



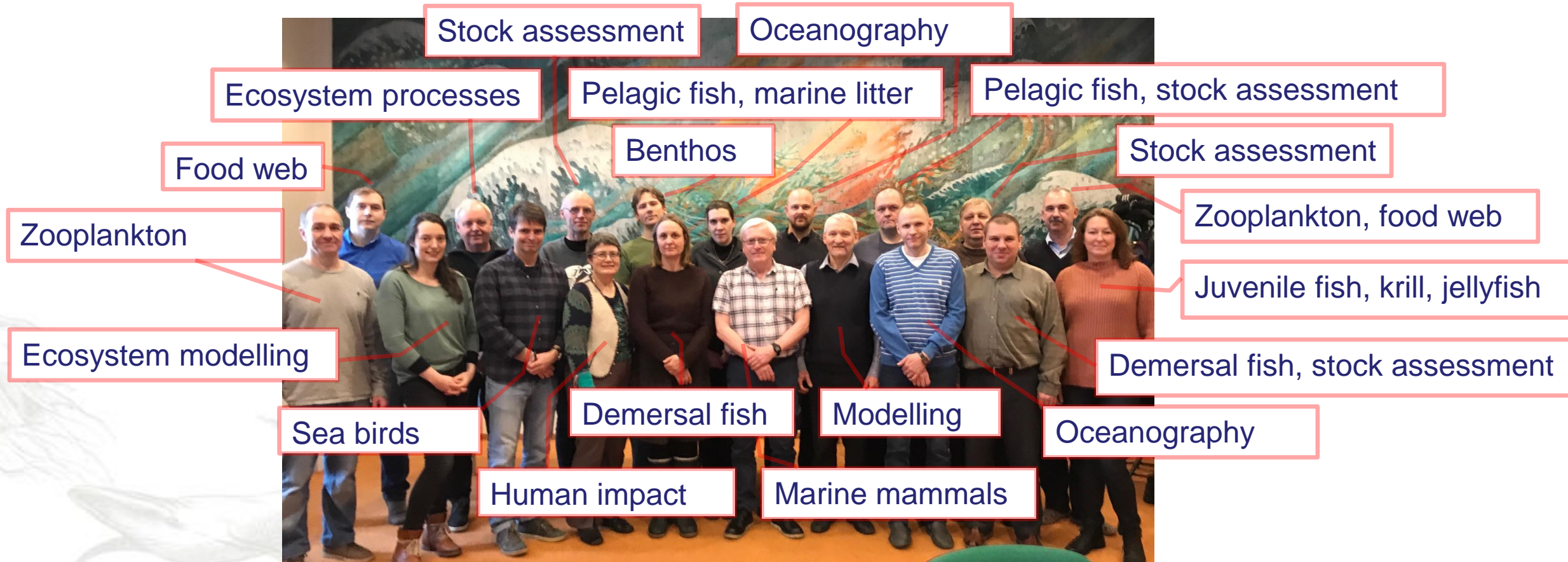
# IEA in practice – Experiences from the Working Group on the Integrated Assessments of the Barents Sea (WGIBAR)

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group*

*Second International Science and Policy Conference on  
Implementation of the Ecosystem Approach to Management in the  
Arctic, 25-27 June, Bergen, Norway*

# ✓ WGIBAR: WG on the Integrated Assessments of the Barents Sea

ICES considers IEA to be a key element in the ecosystem approach and a bridge between science and advice





## ✓ WGIBAR: main goals

- ✓ Description of the ecosystem and processes
- ✓ Summarize and analyze the state of and changes in the Barents Sea ecosystem
- ✓ Identify significant pressures
- ✓ Provide up-to-date knowledge and support managers with relevant information from the area
- ✓ Support ICES WG on stock assessment with ecological knowledge and changes in the ecosystem
- ✓ support ecosystem modelling with new data and knowledge, and gaining increased understanding of the ecosystem
- ✓ Improve the ecosystem monitoring



