

ICES WG Integrated Assessments of the Barents Sea

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ICES WG Integrated Assessments of the Barents Sea



- 40 scientists from IMR (Norway) and PINRO (Russia) with expertise in
 - oceanography, biology (plankton, fish, benthos, marine mammals and sea bird), trophology, ecology, pollution and stock assessment
- invited scientists from Tromsø University
- invited managers from state departments
- 2014-2016 co-chaired by E. Johannesen and Y. Kovalev
- 2017-2019 co-chaired by E. Eriksen and A. Filin



ICES WGIBAR



The group's tasks are to

- describe ecosystem and processes

- summarize and analyze up-to-date knowledge on the state of and changes in the Barents Sea ecosystem

- identify significant pressures

- develop integrated assessment for the Barents Sea

- support

 - managers

 - ICES WG on stock assessment

 - ecosystem modelling

- give feedback for future monitoring of the ecosystem

- inform the users of the Barents Sea about results





Joint Monitoring of the Barents sea

Norway and Soviet agreed on a special attention on conservation and sustainable use of marine living resources and coordination of research in the area (The Convention on Fishing in the North-East Atlantic, 1959)

Since 1960s, Norway and Russia conduct a large scale monitoring

Autumn: 1965: 0-group fish survey
1972: Capelin survey, young herring (1985), polar cod (1986)

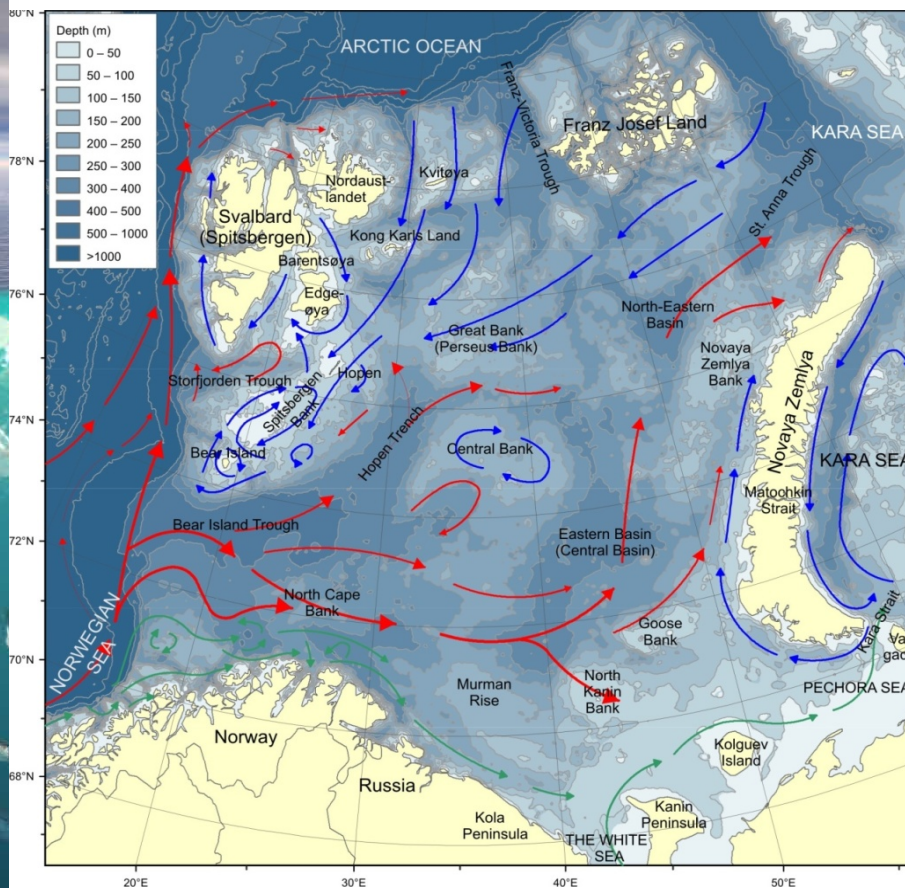
The Barents Sea ecosystem survey since 2004

