

ECOTIP

Investigating Ecological Tipping Cascades in the Arctic Seas

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UiT The Arctic University of Norway



This project is funded by the European Union
under grant agreement No 869383

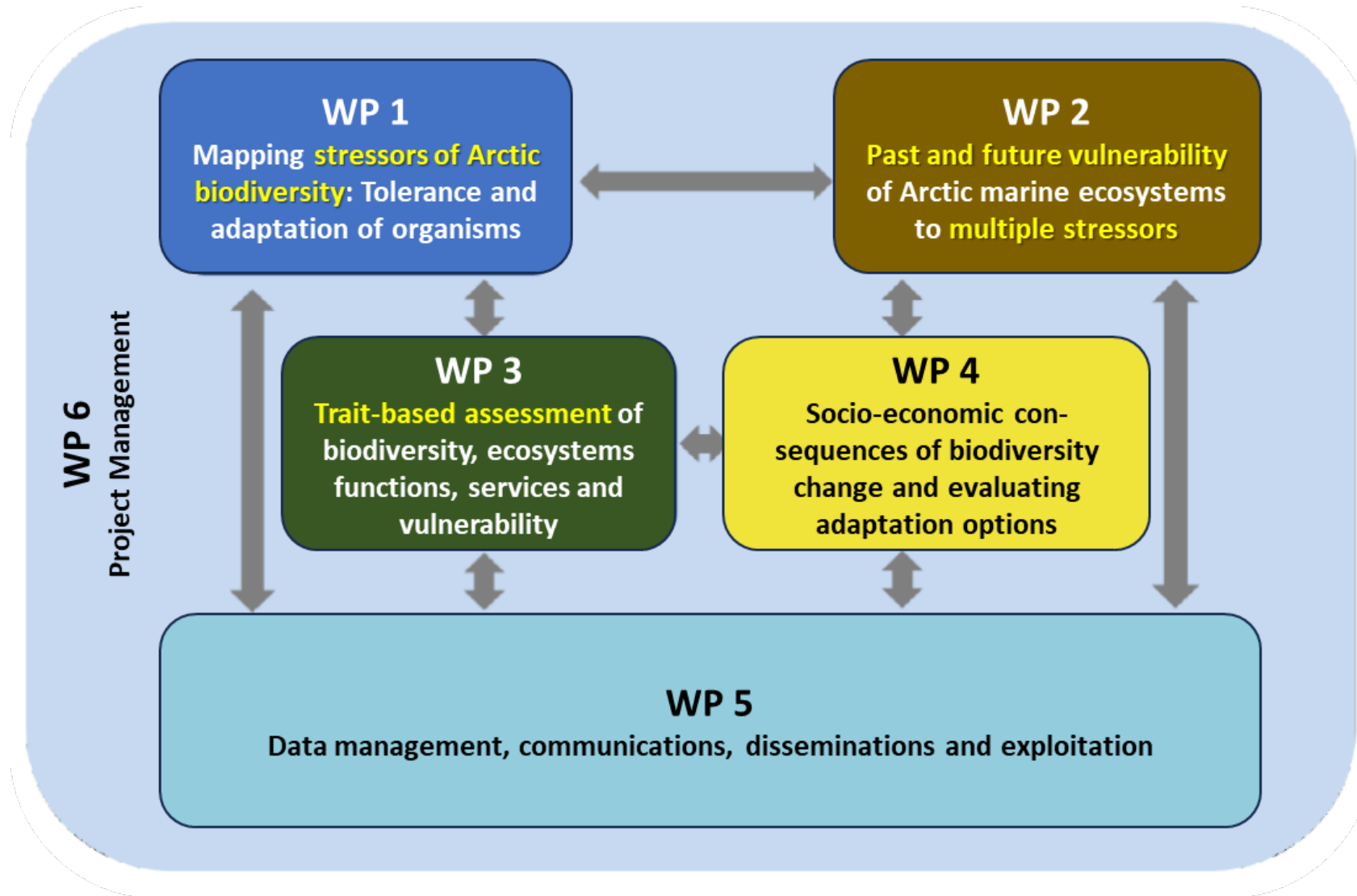
ECOTIP concept



Causes for tipping points (climate and other anthropogenic stressors),
their **consequences** for marine ecosystem services such as fisheries and carbon sequestration,
and **adaptation** strategies of humans.

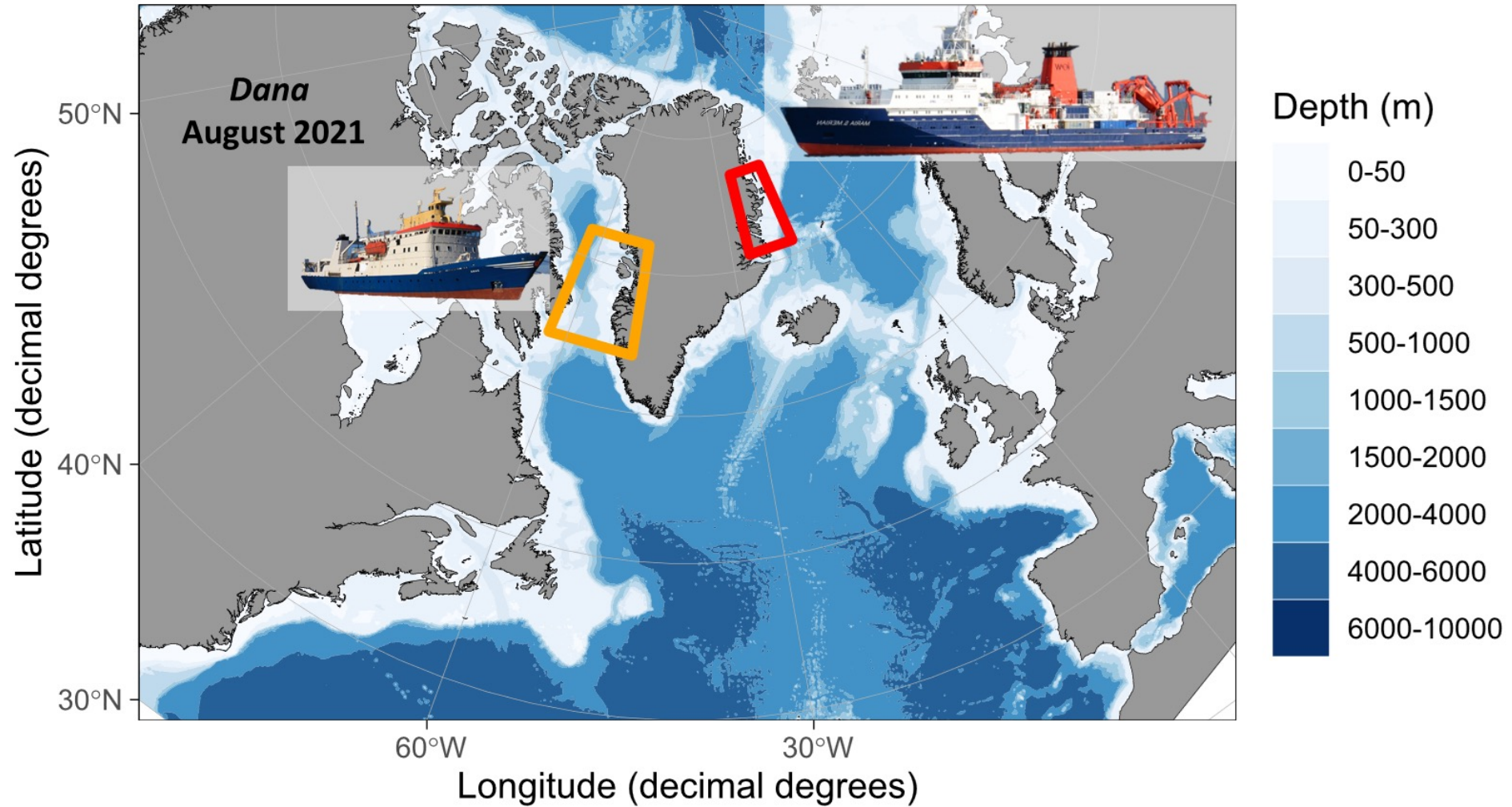
Focus area: Arctic marine ecosystem
(mainly E/W-Greenland)



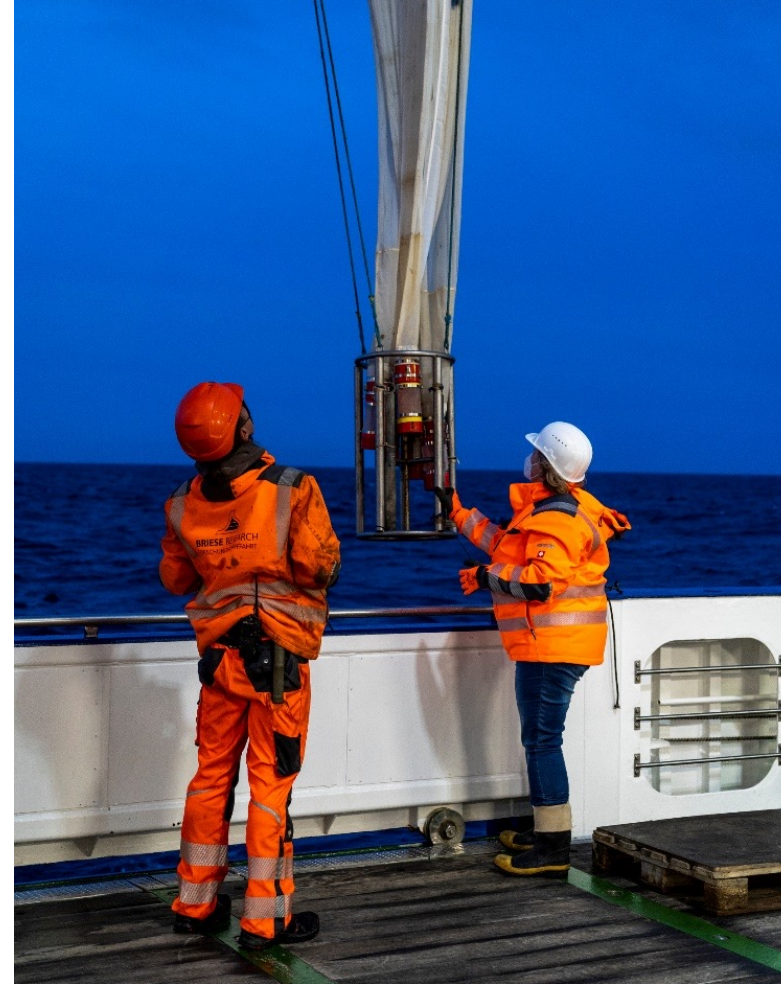


WP1-3: Mapping stressors and the current biodiversity of Arctic marine ecosystems

