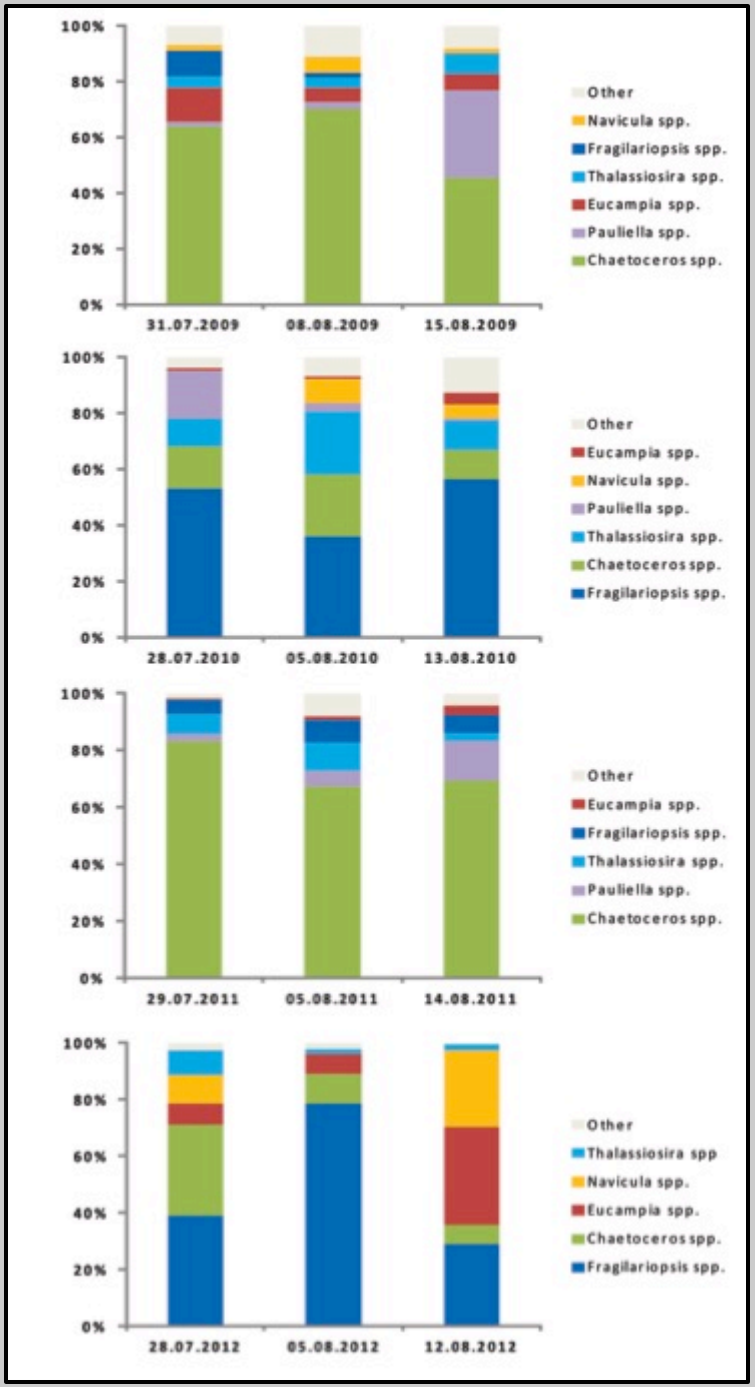
2010

2011

2012

(saline water diatoms)

(sea-ice/ice diatoms)