Winter: 1981: Cod and haddock survey, redfish (1986), Greenland halibut (1989)

The Barents Sea ecosystem winter survey is under development

Huge national effort and international cooperation resulted unique large scale monitoring and long time series

The Barents Sea



The Barents Sea is a shelf sea (~ 1.6 million km²) and a transition zone between Atlantic and Arctic conditions

A productive area, with more than 200 species of fish, thousands of benthic invertebrate species and diverse communities of plankton, seabirds and marine mammals inhabiting or visiting the area

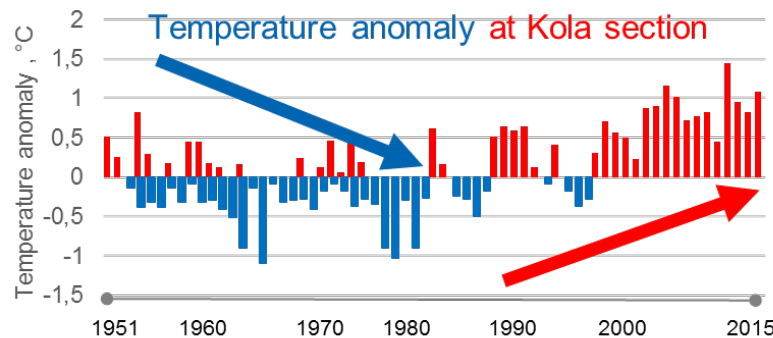
The Barents Sea ecosystem has been strongly influenced by fishing and the hunting of marine mammals. More recently, human activities include transportation of goods, oil and gas, tourism, and aquaculture.



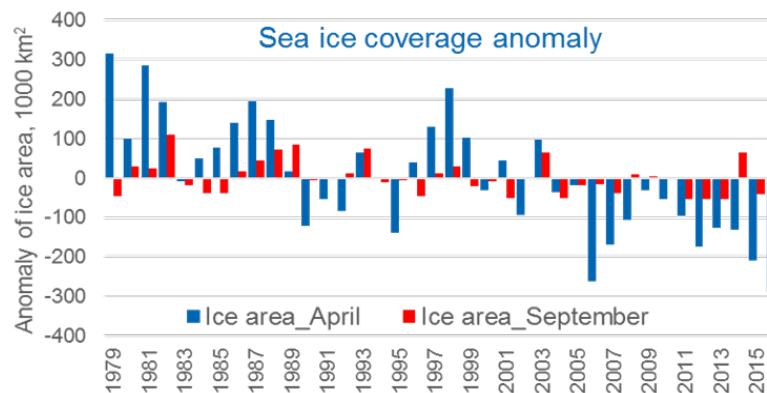
Temporal aspects

To study temporal aspects, the group has compiled numerous time-series:

- **Abiotic:** 13 variables reflecting oceanographic conditions



A cold period from the 1960s into the 1980s, and has since been on a warming trend

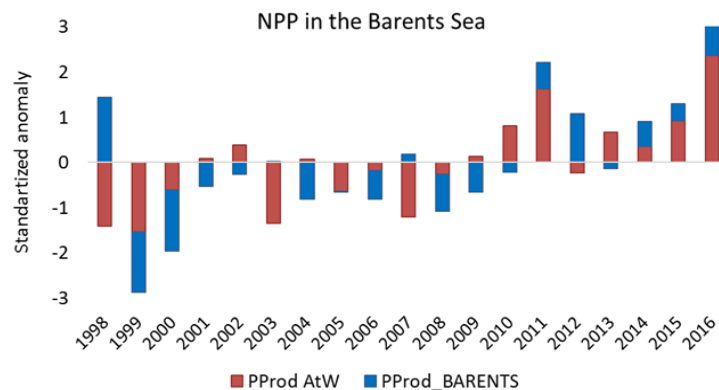


Reduction in the winter sea ice (typically in April), with a loss of about half the area of winter sea ice during the warming