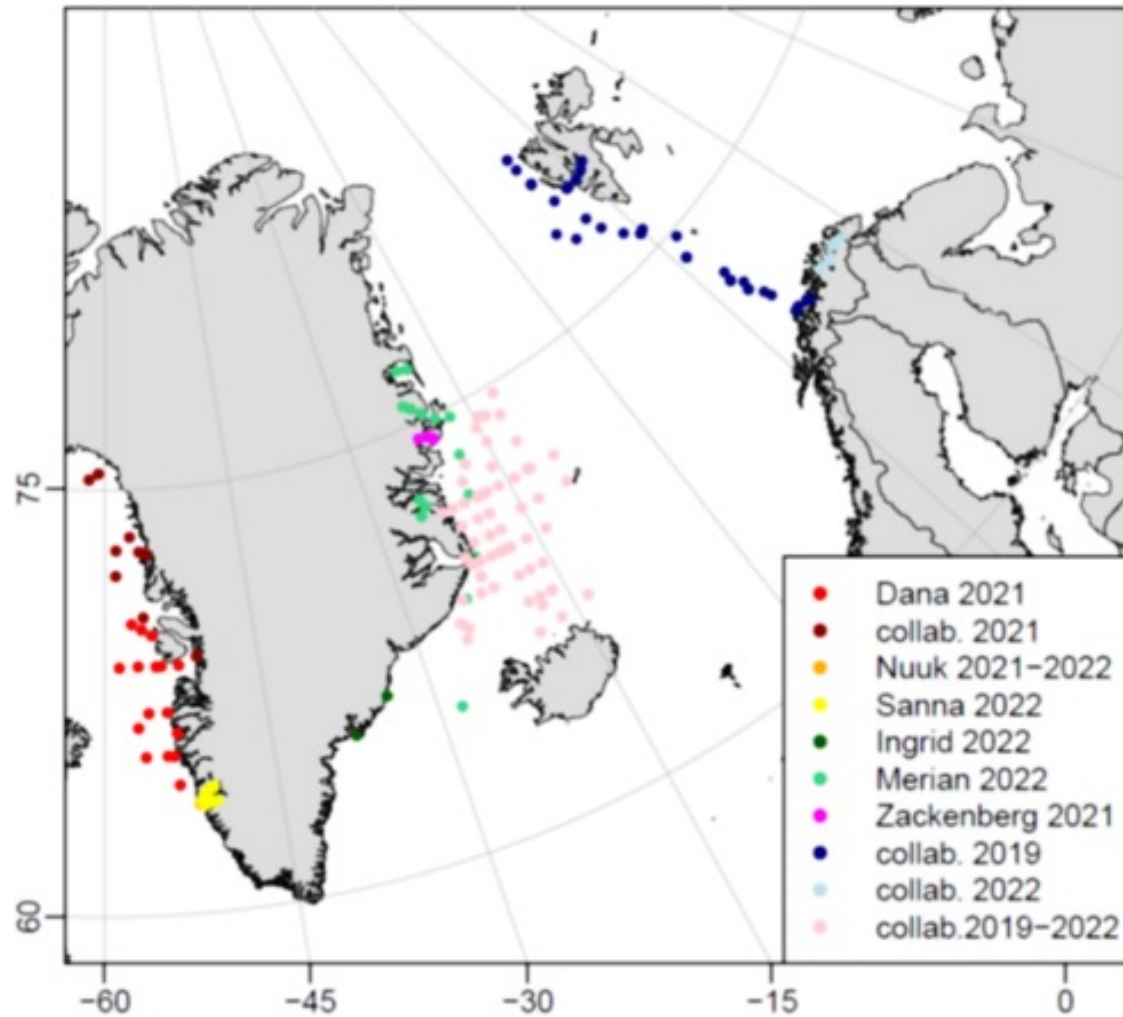
M.S. Merian August 2022



WP1-3: Mapping stressors and the current biodiversity of Arctic marine ecosystems



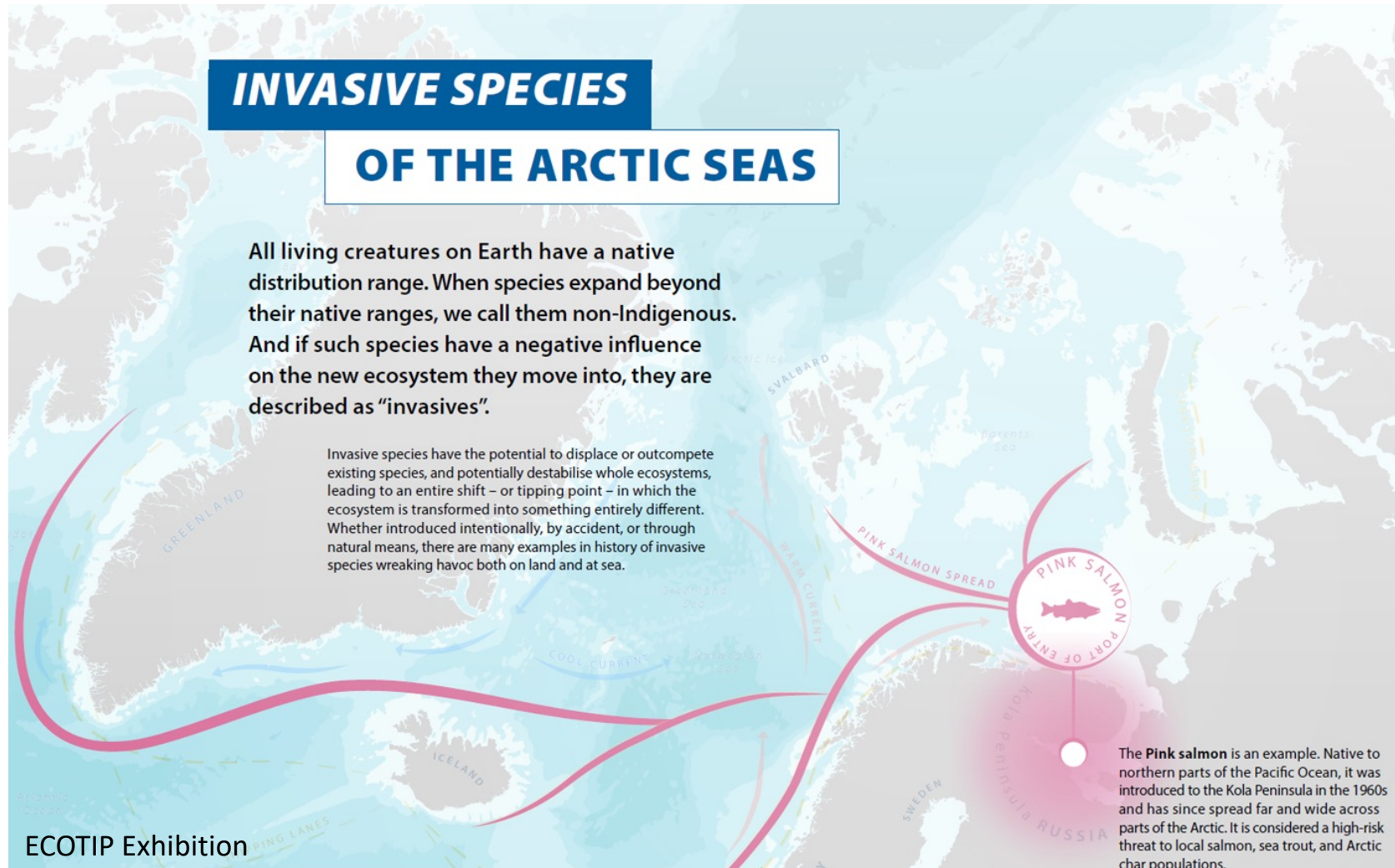
WP1-3: Mapping stressors and the current biodiversity of Arctic marine ecosystems



Monitoring of biodiversity and non-native species by eDNA



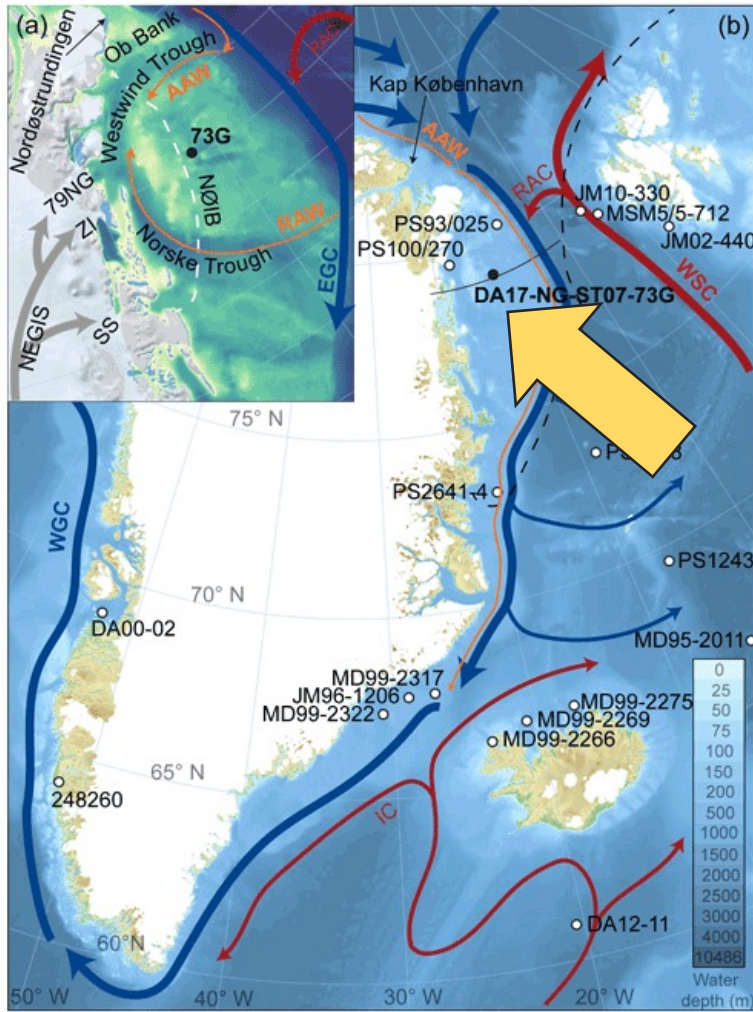
WP1-3: Mapping stressors and the current biodiversity of Arctic marine ecosystems