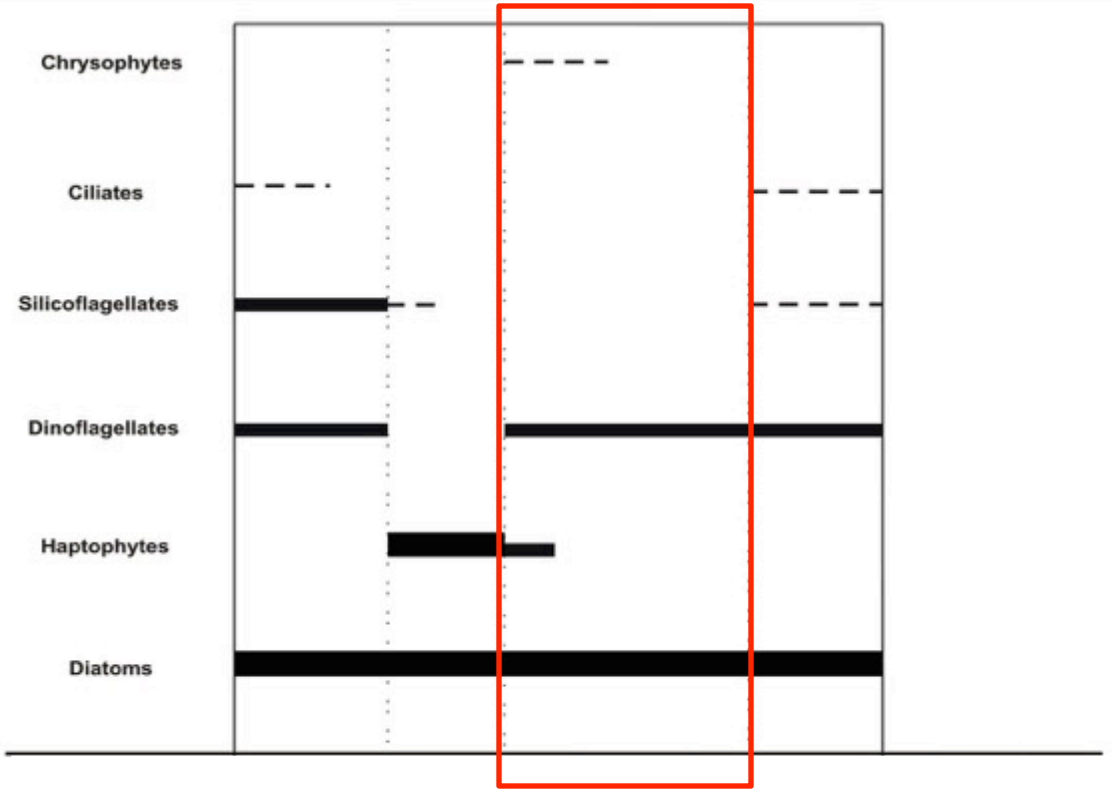


- **dynamic water exchange between inner and outer fjord triggered by TS gradient**

Nuuk station

- typical summer water stratification with low salinity but elevated surface water temperature

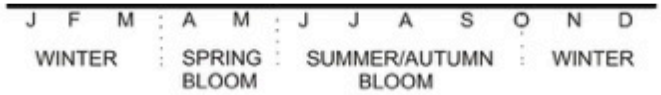
Avr 2006-2010



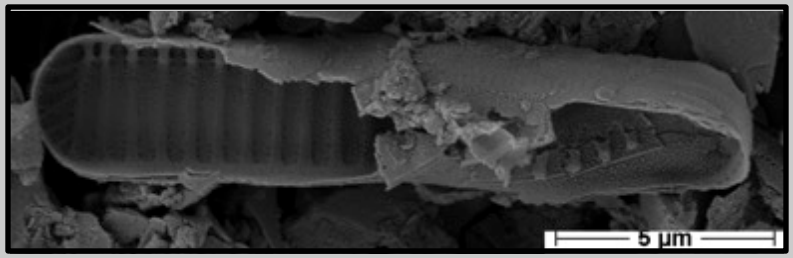
(warmer water diatoms)

(summer water predators)

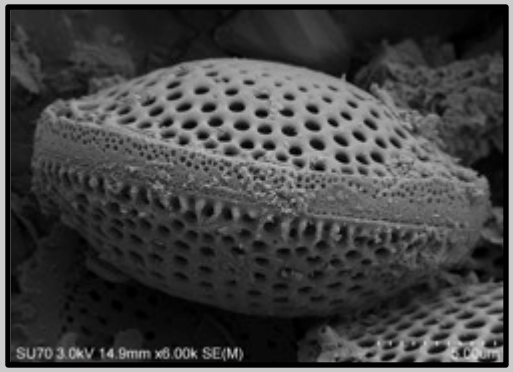
(low-salinity water golden algae)