Temporal aspects

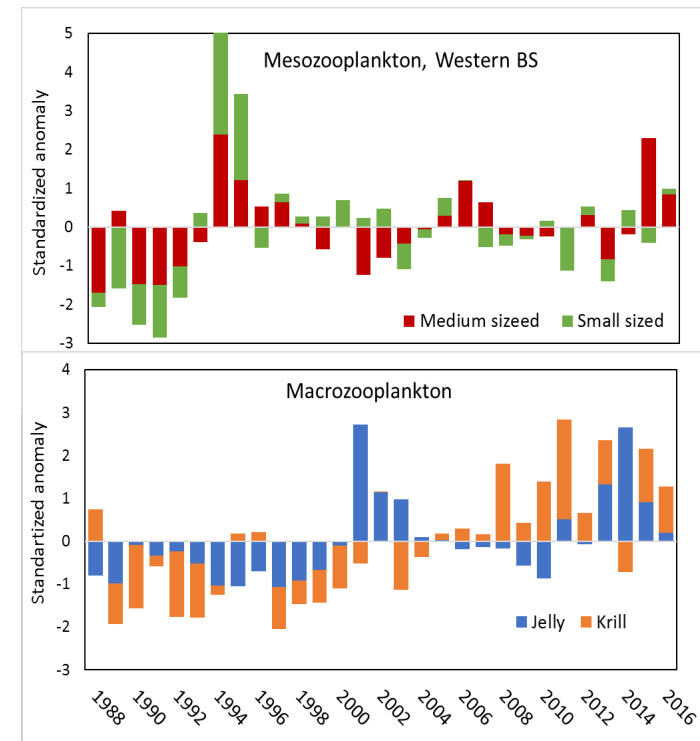
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Increase of NPP is associated with higher temperatures and expanded open water conditions

Krill and jellyfish biomass was generally low during 1980-1990s and increased since 2004



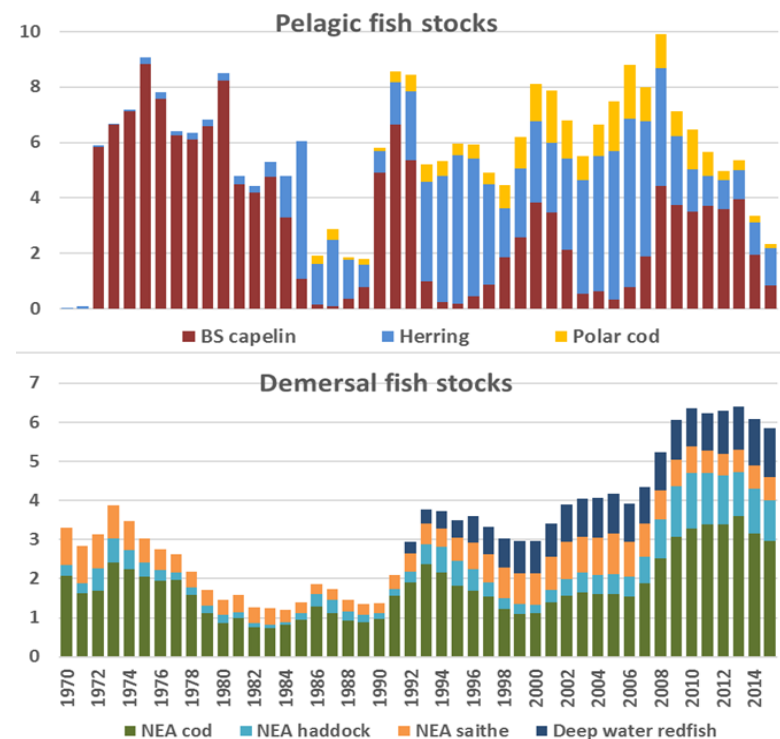
Temporal aspects

To study temporal aspects, the group has compiled numerous time-series:

- **Abiotic:** 13 variables reflecting oceanographic conditions
- **Biotic:** abundance of meso- and macro-zooplankton (7), abundance of ichthyoplankton (13),
25 variables reflecting stock size, growth, condition and maturation of various fish species

Total biomass of pelagic and demersal fish stocks was generally high during last three decades.