**WP1-3: Mapping the biodiversity of Arctic marine ecosystems
in the past and its interaction with external drivers**

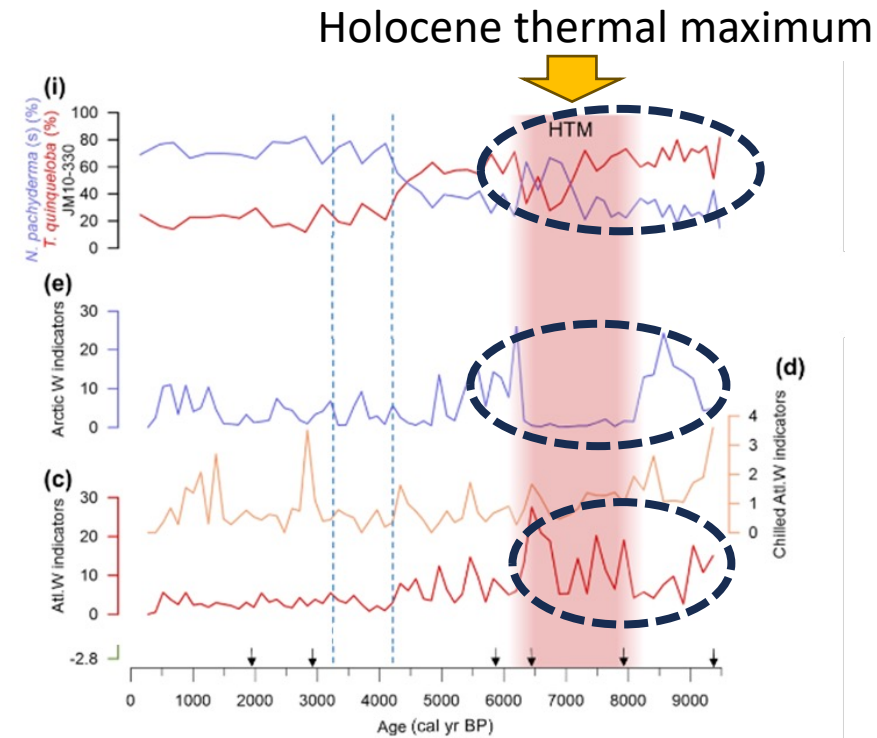


WP1-3: Mapping the biodiversity of Arctic marine ecosystems in the past and its interaction with external drivers



Sediment core from this sampling site has been analyzed

(sampling influenced by **cold Arctic derived water** and by **warmer Atlantic derived water**)



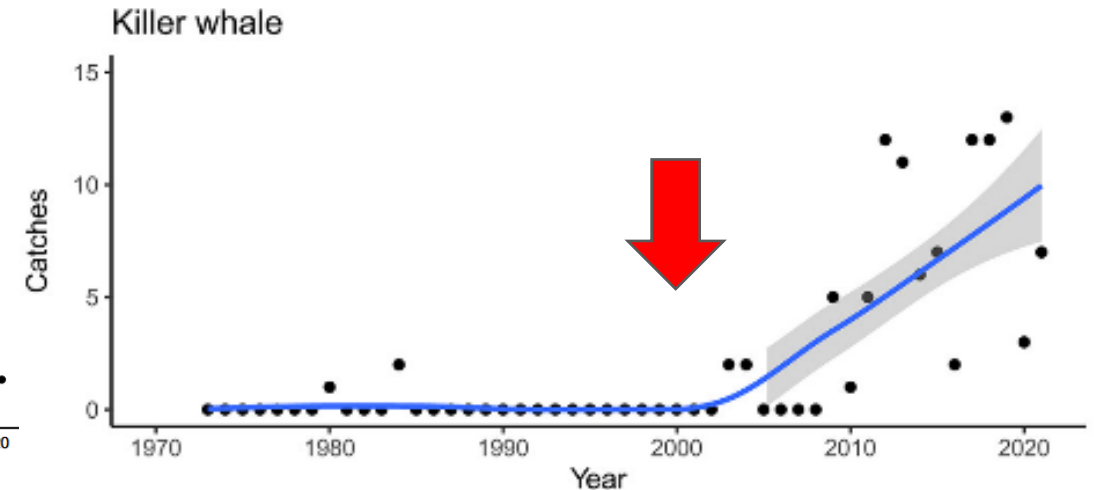
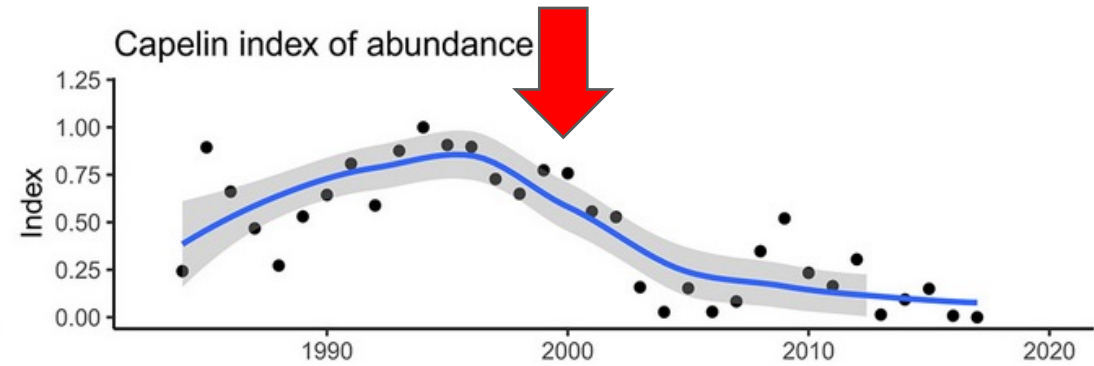
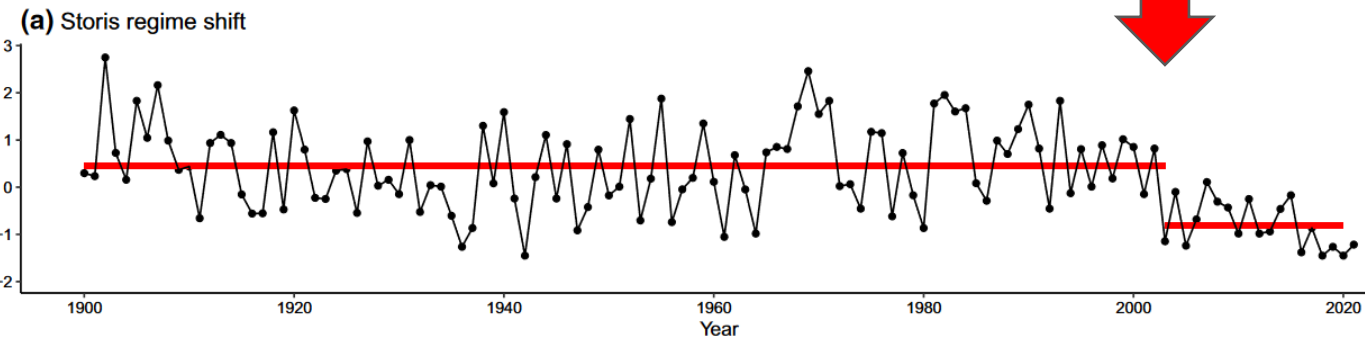
WP1-3: Determine the potential for ecosystem tipping points – Fisheries and marine mammals



Global Change Biology

A regime shift in the Southeast Greenland marine ecosystem

Mads Peter Heide-Jørgensen¹ | Philippine Chambault^{1,2} | Teunis Jansen^{3,4} |
Caroline V. B. Gjelstrup³ | Aqqalu Rosing-Asvid⁴ | Andreas Macrander⁵ |
Gísli Víkingsson⁵ | Xiangdong Zhang⁶ | Camilla S. Andresen⁷ | Brian R. MacKenzie³



Heide-Jørgensen et al. 2022

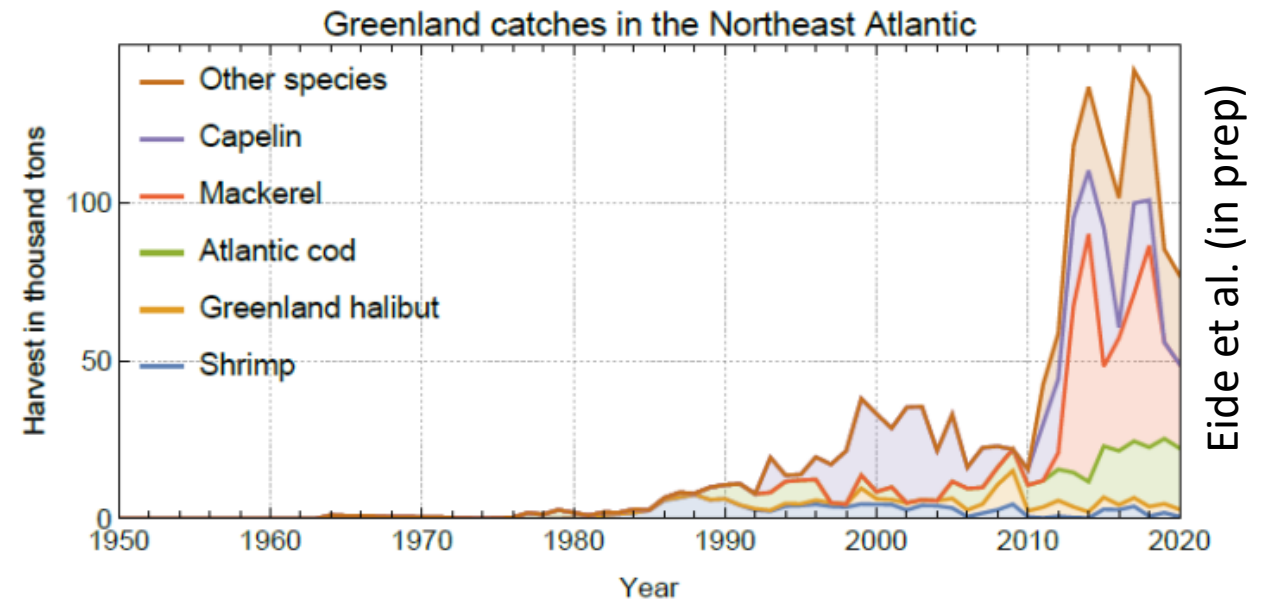
WP4: Dialogue and co-creation of advice for improved governance and adaptation strategies with local and indigenous communities, industries and regulatory authorities



