Experiences from the Working Group on the Integrated Assessments of the Barents Sea (WGIBAR) and collaboration with WGICA

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PICES-2019 Annual Meeting, PICES contribution to Central Arctic Ocean (CAO) ecosystem assessment
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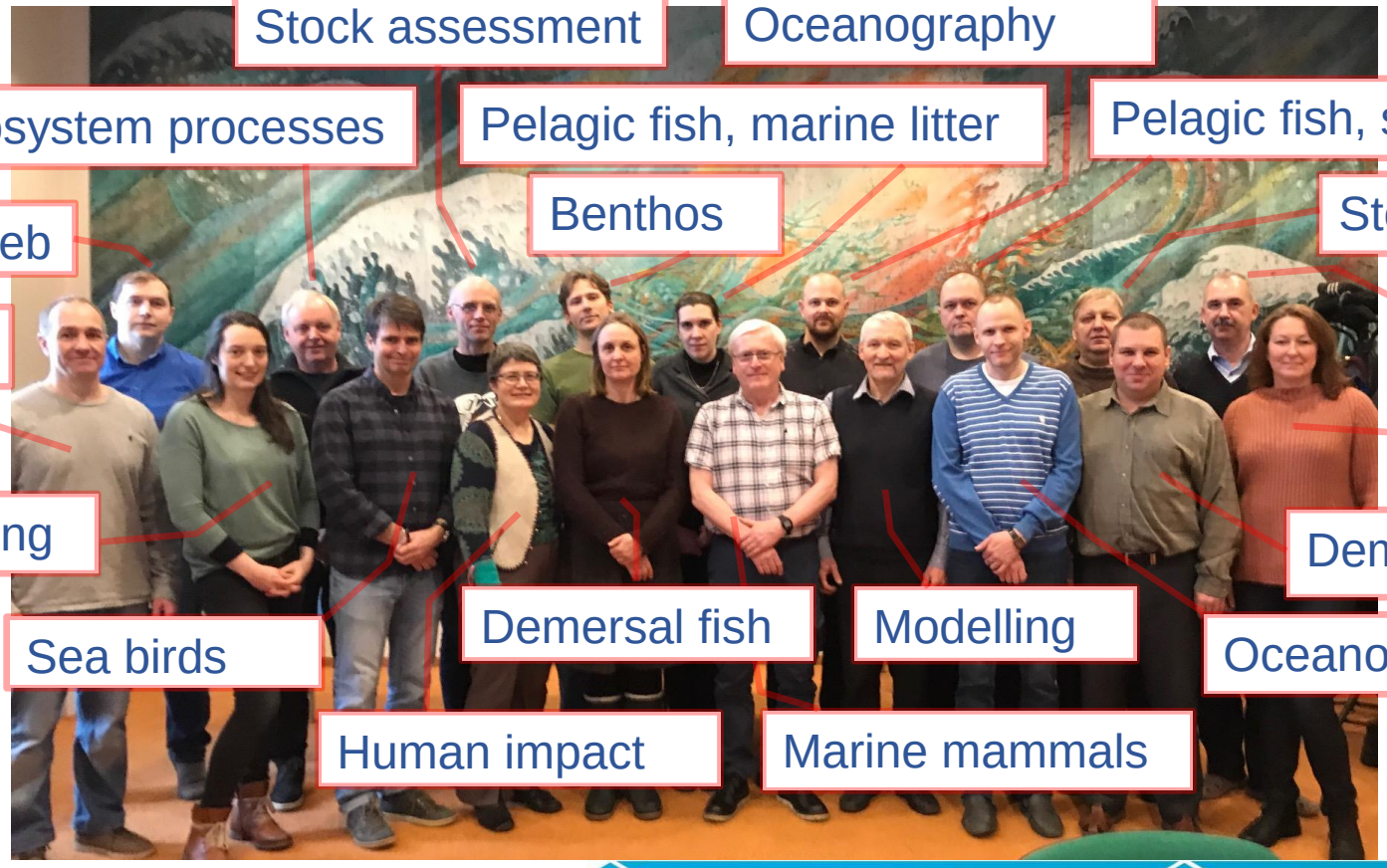
✓ WGIBAR: WG on the Integrated Assessments of the Barents Sea

WG on the Integrated Assessments of the Barents Sea (WGIBAR) is a multidisciplinary group