Pelagic biomasses varied between 4 and 10 MT and demersal biomasses between 3 and 6 MT.

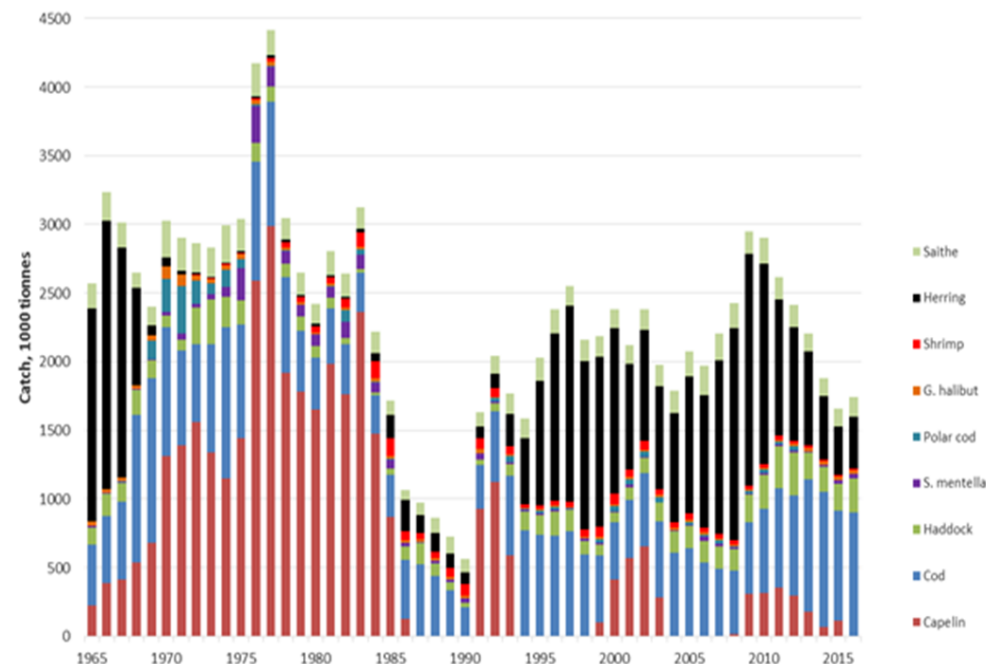


Temporal aspects

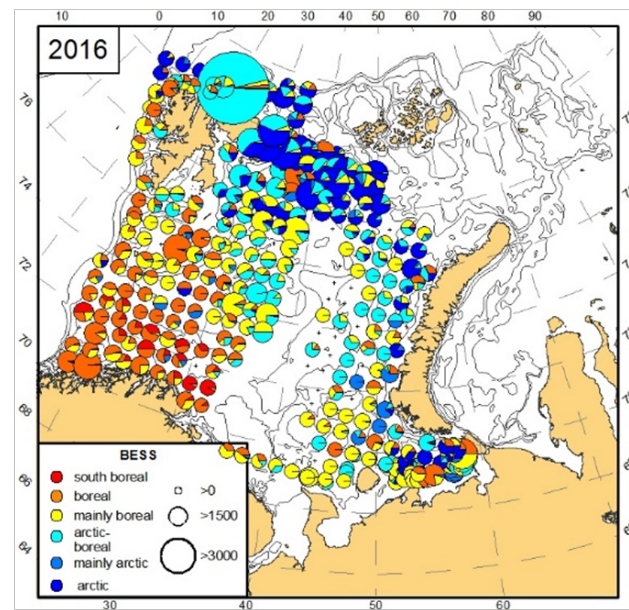
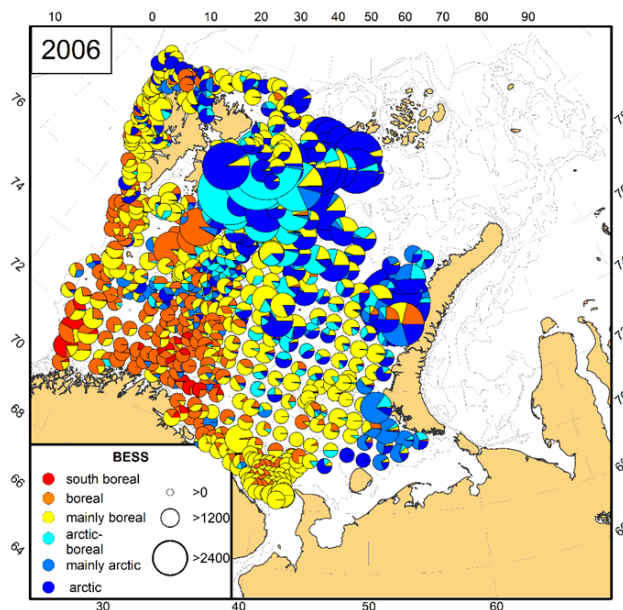
To study temporal aspects, the group has compiled numerous time-series:

- **Abiotic:** 13 variables reflecting oceanographic conditions
- **Biotic:** abundance of meso- and macro-zooplankton (7), abundance of ichthyoplankton (13), and 25 variables reflecting stock size, growth, condition and maturation of various fish species
- **Pressures:** fishery activity

Catches of pelagic fish varied due to capelin collapse, while high catches of demersal fishes



Identify changes



The most rapid and substantial climate driven changes occurred in regions within, or bordering, the Arctic

Reduced average catches of mainly arctic and arctic fish species
Reduced distribution of arctic fish community in the eastern Barents Sea and north of Svalbard

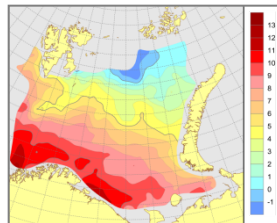
This led to restructuring of fish and benthos community and worse feeding conditions for seasonally migrating predators