Communicating with Greenlandic communities



Analysis of fleet structure and markets



WP1-3: Determine the potential for ecosystem tipping points – Carbon sequestration

Melting ice



Increased stratification



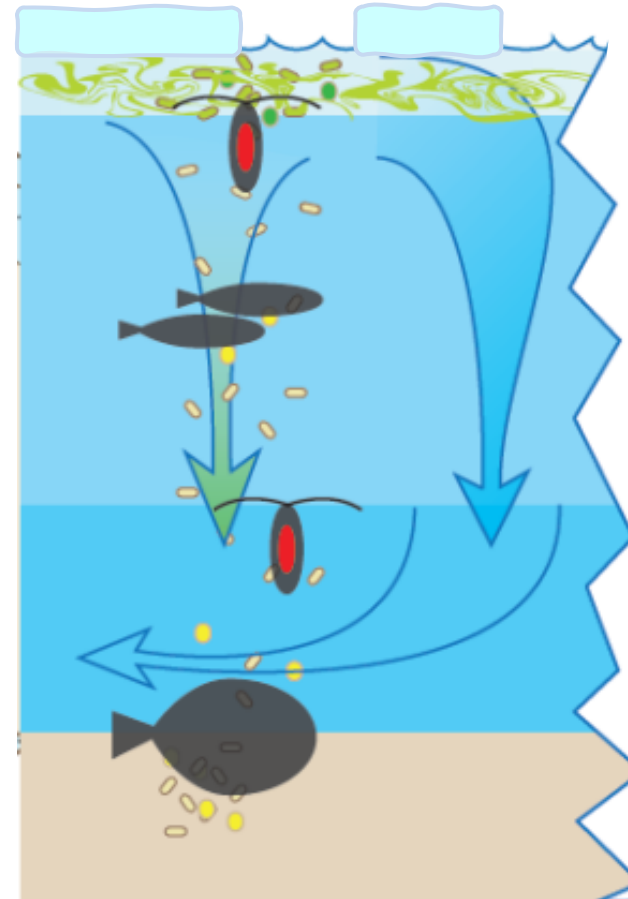
Decrease in the cell size of primary producers



Shift towards small detritus-feeding copepods



Effects on the biological carbon pump,
food supply for the benthic communities,
and food web efficiency



Abundant benthic fish
more C sequestration

WP1-3: Determine the potential for ecosystem tipping points – Carbon sequestration

Melting ice



Increased stratification



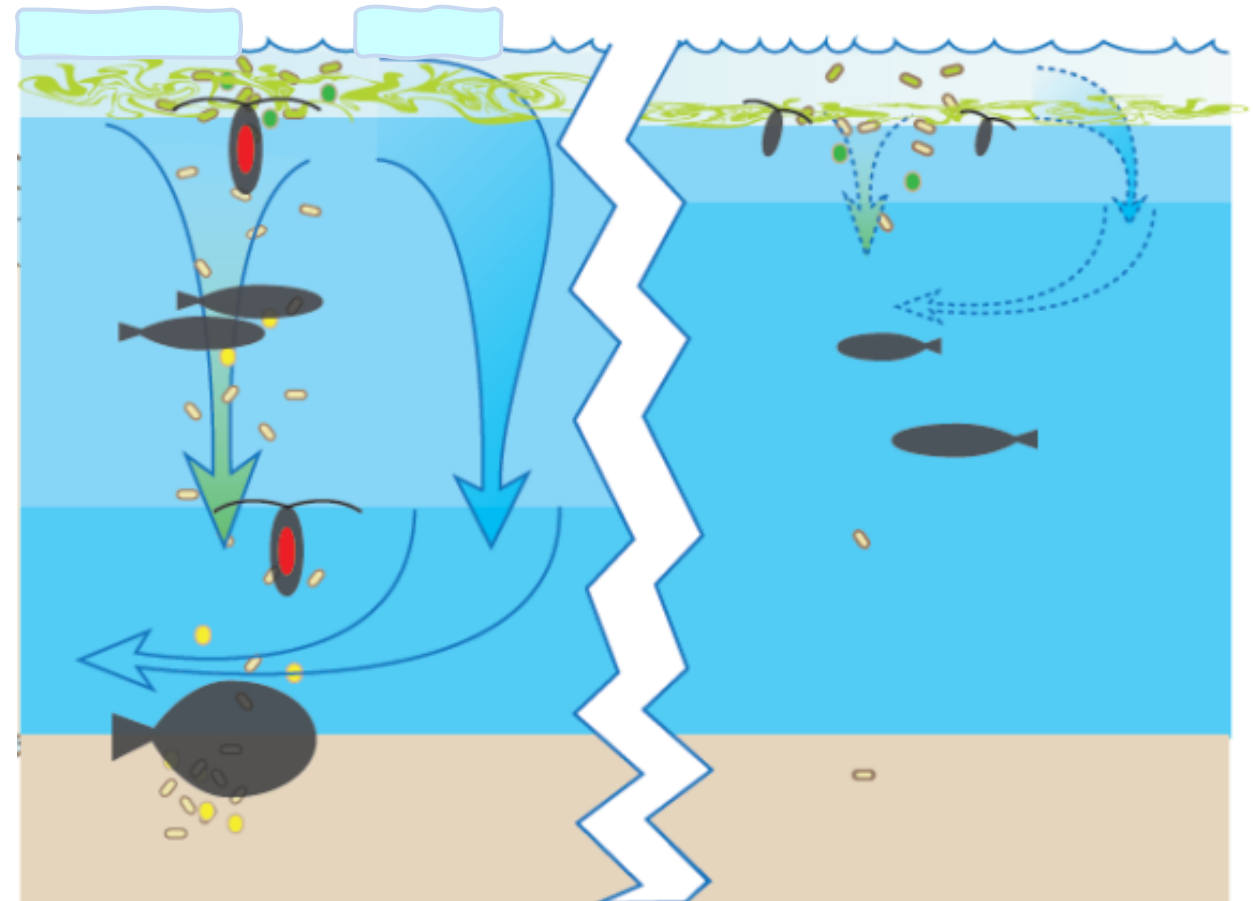
Decrease in the cell size of primary producers



Shift towards small detritus-feeding copepods



Effects on the biological carbon pump,
food supply for the benthic communities,
and food web efficiency



Abundant benthic fish
more C sequestration

Little benthic fish/
little C sequestration

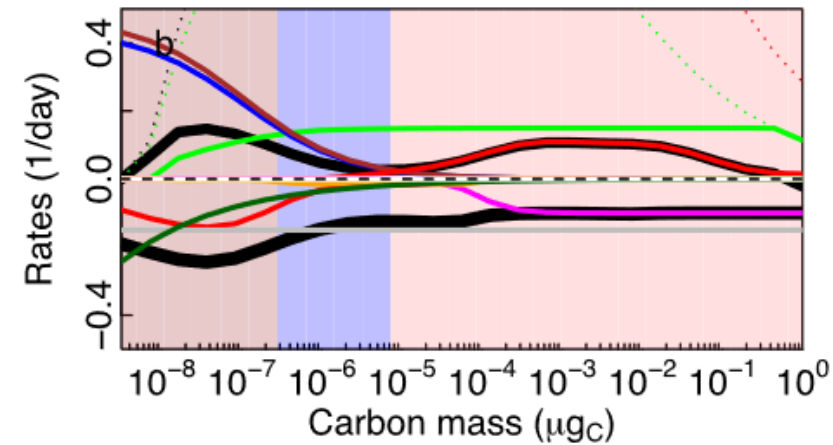
WP1-3: Determine the potential for ecosystem tipping points – Carbon sequestration



Field & experimental studies to get insight in current state

Use models to determine rates and understanding for distinct processes

- Light harvesting
- Nutrient uptake
- DOC uptake
- Food consumption
- Division rate
- Predation
- Virulysis
- Higher trophic levels
- Respiration
- Passive



Andersen & Visser, 2023

WP1-3: WP1-3: Determine the potential for ecosystem tipping points – Carbon sequestration



Action organized by ECOTIP and EU4OceanObs to advance the understanding between observational scientists and the modelling community

A wide-angle photograph of a snowy Arctic landscape with mountains and a body of water, serving as a background for the central text box.

Biogenic Data Products to Advance Ocean Carbon Sequestration Modelling in the Arctic

With this survey, we invite you to join an action organized by the EU-funded projects ECOTIP and EU4OceanObs towards advancing modeling carbon sequestration in the Arctic. The final goal is the publication of a community-perspective article submitted in winter 2024.