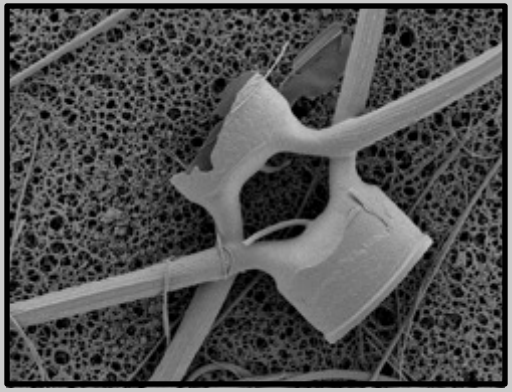
Indicator diatom species



sea-ice/ice diatoms

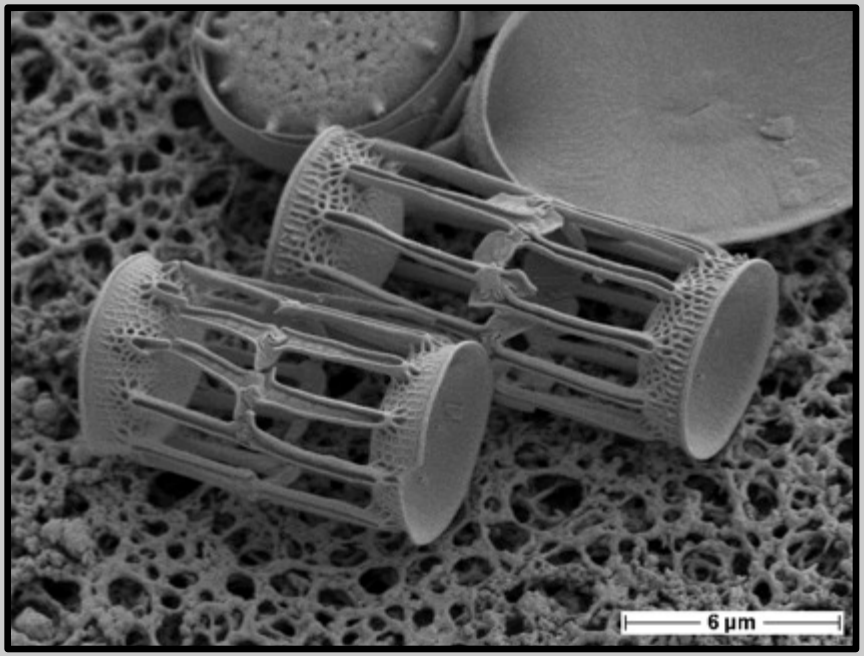


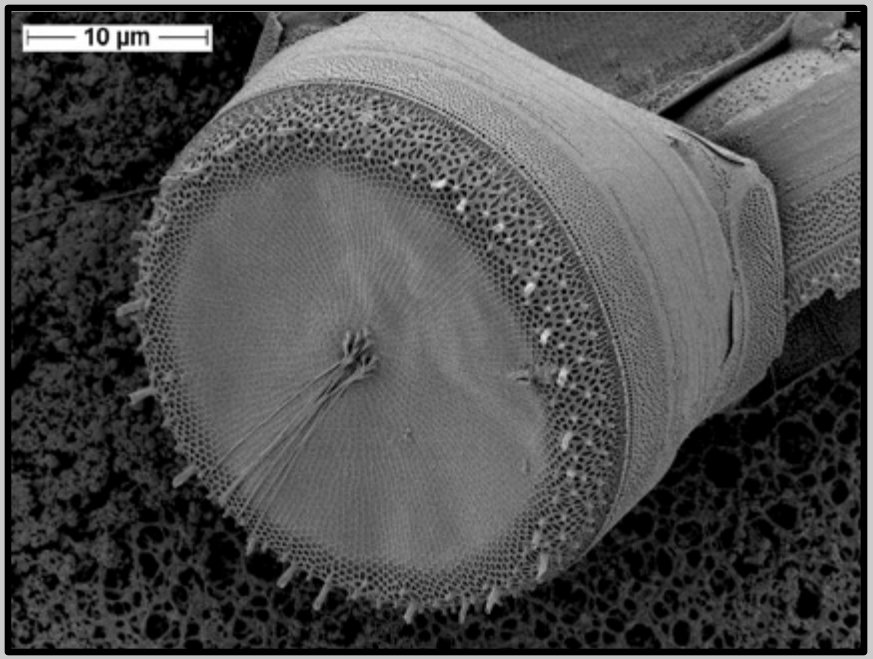
warmer water diatoms