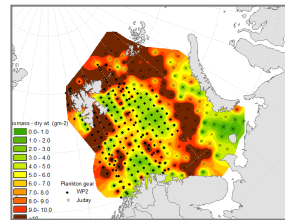
From monitoring to the ecosystem state



Temperature



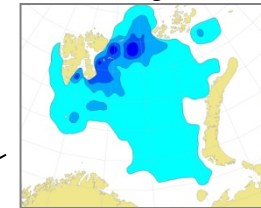
Plankton



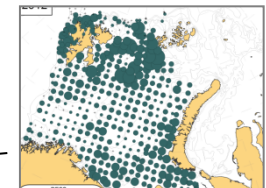
0-group fish



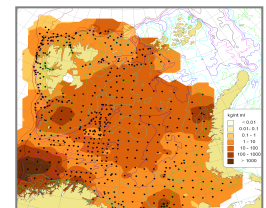
Pelagic fish



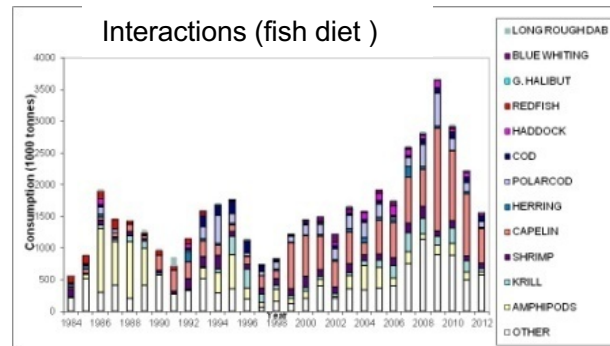
Demersal fish



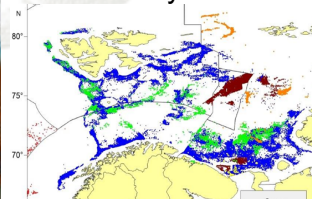
Benthos



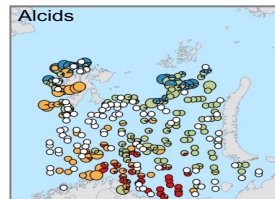
Interactions (fish diet)