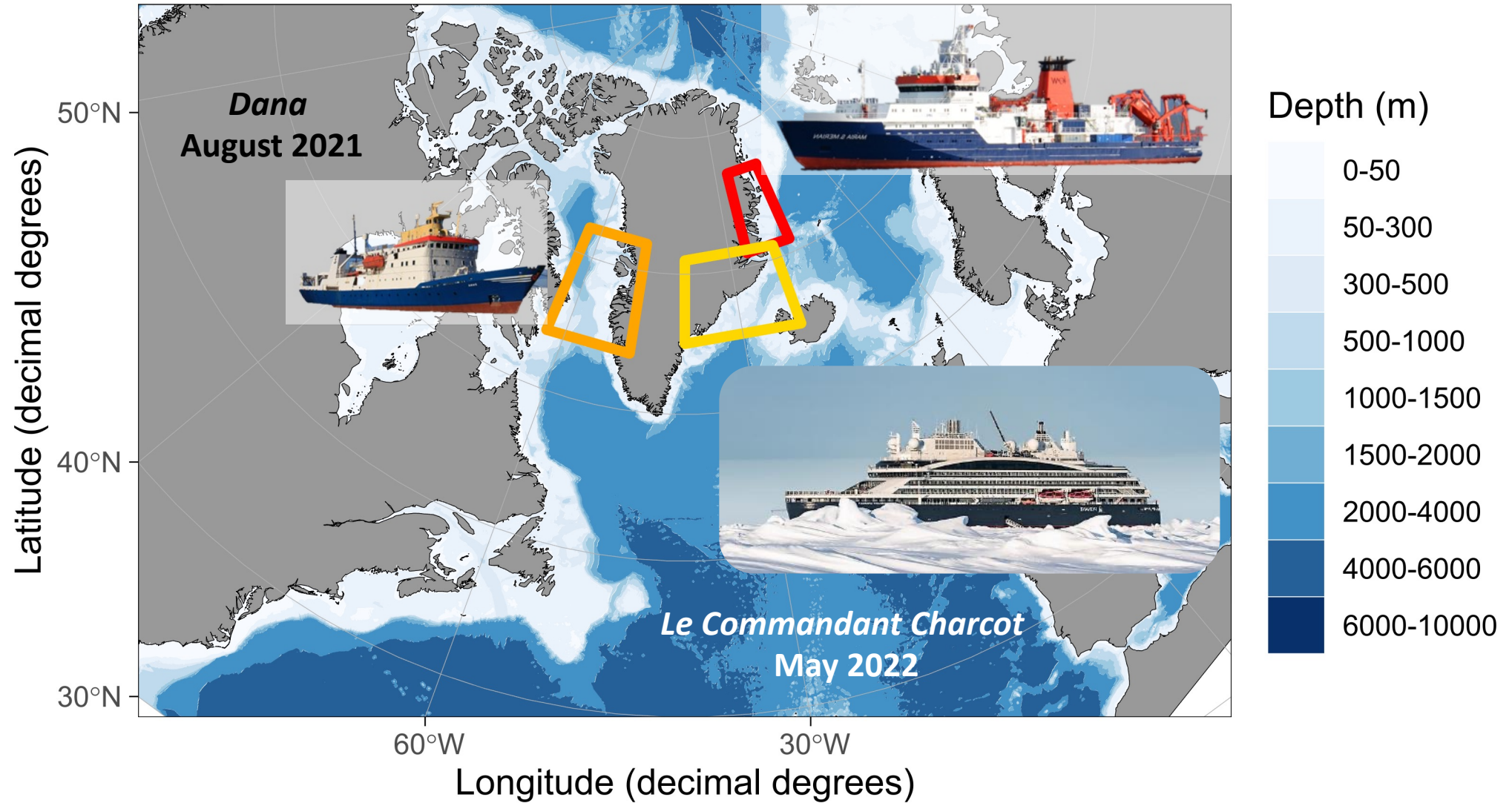
The action has 3 phases:

Phase 1- present survey: Community perspectives on identifying important processes for advancing modelling carbon sequestration in the Arctic.

Phase 2- online workshop: Online workshop for identifying biogenic products related to the priorities from the survey, their observing status, and model readiness.

Phase 3- manuscript preparation: Engaged participants from phases 1 & 2 will work as co-authors for the submission of a perspective article on biogenic data products for advancing ocean carbon.

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Suspended biomass
Chlorophyll a and
particulate organic carbon (POC)

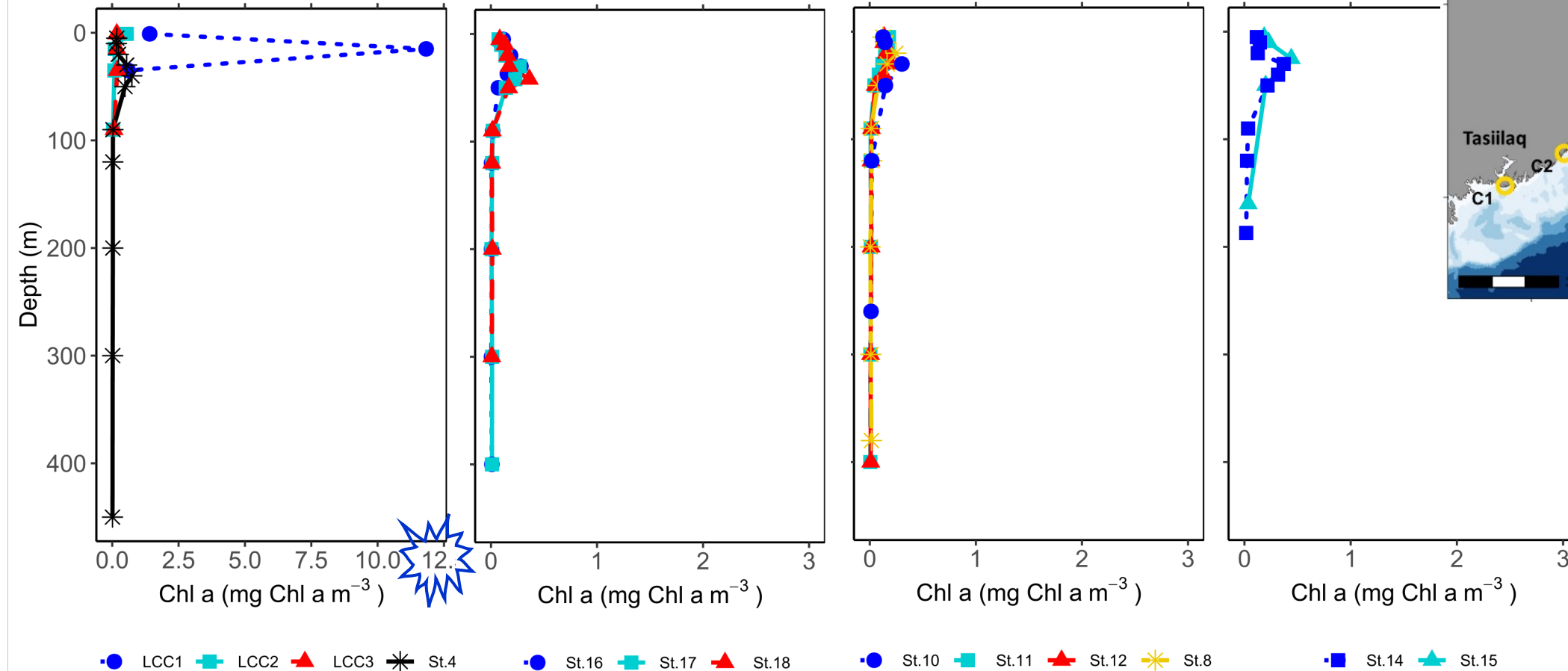
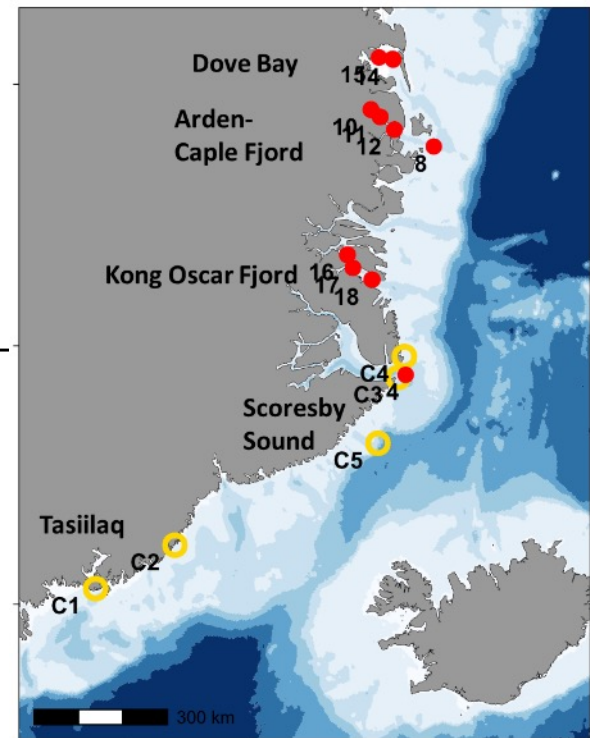
Chl a concentration in the water column

“South”

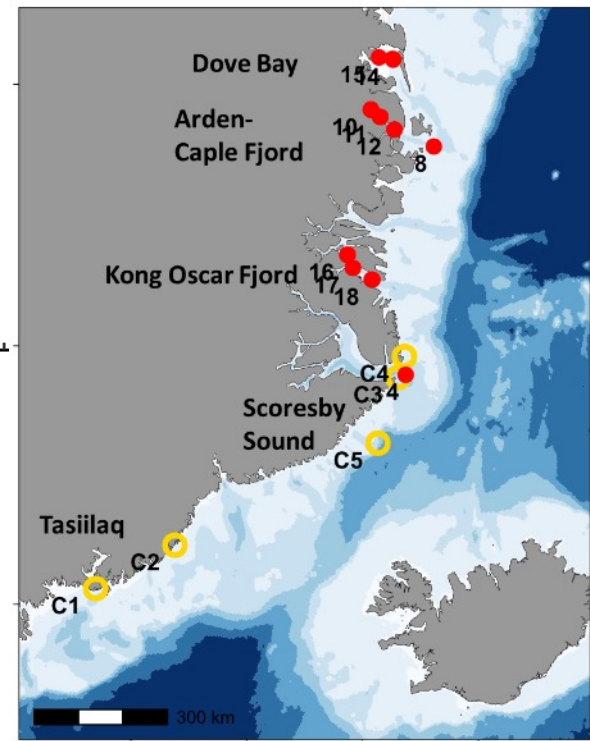
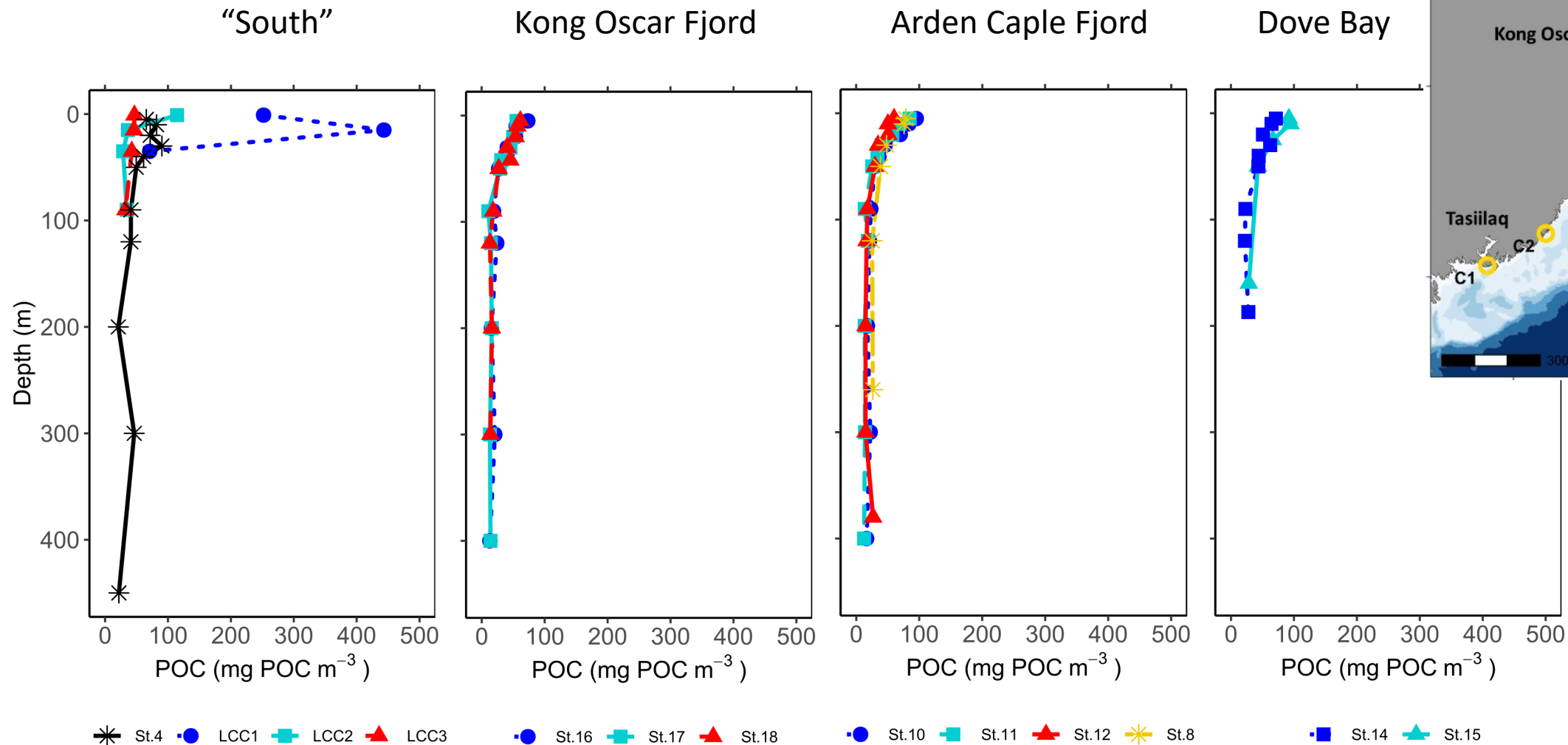
Kong Oscar Fjord

