



Changing Arctic Ocean

NERC

Implications for marine biology and biogeochemistry

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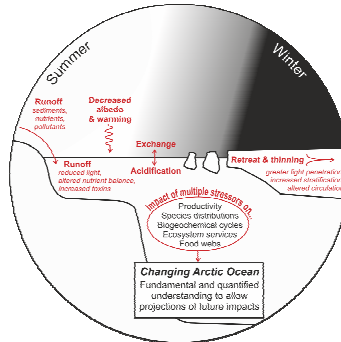
@NERC_CAO

www.changing-arctic-ocean.ac.uk

NERC has invested £16 million in a 5-year programme (2017-2022) to understand the effects of climate change on the ecosystems, marine biology and biogeochemistry of the Arctic Ocean.

The focus of the programme is to understand these changes in a quantifiable way.

This will allow computer models to predict the consequences on, for example, surface ocean productivity, species distributions, food webs and ecosystems, and the associated ecosystem services.

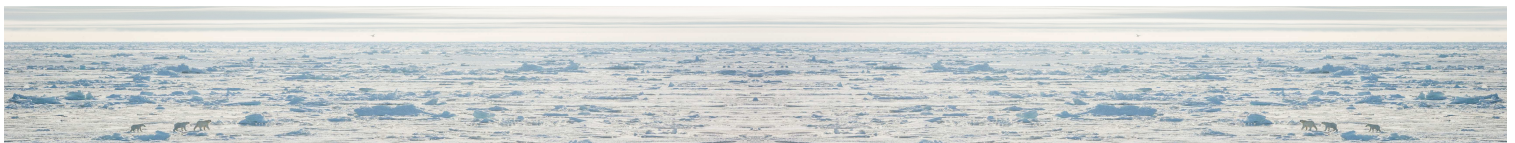


Multistressors and their impact on processes in the Arctic Ocean

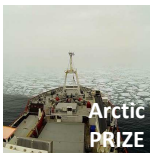
The aim of the programme is to model future impacts of change in the Arctic, and to provide projections for future ecosystem services.

To achieve this, the programme has two overarching research challenges:

1. To develop a quantified understanding of the structure and functioning of Arctic ecosystems.
2. To understand the sensitivity of Arctic ecosystem structure, functioning and services to multiple stressors and the development of projections of the impacts of change.



Projects



Prof Finlo Cottier
SAMS

Surface ocean

Declining sea ice alters water column properties and the availability of light and nutrients that support productivity.

- How will changes in sea ice modify mixing and light in the surface ocean?
- What is the effect on the timing and rates of productivity, taxonomic composition, and pelagic and benthic consumers?



Dr Claire Mahaffey
University of Liverpool

Ecosystem response

To understand how Arctic ecosystems will evolve in response to multiple stressors, it is crucial to evaluate the effects of recent and on-going change.

- Are food webs sensitive to Arctic change?
- How have food webs changed in the past?
- How will they respond to future change?



Dr Christian März
University of Leeds

Seafloor

Sea ice retreat and thinning leads to longer, more extensive open water conditions. A longer growing season and altered primary productivity affect the amount and nature of organic matter reaching the seafloor.

- How will changes in the surface ocean influence seafloor processes?
- What are the consequences for carbon sequestration in sediments?



Prof David Pond
University of Stirling

Ecosystem reliance

Calanus comprise ≤90% of zooplankton biomass in the Arctic Ocean, and link phytoplankton to fish. They also transport carbon into the deep ocean via the Calanus "lipid pump".

- How does change in the Arctic Ocean alter the availability of this key Arctic food source?
- How do changes in Calanus affect the cycling of carbon in the Arctic?



Summer 2018

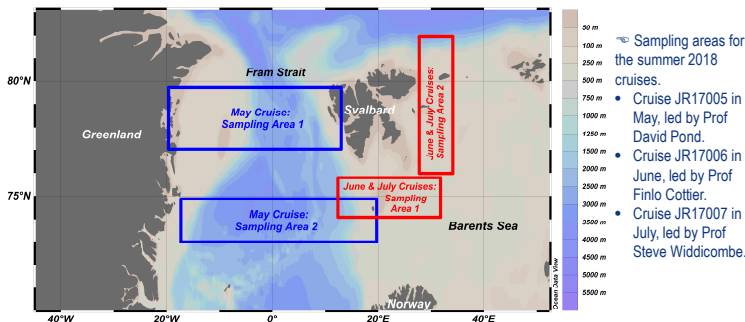
A second round of CAO funding will see up to 12 new projects join the programme in summer 2018.

These are co-funded by NERC and the German Federal Ministry of Education and Research.

All the new projects have co-investigators based in Germany and the UK. These projects will be ~3 years in duration.

Cruises

The first CAO cruise took place in summer 2017 to the Barents Sea (JR16006). During May-July 2018, three further cruises covering the Fram Strait, Greenland Sea and Barents Sea take place on the RRS James Clark Ross. The final CAO cruises are planned for summer 2019.



Collaboration and data

The programme has links with more than 60 international collaborators. A key aim is to forge engagement with Arctic community beyond the lifetime of the CAO.

Large and diverse data sets are being produced by the investigators:

- water column properties collected by CTD, gliders and seals
- water column sampling for seawater, particulates and plankton
- seafloor sampling for sediments, pore waters and benthos.

These data are being applied to a suite of models spanning different temporal and spatial scales: e.g. UKESM1, PISCES-ISO, COLTRANE, MEDUSA.

Collaboration with researchers external to the CAO is encouraged to maximise scientific outputs and to make best use of the data. Access to CAO data is available under licence through BODC.

