



The SEA-Quester project making use of Finnish marine research infrastructure

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SEA-Quester in brief

Title: Blue Carbon production, export, and sequestration in emerging polar ecosystems (SEA-Quester)

Timeframe: 2024 (Feb. 1st) – 2028

Funder: EU Horizon Europe

Call: HORIZON-CL6-2023-CLIMATE-01-3, Option B: Uncover mitigation opportunities of newly emerging European and polar blue carbon habitats

Coordinator: Technical University of Denmark (DTU-Aqua), Marja Koski



Partners:

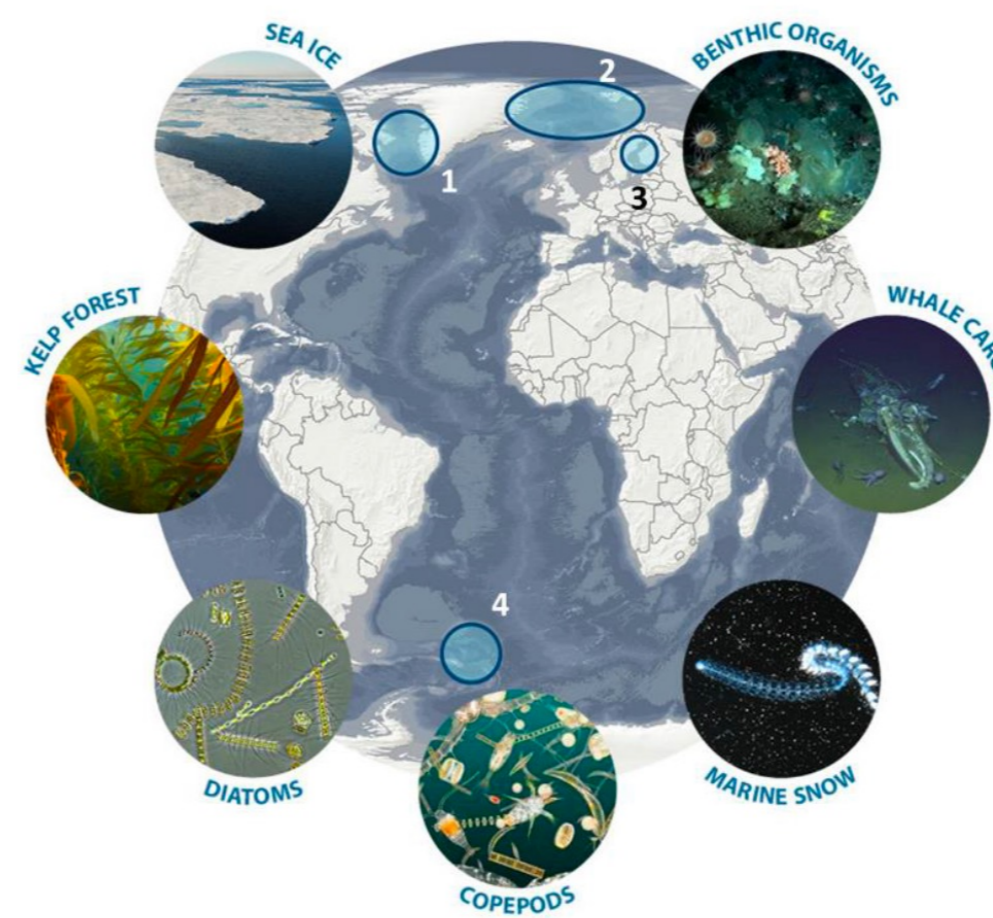


Figure 1. SEA-Quester study areas. Novel marine ecosystems are emerging in high latitude seas along coastal margins, within shelf seas and in the pelagic ocean; primarily associated with changing sea ice coverage and species distribution patterns. Manifestations include poleward expansion of macroalgae, change in phytoplankton bloom timing, location and intensity, restructured metazoan and benthic communities, and changing particle flux, among others. These changes are hypothesized to enhance the natural environments capacity to store carbon as living biomass, dissolved carbon in the deep ocean water, and within ocean sediments. SEA-Quester seeks to document and quantify these ecosystem changes and associated blue carbon storage in 4 representative locations: 1) West Greenland, 2) the Norwegian sea spanning from East Greenland to Svalbard, 3) the Baltic Sea and 4) the Southern Ocean.

Finnish marine research infrastructure in a Polar context

As part of the SEA-Quester project, ÅAU will conduct studies in intertidal and fjord systems to open ocean, and in ice free and ice-influenced areas. The aims are to quantify biodiversity and biomass of macrophyte-associated fauna as well as soft-bottom habitats and assess related ecosystem function as well as their potential as emerging carbon sinks in relation to physical and chemical variables. In addition, macrofaunal biodiversity and function will be related to diagenesis of carbon sequestration and paleorecords.

Infrastructure by FINMARI: sensors, ROV, acoustics etc.

SEA-Quester Objectives

The objectives of SEA-Quester are:

- To document the biodiversity, primary production and function of emerging polar and sub-polar marine ecosystems and to quantify their carbon sequestration – accounting for biomasses, fluxes and residence times of carbon.
- To strengthen the predictive skills of models through trait-based approaches that build on a better understanding of the interactions between functional biodiversity and carbon sequestration, and through assessing the past (paleo-oceanographic) interactions between organisms and their environment.
- To explore the interacting effects of climate change, anthropogenic stressors, carbon sequestration, oxygen demand and nutrient supply.
- To provide a rigorous means of quantifying i) marine carbon sequestration and ii) trade-offs between harvesting marine biomass and its net carbon sequestration that can be used to map, evaluate and compare blue carbon stocks and their potential, and to assess the impacts of conservation vs. other actions.
- To develop observations and monitoring of blue carbon within the framework of Essential Ocean Variables (EOVs).
- To support local, national and EU level policy-makers and management authorities on decisions regarding biodiversity, blue carbon, sequestration and human activities in emerging polar and sub-polar ecosystems as well as to promote ocean literacy with focus on blue carbon.

Year-round sampling for blue carbon in Northern Baltic Sea

Research aims:

To assess seasonal and long-term community changes in phytoplankton (and ice algae), zooplankton, benthos and macrophyte communities, as well as investigate fate of production and carbon flux throughout the water column to the seafloor.

Planned field activities:

Long-term year-round field sampling of carbon stocks, carbon sequestration processes and environmental conditions in three coastal inlets along a nutrient and exposure gradient (Kasviken, Karviken, Yttre Verkviken) in North-Eastern Åland Island during 2024-2025. The same sampling scheme is conducted at regular intervals at the three stations from May 2024 (June) onwards. Sampling span: phytoplankton, zooplankton, benthic soft-bottom & hard-bottom fauna, macrophytes and macroalgae (and fish), and include: carbon-flux measurements, productivity measurements, assessment for community structure and function, e-DNA, etc.

Infrastructure by FINMARI:

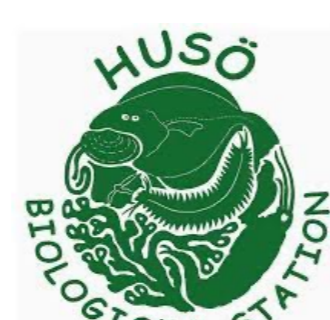
- Facilities and infrastructure provided by Husö Biological Station (potentially also ÅAU field base at Archipelago Centre Korpoström)
- Sensors, ROV & uw-drone, areal drone, molecular lab etc.



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