Arden Caple Fjord

Dove Bay

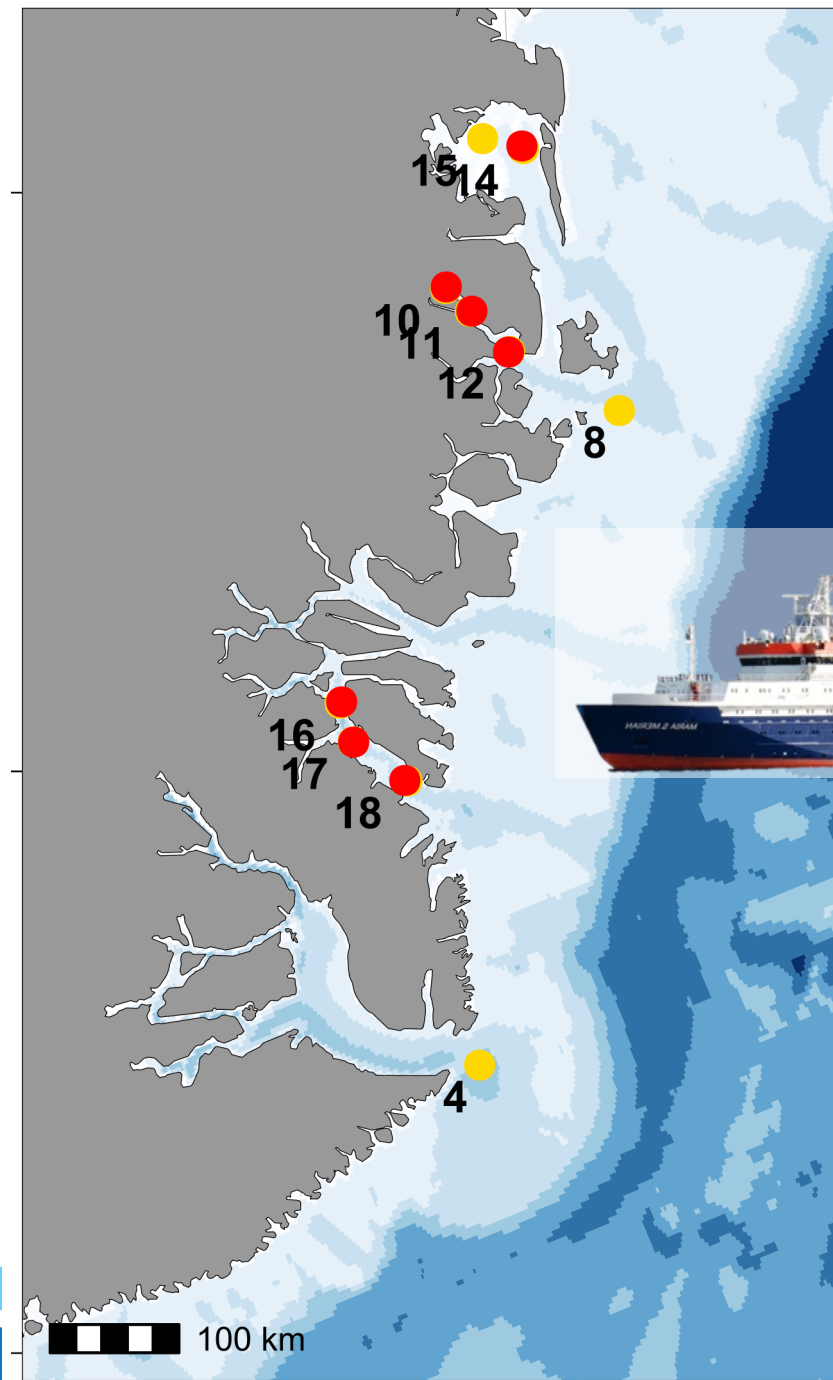


POC concentration in the water column





**Downward flux
of chlorophyll a
and
particulate
organic carbon
(sediment trap
data)**

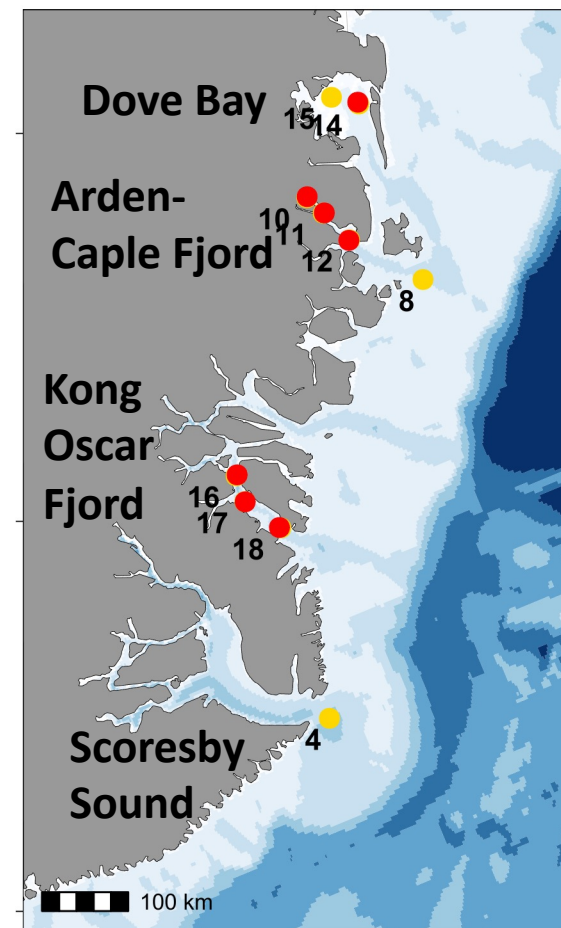
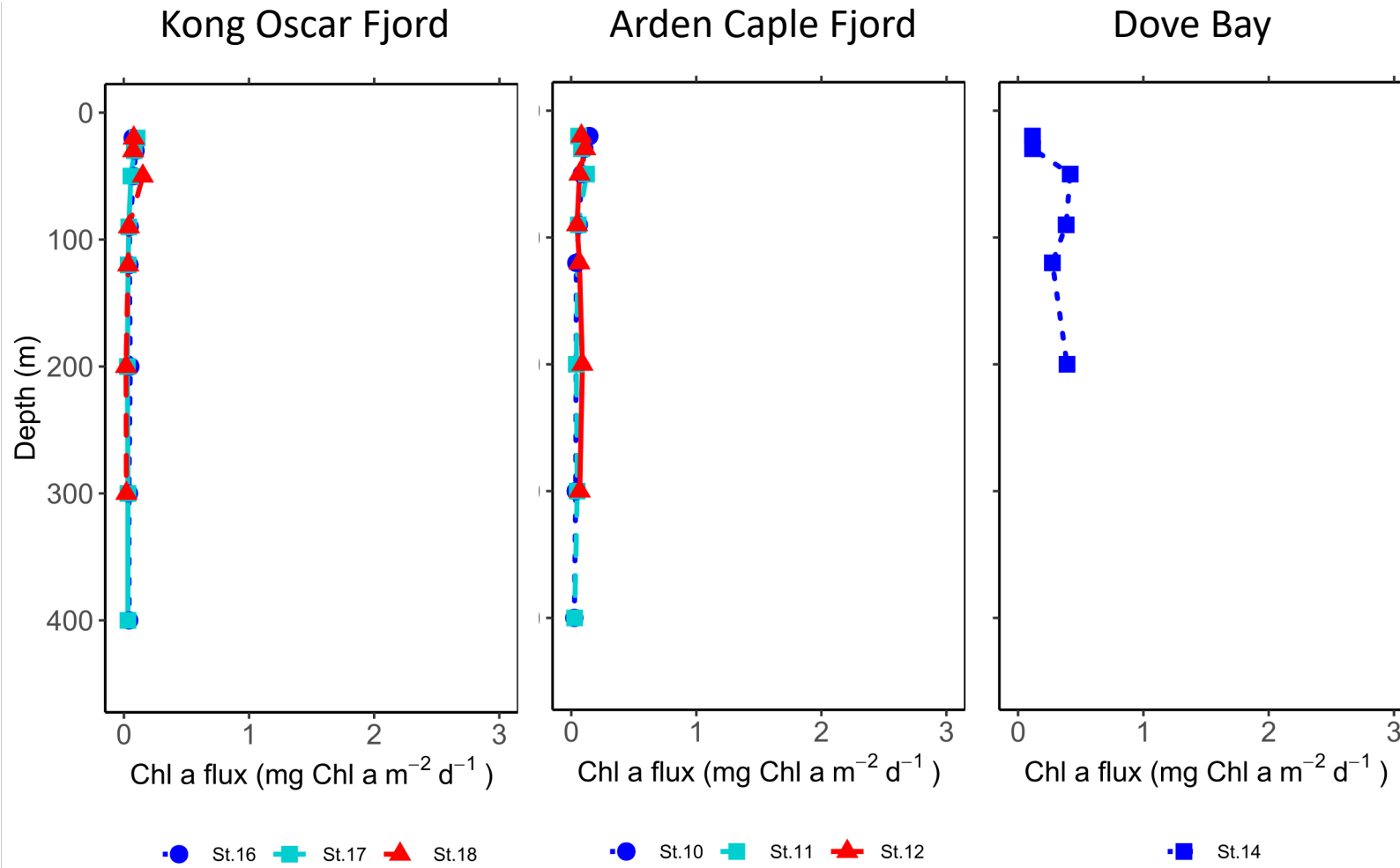