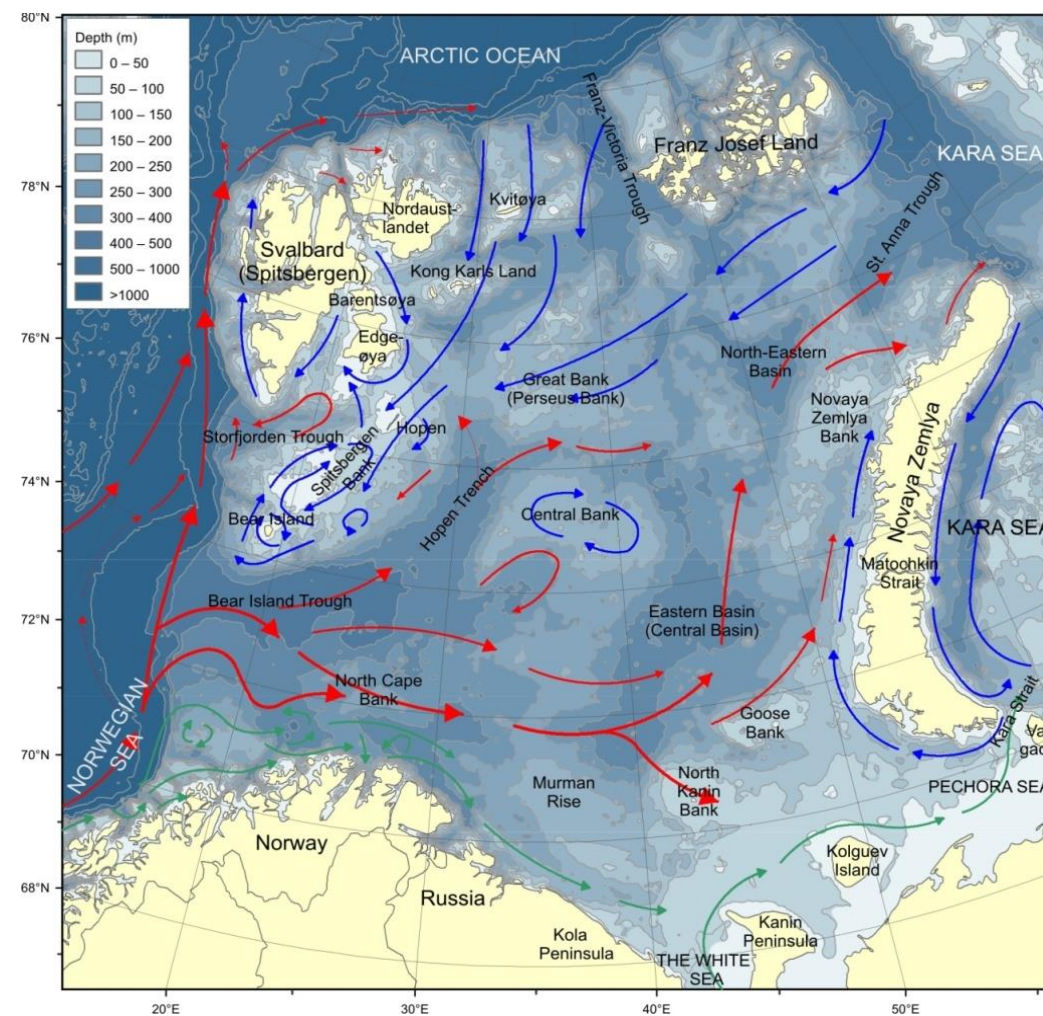
# ✓ The Barents Sea

A sub arctic shelf sea (~ 1.6 million km<sup>2</sup>) and a transition zone between Atlantic and Arctic conditions