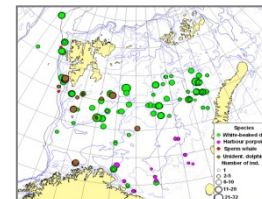
Fishery activities



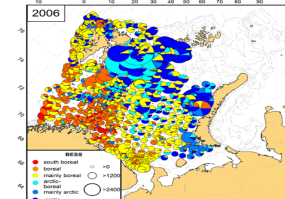
Sea birds



Marine mammals



Communities





From monitoring to the ecosystem state

54 color coded
time series

Oceanography

Plankton

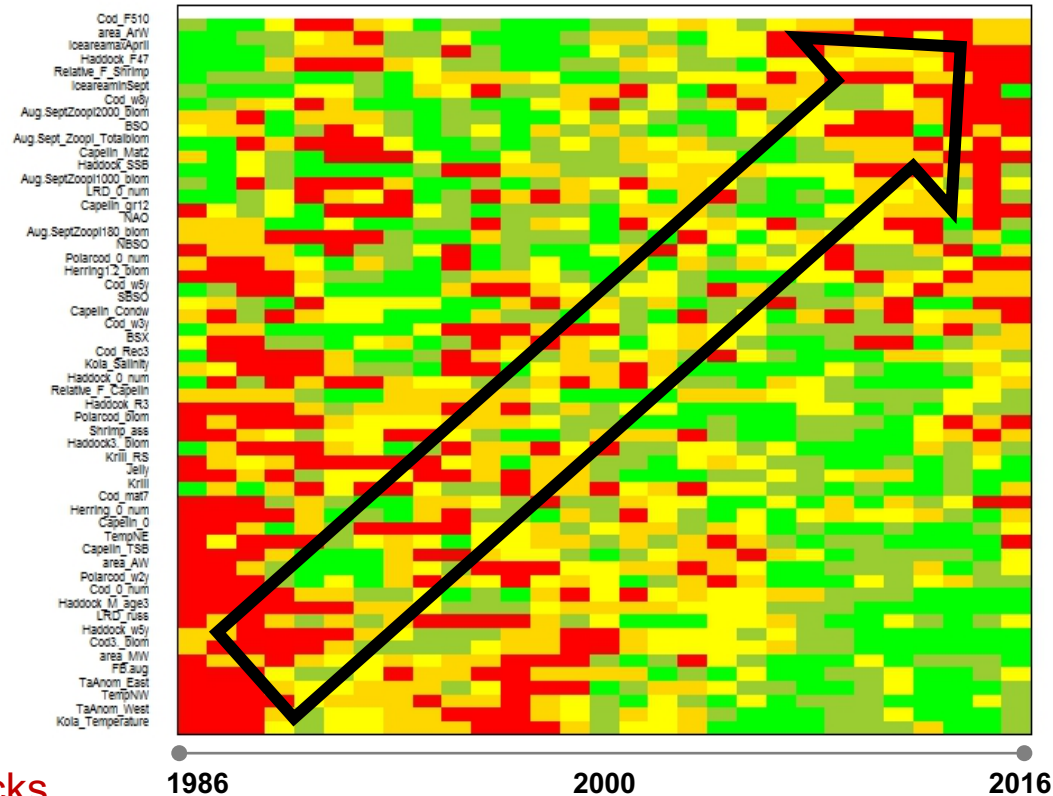
Pelagic fish

Demersal fish

Shrimp

Fishing mortality