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August 2022

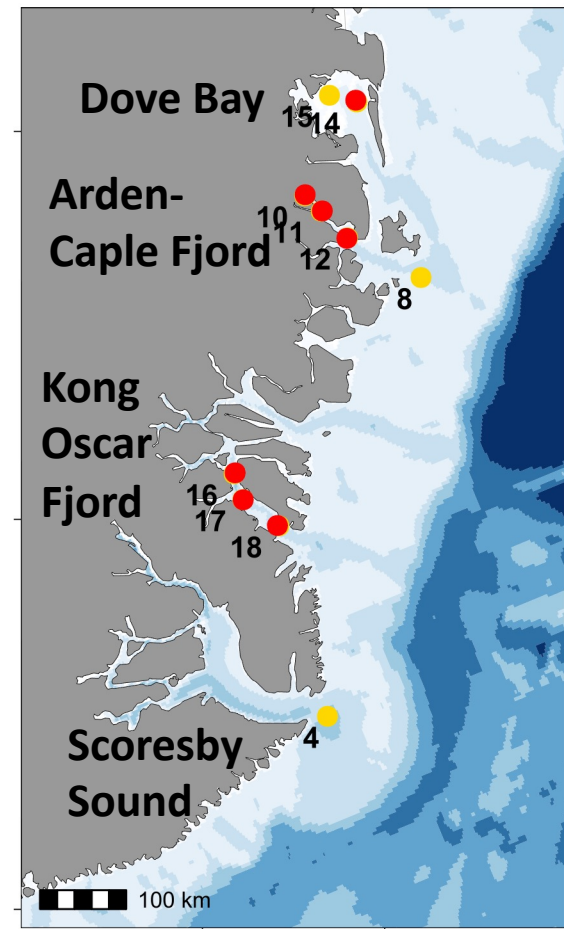
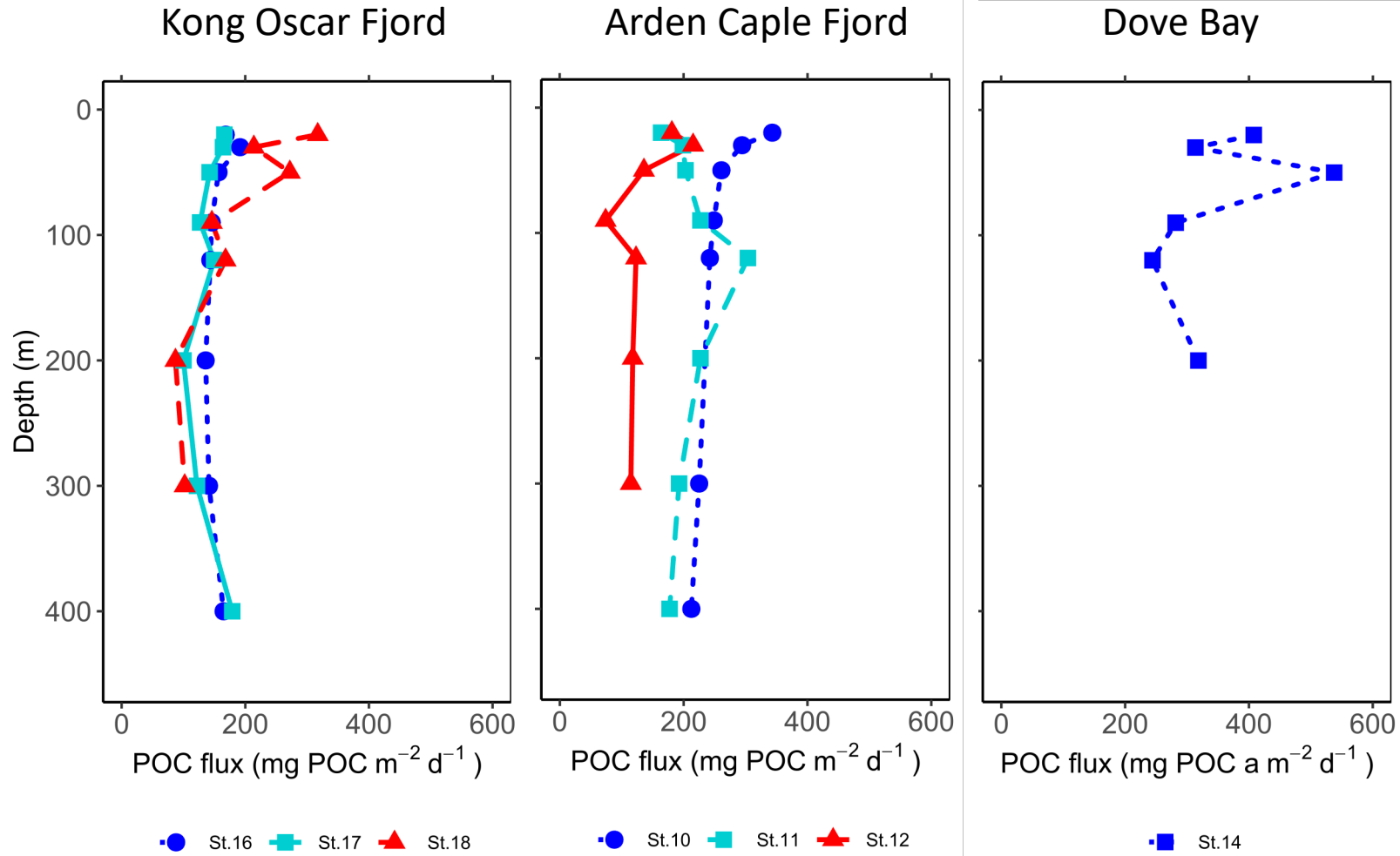


Sediment traps
deployed
at the “red”
stations

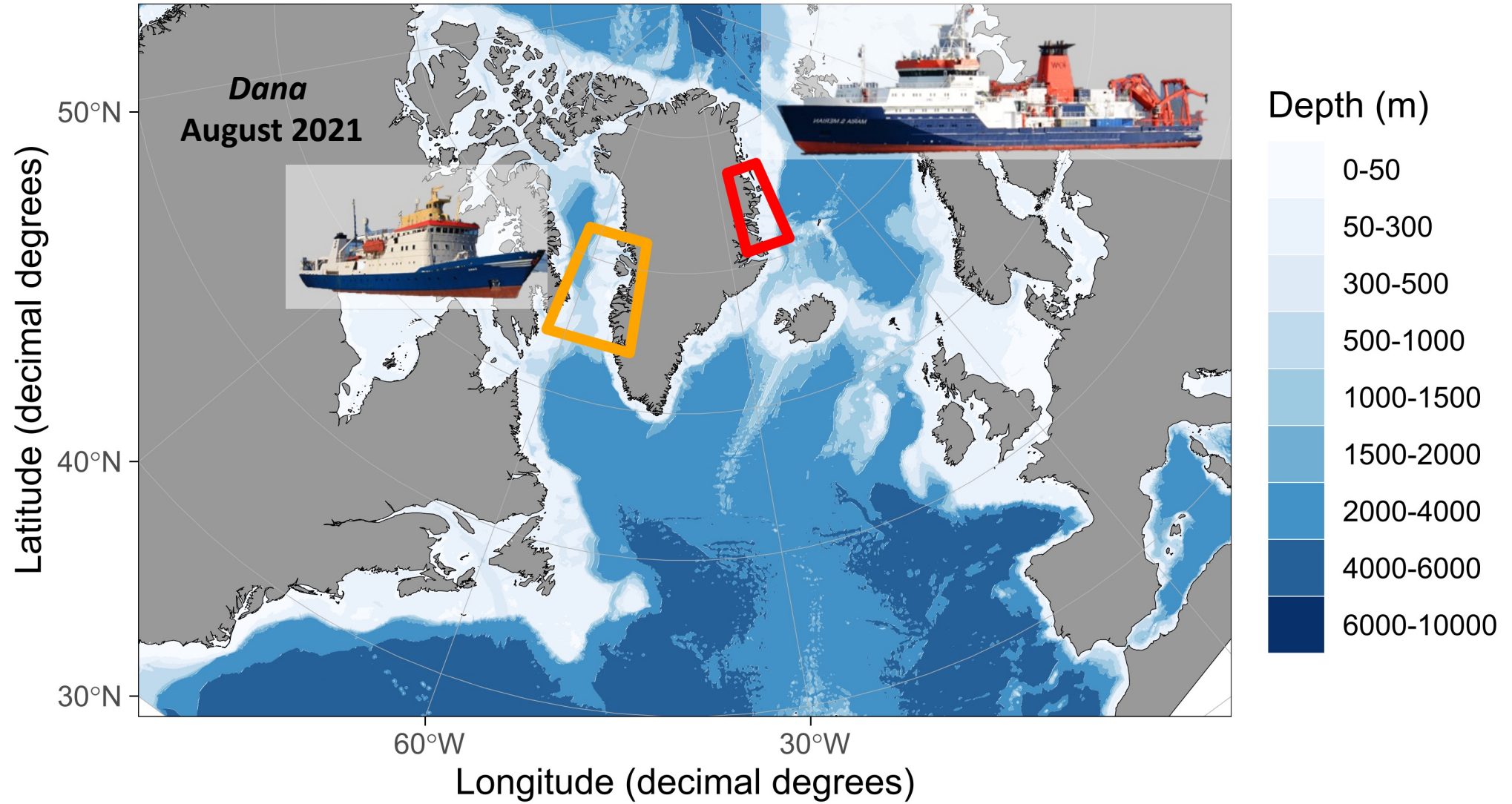
Downward Chl a flux (sediment traps)