A productive area

The Barents Sea ecosystem experienced huge changes during the last four decades

The Arctic is warming twice as fast as the lower latitudes





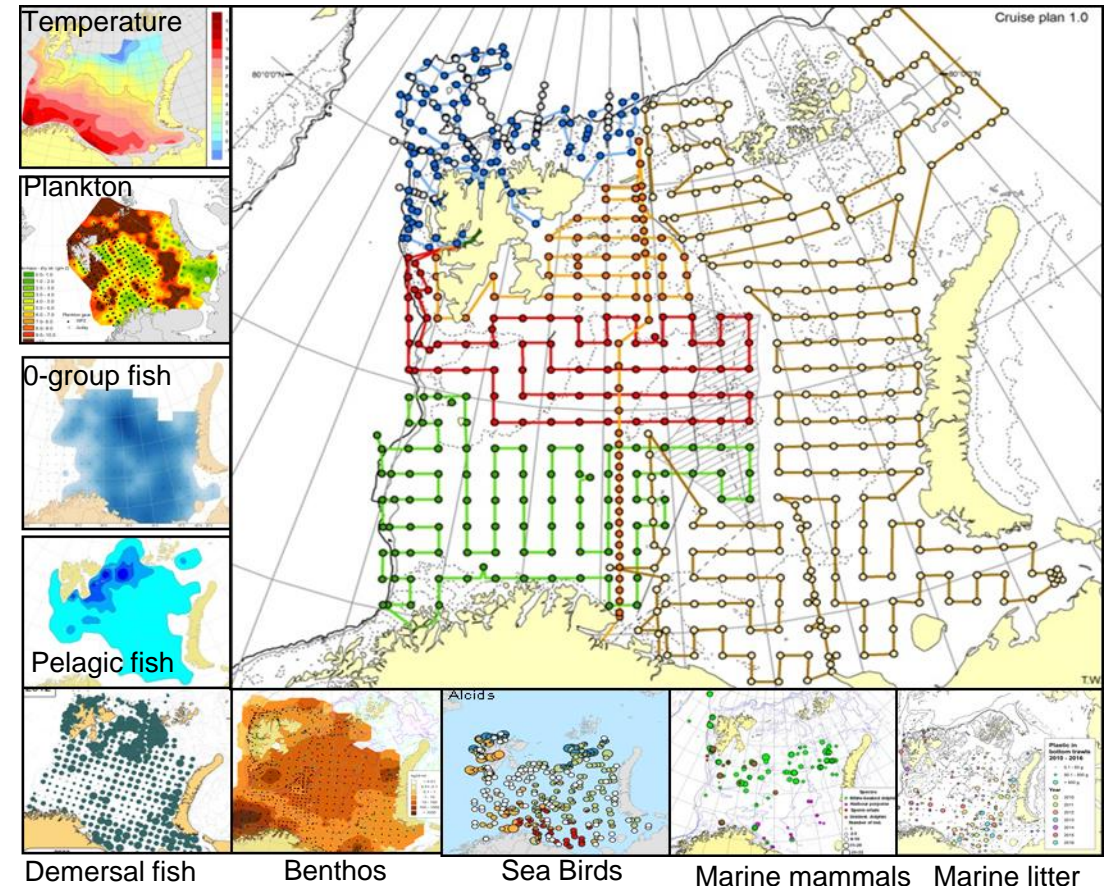
# ✓ Monitoring

## The Joint Norwegian-Russian Ecosystem Survey

monitor the state of the Barents Sea ecosystem to support scientific research and management advice

### Unique in world context

- Well coordinated international effort
- Comprehensive spatial coverage and number of parameters monitored
- The results/output used in single-species stock assessments, ICES WGs, and process understanding