Warm,
high stocks,
low fishing
pressure



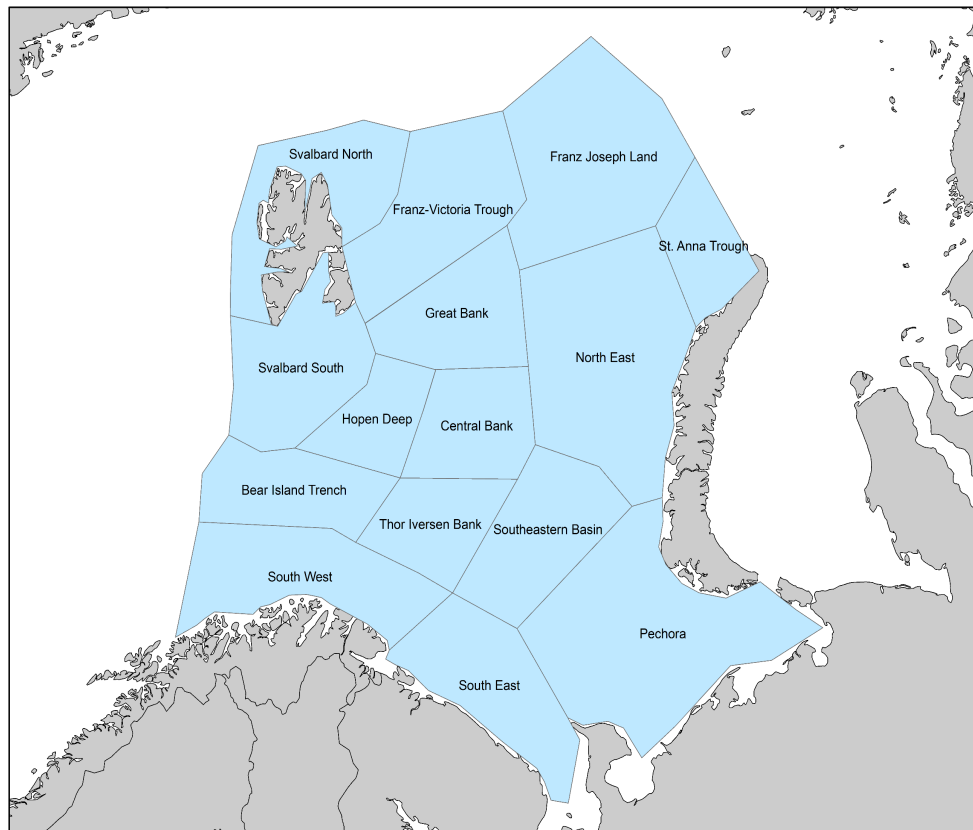
Cold,
low stocks,
high fishing
pressure



Needs for more data

The Barents Sea is a heterogeneous system changing from boreal conditions in southwest to Arctic conditions in the north

2017- deviation of the Barents Sea into 15 subareas



Spatial time series:

oceanography

NPP

plankton

fish recruits

pelagic fish stocks

demersal fish stocks

benthos



Communicating the results

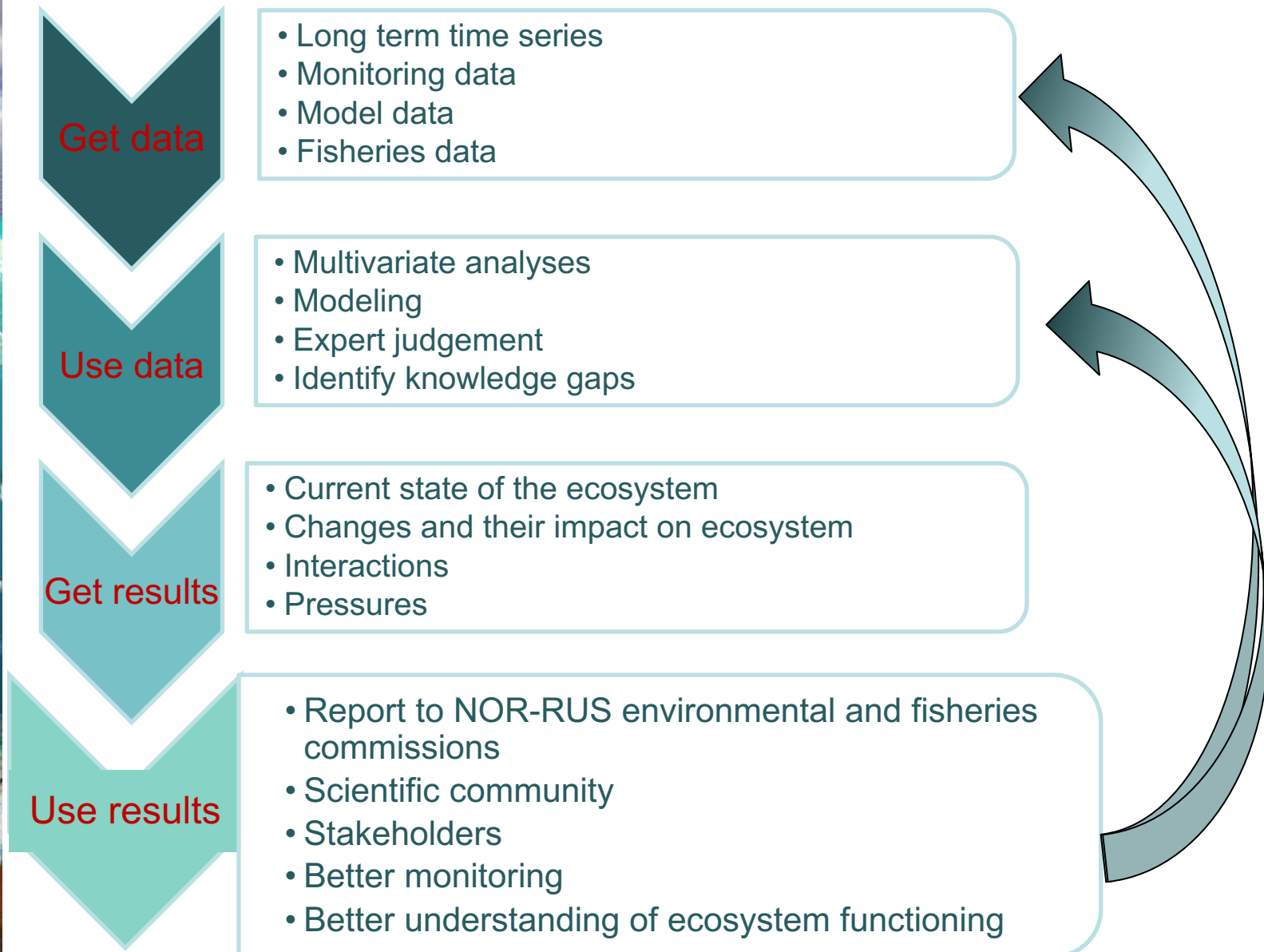
WGIBAR wants to inform the stakeholders about the state of and the changes in the Barents Sea ecosystem, and the stakeholders are considered to be

- the scientific community
- managers dealing with fisheries management
- managers dealing with environmental management
- managers dealing with management of other human activities, like shipping, petroleum exploration etc.
- fishermen's organizations

The working group also wants to contribute to better understanding of various ecosystem components, interactions, drivers and pressures, as well as changes that have taken place and likely will take place in the future

In short: the group wants to be a bridge between the scientists and the users of the Barents Sea

Activities plan



Thanks for your attention