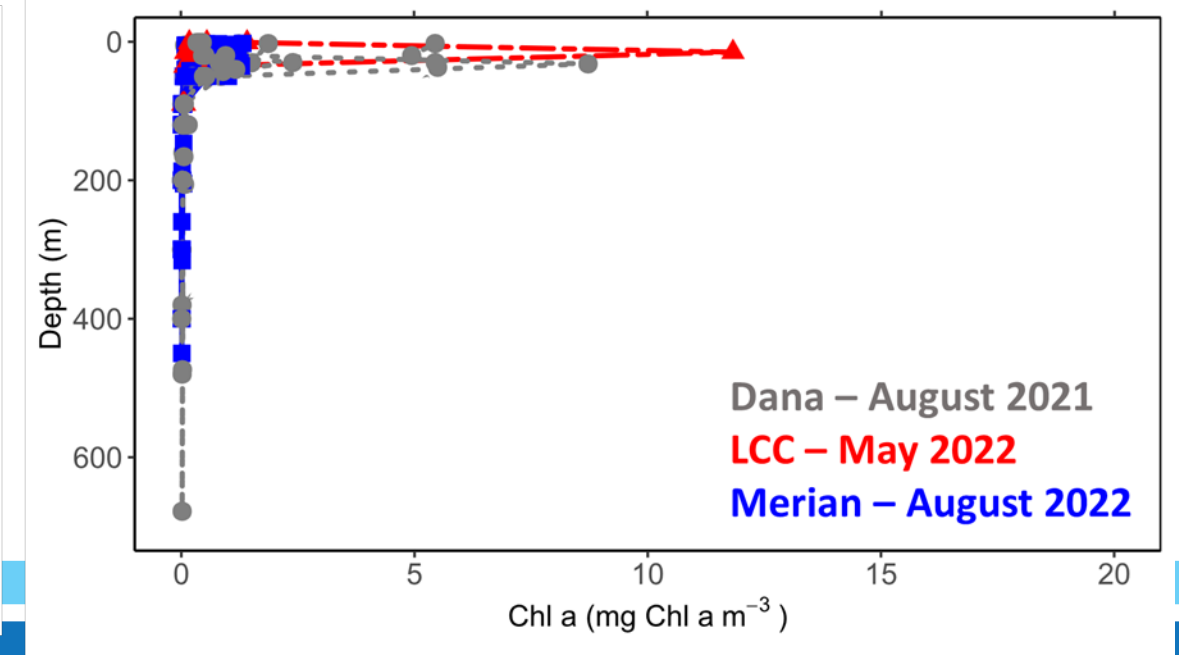
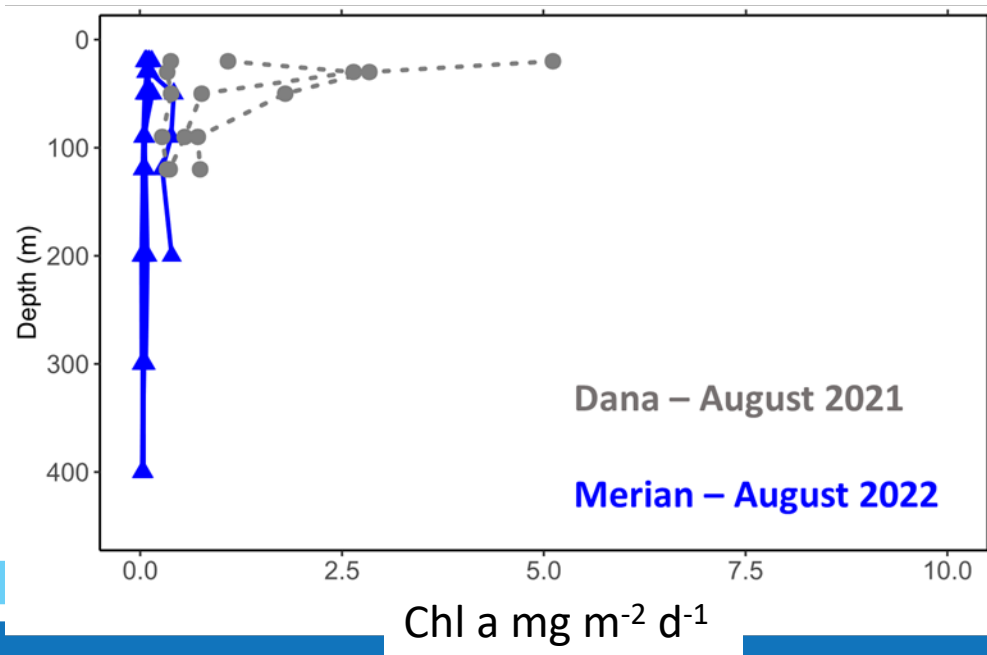
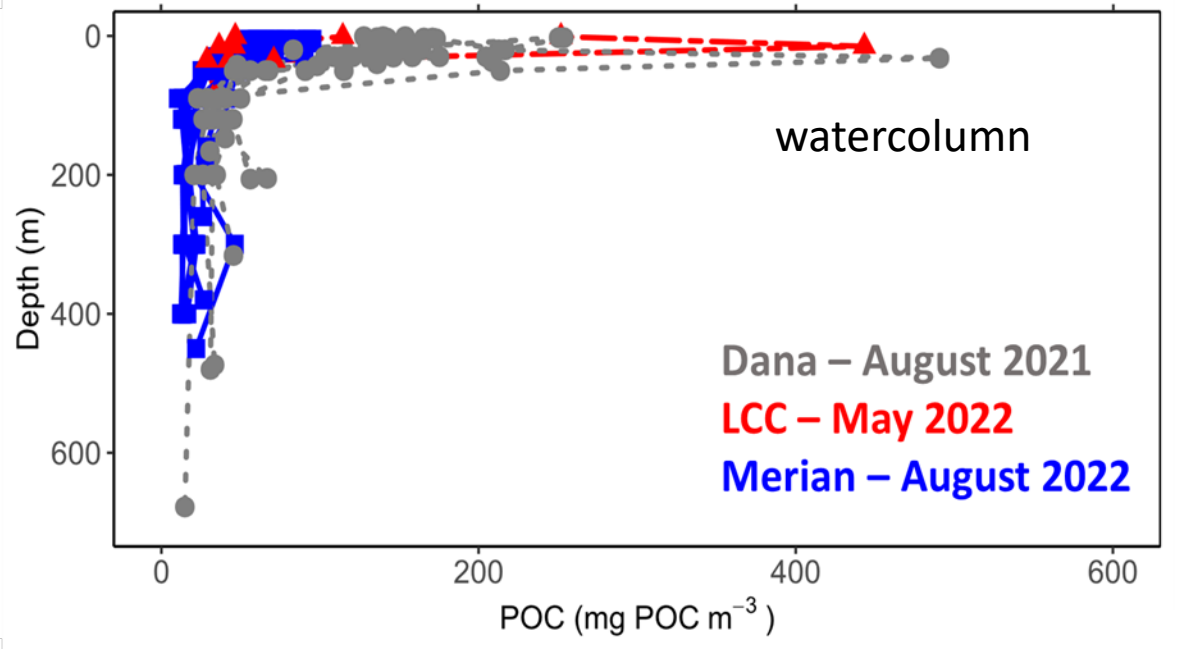
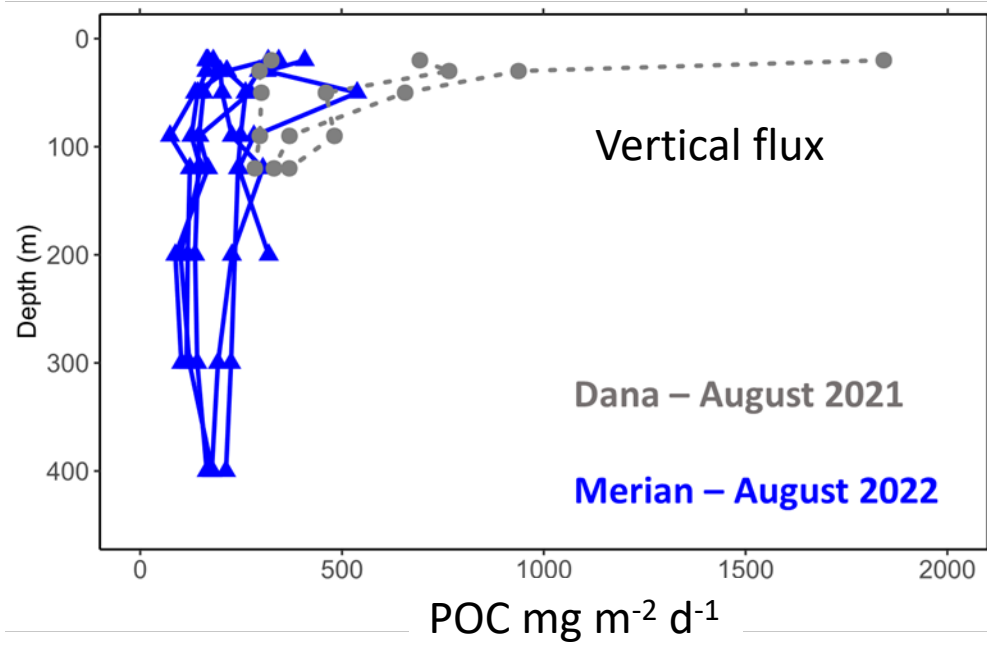


Downward POC flux (sediment traps)



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Next steps

- Phytoplankton taxonomy – pelagic and in traps
- Zooplankton functional traits
- Looking at processes and traits related to the biological pump
 - Phytoplankton
 - Benthos
 - zooplankton