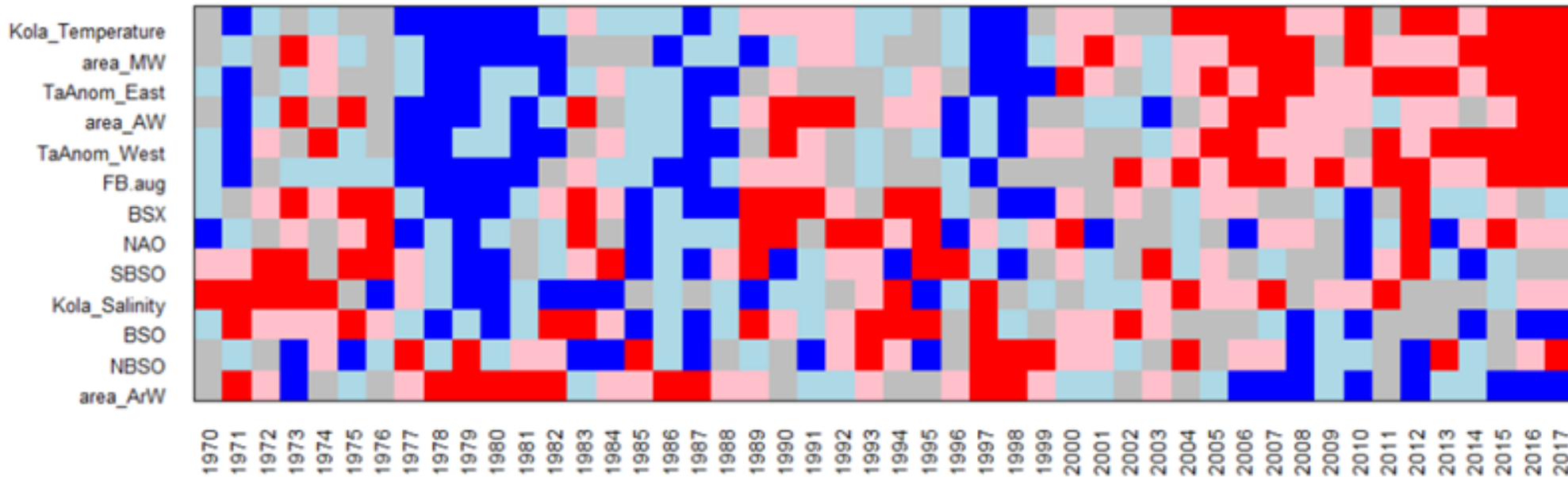
# ✓ Time series analyses

13 color coded time series indicated oceanographic conditions

Colder water and air temperature, larger area covered by Arctic water masses



Warmer temperature, larger area covered by Atlantic and mixed water masses

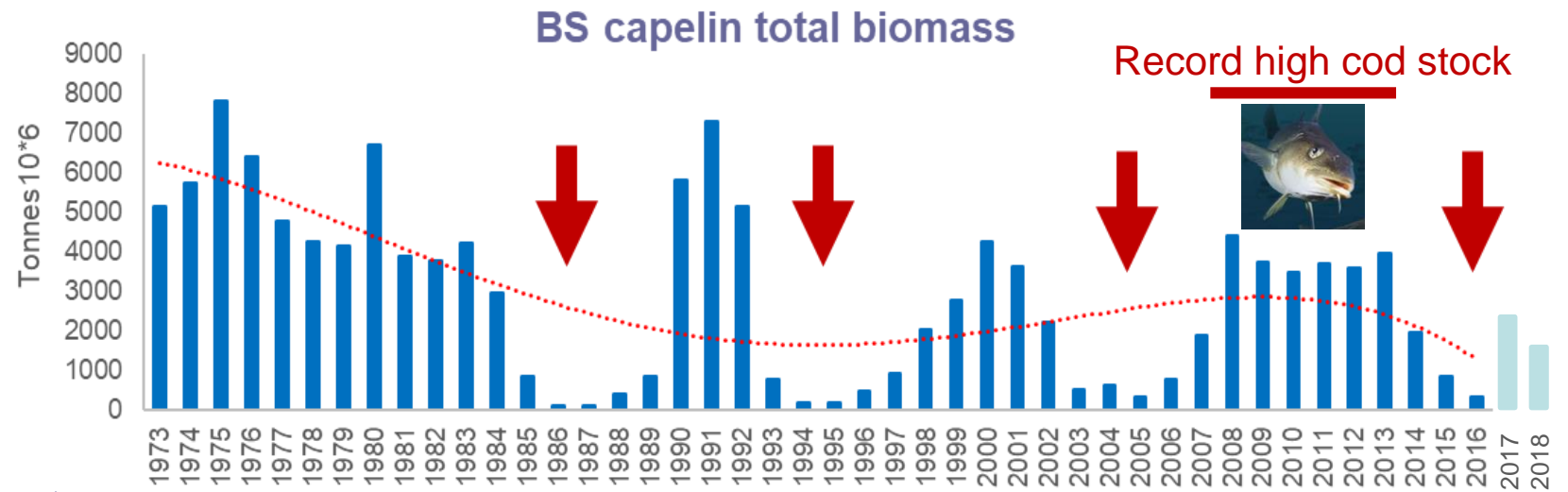




# ✓ Key stock fluctuation and impact on the ecosystem

Since 1970s, the stock experienced 4 collapses

The first collapse had had serious effects on the food-web (both ways)