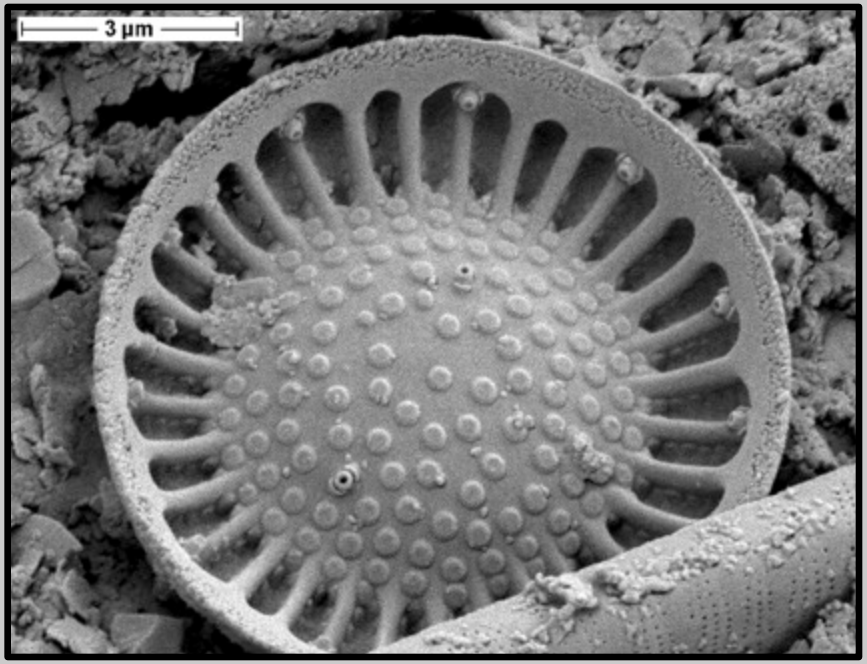


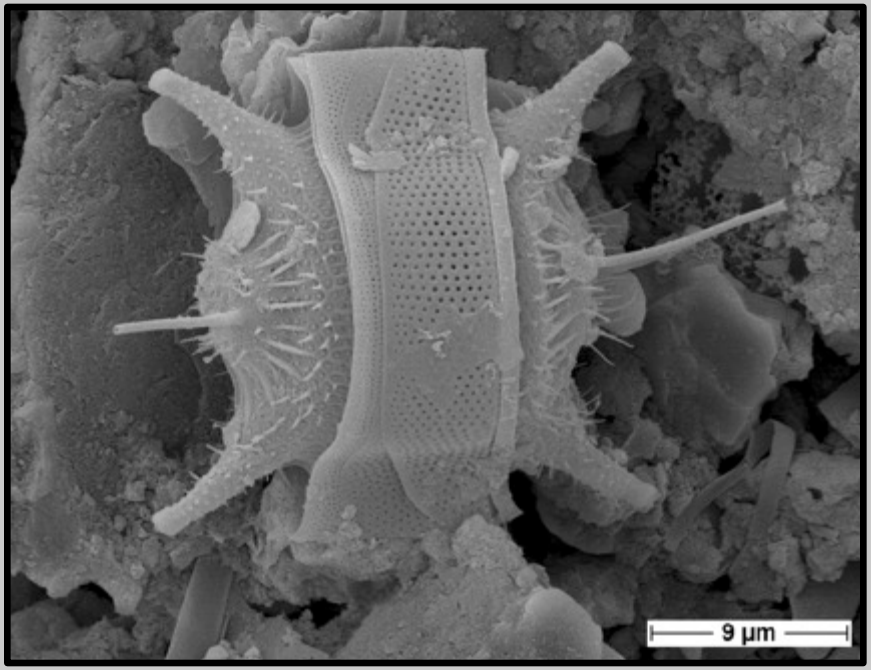
saline water diatoms

3) GEOLOGICAL SCALE

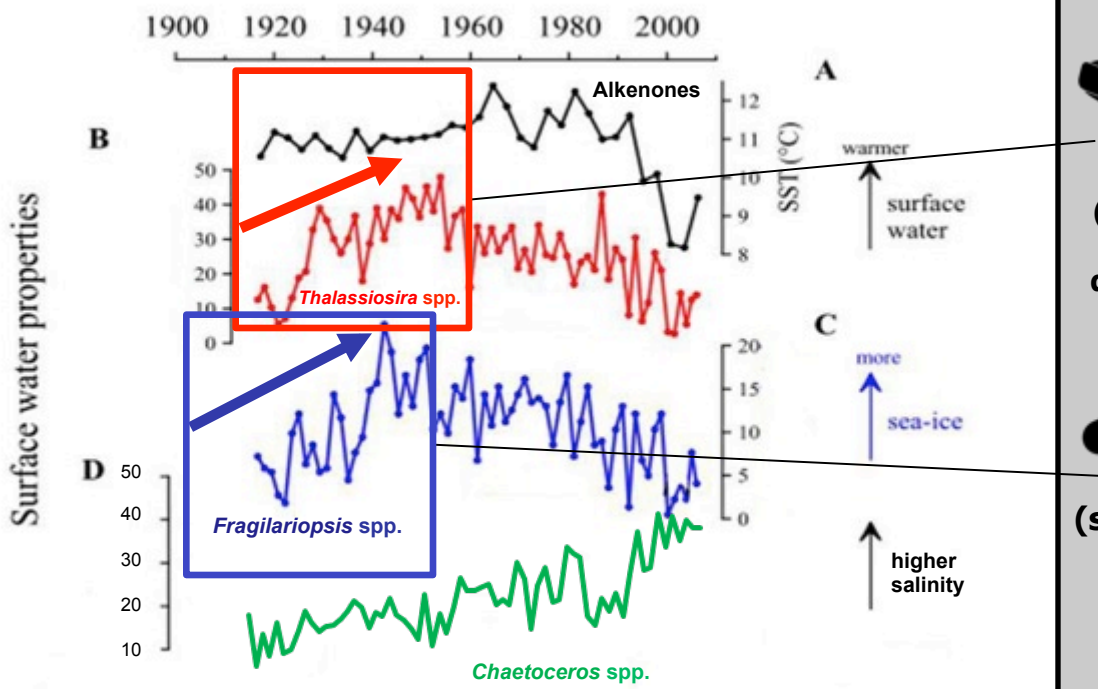






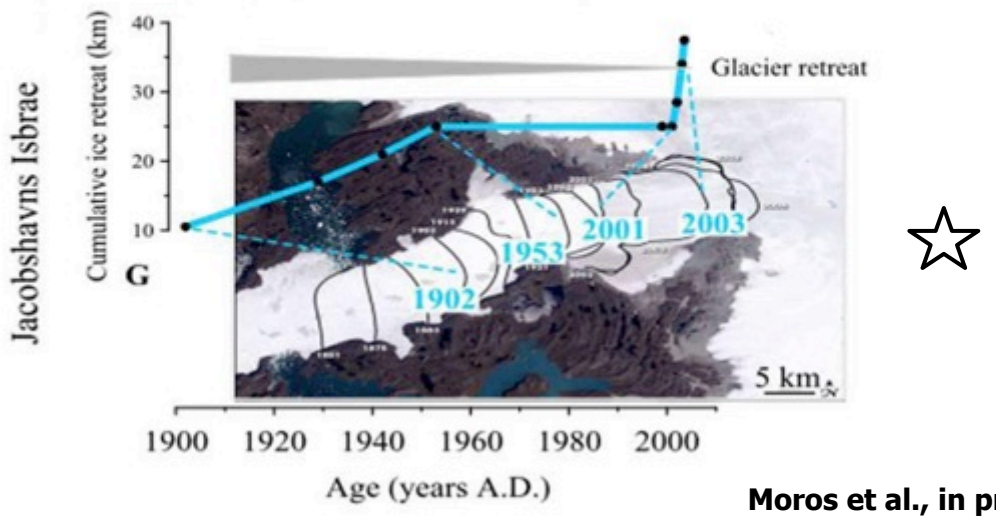


- **Glacier retreat in the first half of 20th century**
- **Atmospheric and ocean warming**
- **Higher sea surface temperature and melting of sea-ice/ice**



(warmer water diatoms)

(sea-ice/ice diatoms)