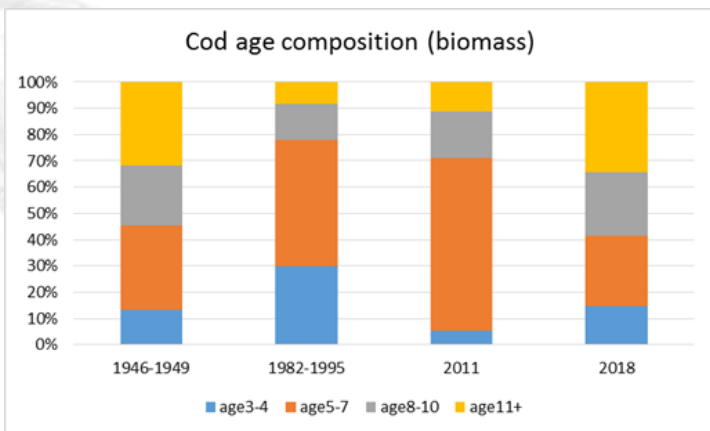
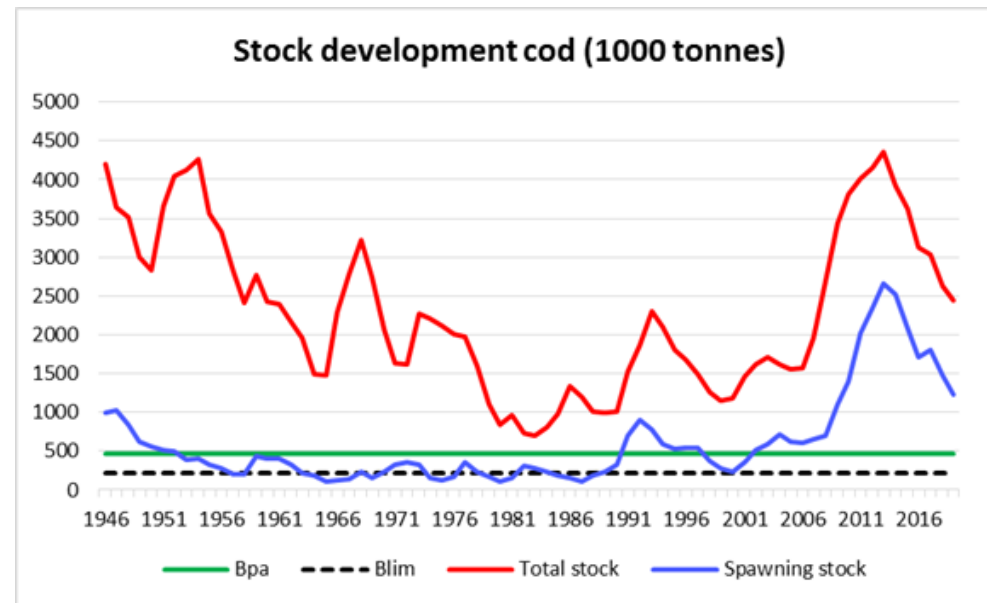
Last mini-collapse occurred due to  
still high predation pressure  
poor recruitment (age 1) in combination with low growth  
-> no dramatic consequences on ecosystem

# ✓ Key stock fluctuation and impact on the ecosystem



Record large stock in 2011-2014

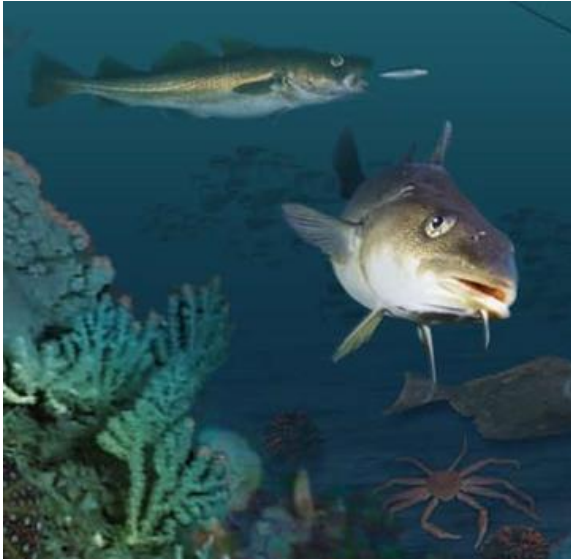
Stock is currently in good condition



The strong year classes have, together with a low fishing mortality, led to rebuilding the age structure to that seen in the late 1940s

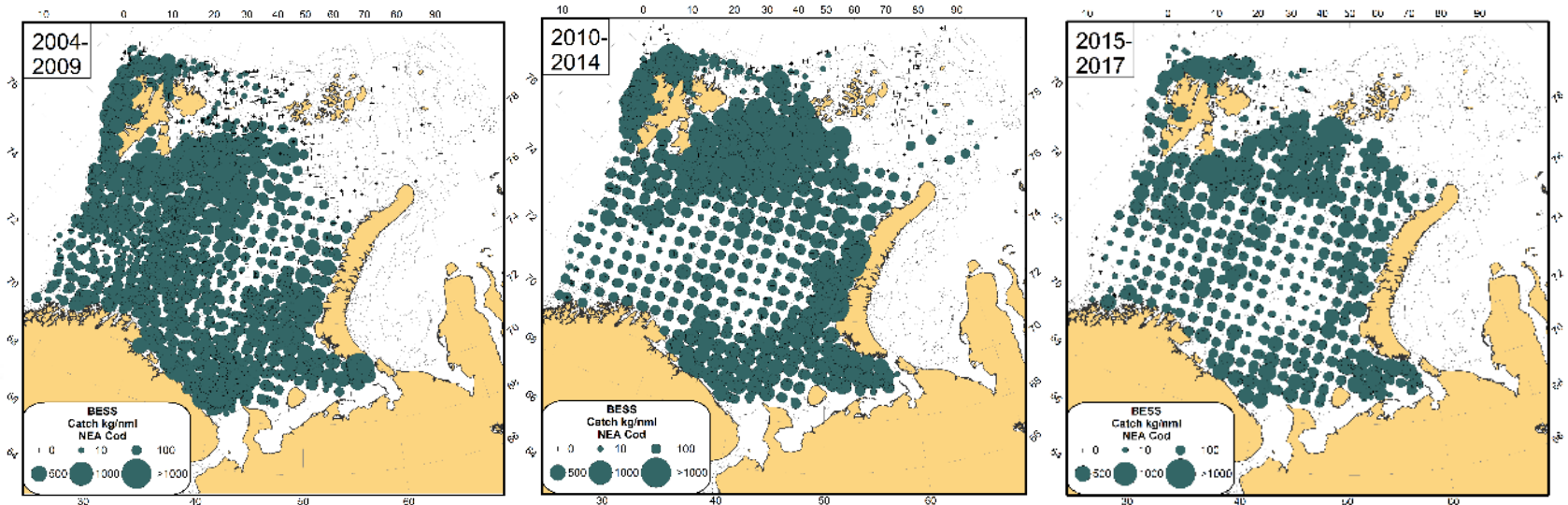


# ✓ Key stock fluctuation and impact on the ecosystem



Record large stock distributed over larger area

due to warming the northern area were suitable for cod  
new food resources and larger overlap with polar cod



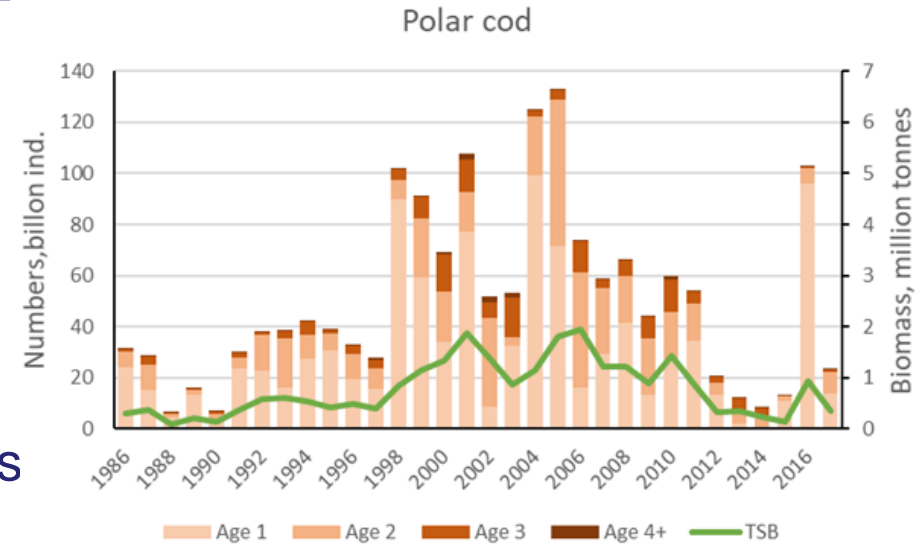
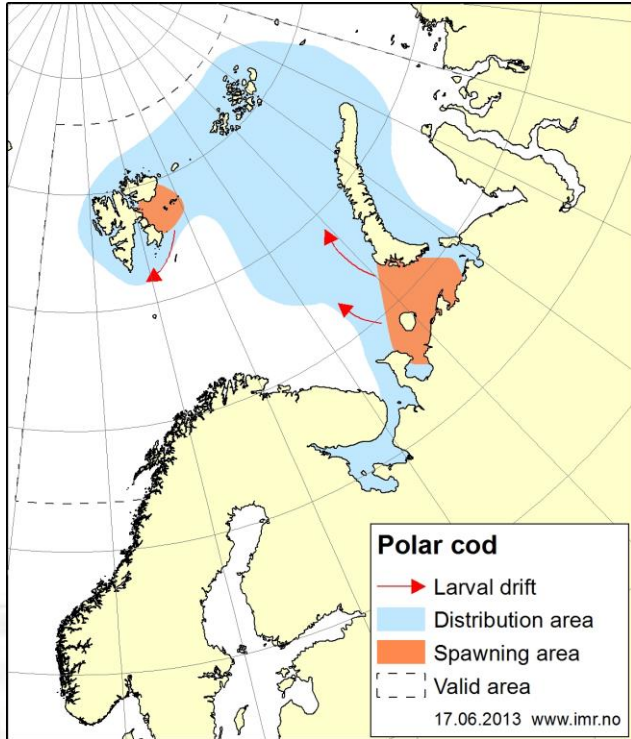
# ✓ Key stock fluctuation and impact on the ecosystem