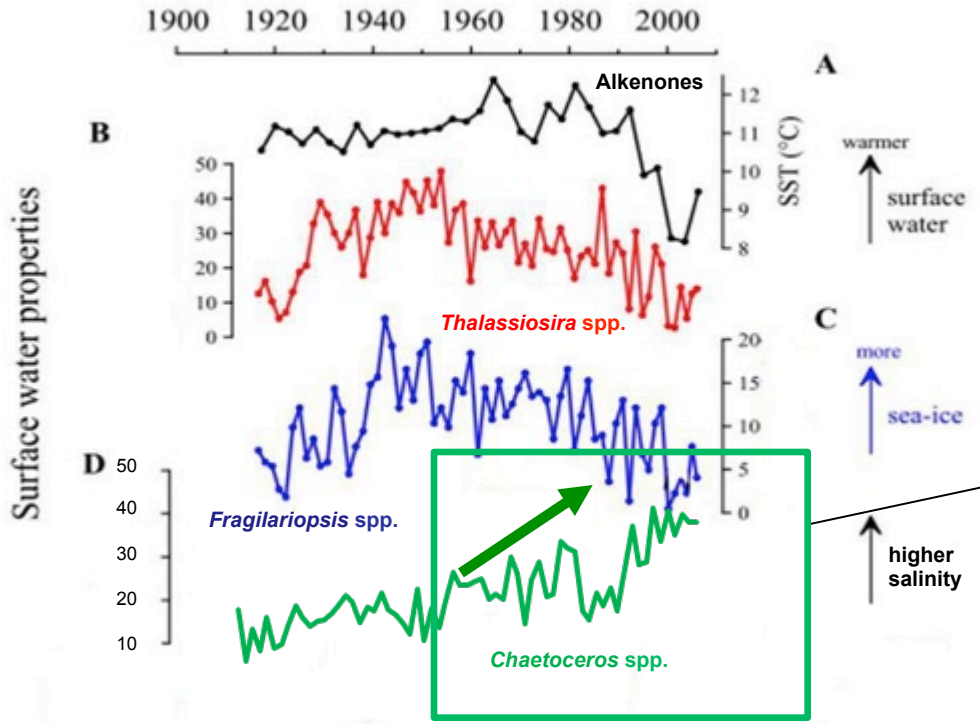


Moros et al., in prep.

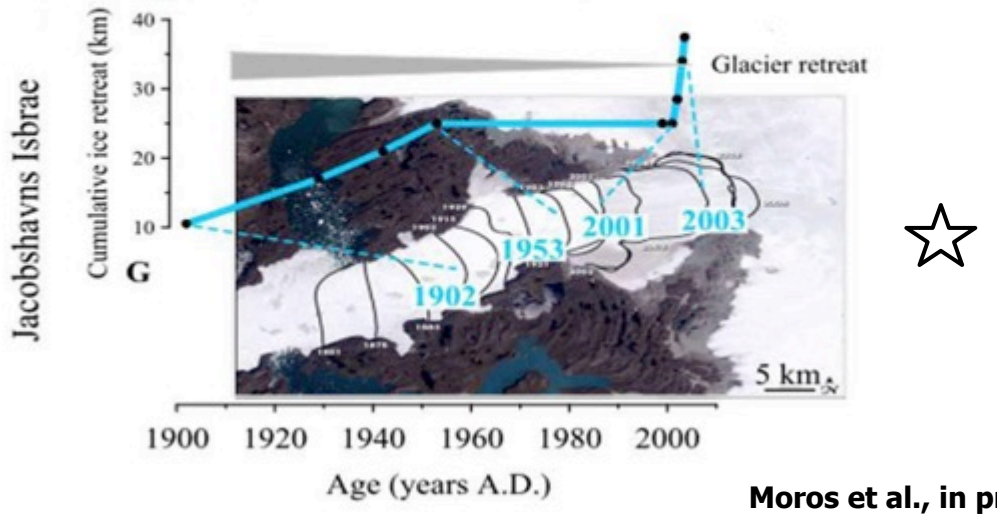
- **Rapid glacier retreat at the start of 21st century**

- **Stronger inflow of WGC carrying Atlantic water masses**

- **Higher sea surface salinity**



(saline water diatoms)



Moros et al., in prep.

SUMMARY

- **Monitoring studies:**
  - **Seasonal and annual successions of micro-plankton**
  - **Drivers: TS gradients and fjord-ocean water exchange**

- **Geographic studies:**
  - **Spatial distribution and diversity patterns**
  - **Drivers: 'regional waters' and oceanic currents**

Recommendation # 16 of the Arctic Biodiversity Assessment

Climate changes → (Sterssors) TEMPERATURE, SALINITY, (SEA) ICE, OCEAN CURRENTS → plankton distribution & diversity

Monitoring stations in a high-productivity regions of Arctic shelf with a focus on oceanic forcing

Sediment cores → reconstruction of climate-driven, past environmental changes based on fossil plankton species

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- Polish National Science Foundation (project PRELUDIUM)


THANK YOU FOR YOUR ATTENTION!