Polar cod stock was at low level in 1980s

Even stock was large in early 2000s, no strong year classes occurred since 2002

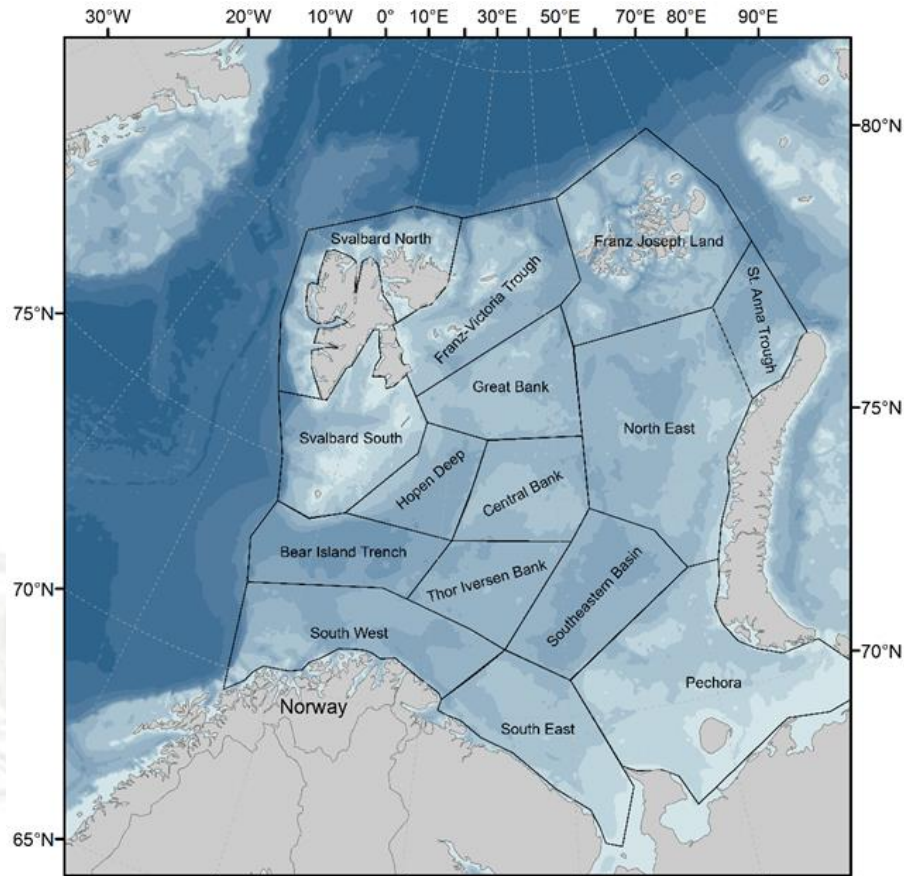
Stock decrease influenced by  
reduction in ice cover  
increased temperature  
increased overlap with predators





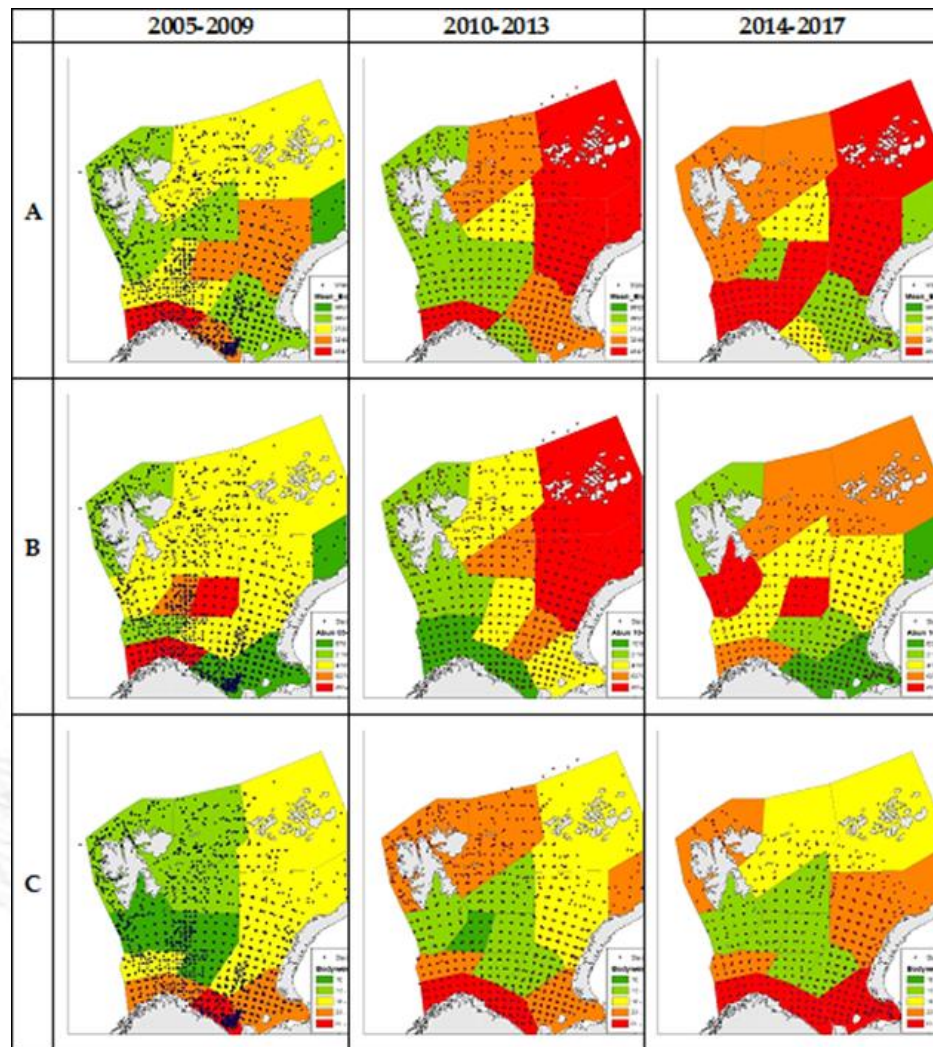
# ✓ Temporal and spatial variation

The Barents Sea have been divided in to 15 sub areas based on bottom topography



Water temperature  
Phytoplankton  
Meso plankton  
Macro plankton  
Juvenile fish  
Pelagic fish stocks  
Demersal fish  
Benthos  
Marine mammals  
Sea birds  
Fishery activities  
Marine litter

# ✓ Temporal and spatial variation



Mean megabenthic A) biomass (g/nm), B) abundance (number of individuals per nm), C) body weight (g) per TIBIA polygons for periods 2005-2009, 2010-2013 and 2014-2017

- The mean biomass increased in the north eastern and the central areas
- The mean abundance values demonstrated the same tendency, but not so strongly expressed, as the biomass.
- The body weight has increased in the coastal areas (northern Norway and Russia, Svalbard and Novaya Zemlya)



# ✓ Output

## Use of annual WGIBAR report

- > update of the Norwegian management plan
- > ICES stock assessment groups, as background for ecosystem state and changes
- > Norwegian-Russian fishery commission (ecosystem state and changes)
- > Norwegian Russian environmental commission (pollution and marine litter)
- > BarentsPortal (ecosystem state and changes, in English and Russian)

Support managers and fisheries organizations with relevant information from the area

Communicate results to managers, fisheries organizations, public and scientific community

**Thank you for your attention**