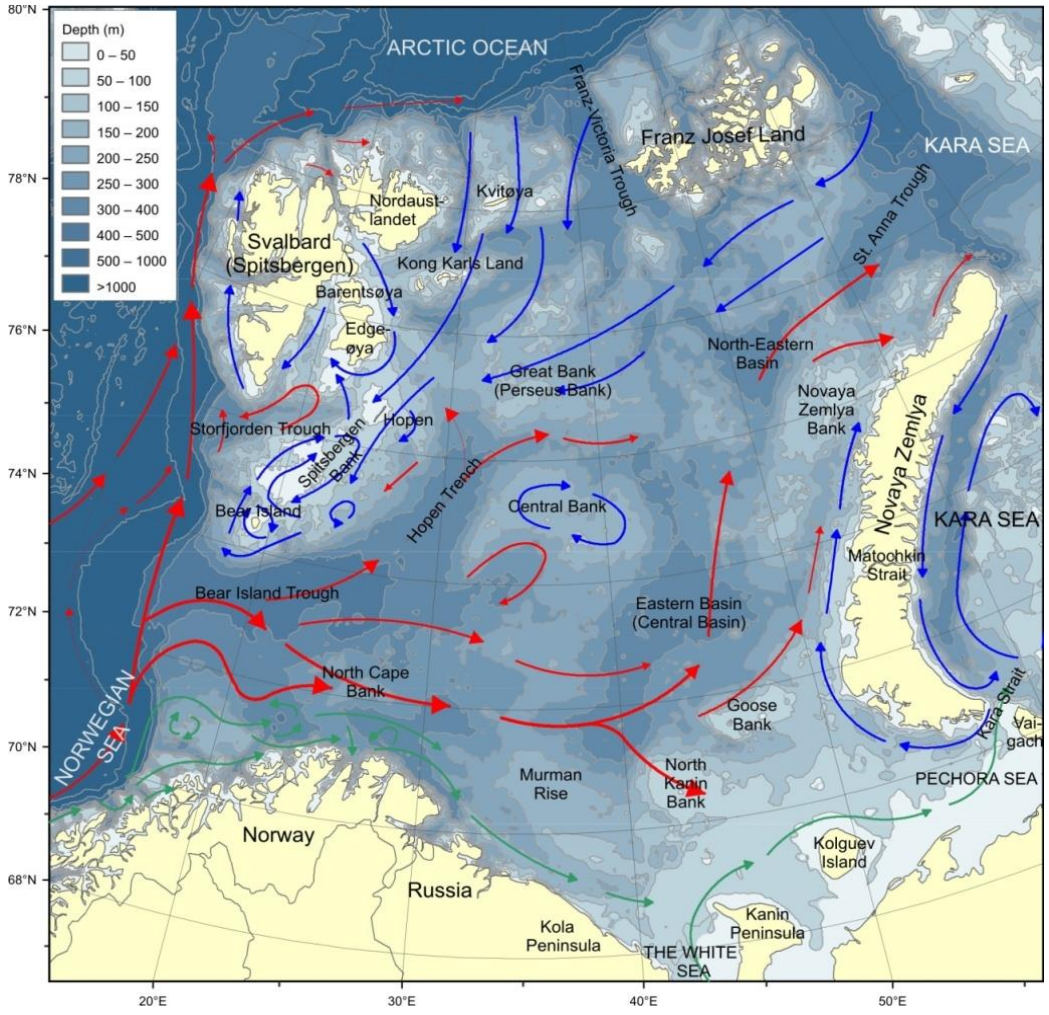


The Barents Sea

A sub arctic 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 experienced huge changes during the last four decades

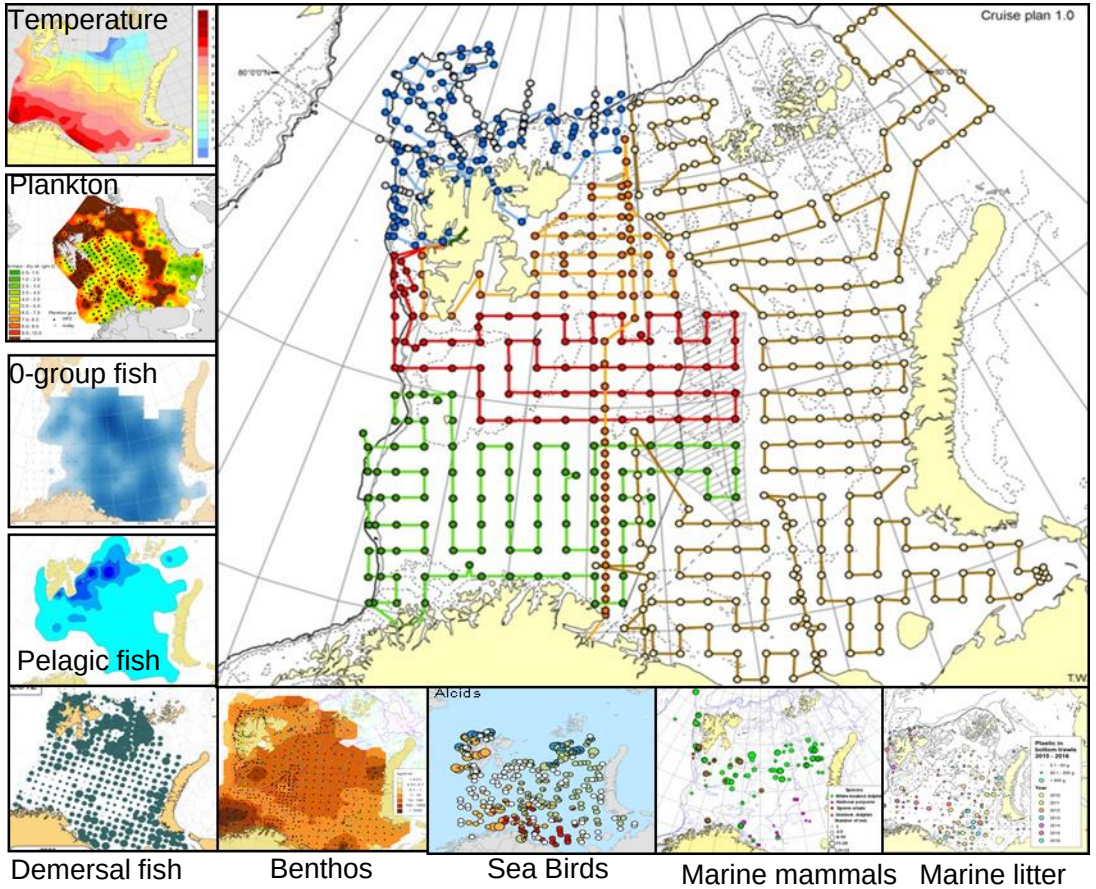


✓ Monitoring

The Joint Norwegian-Russian Ecosystem Survey monitor the state of the Barents Sea ecosystem to support scientific research and management advice

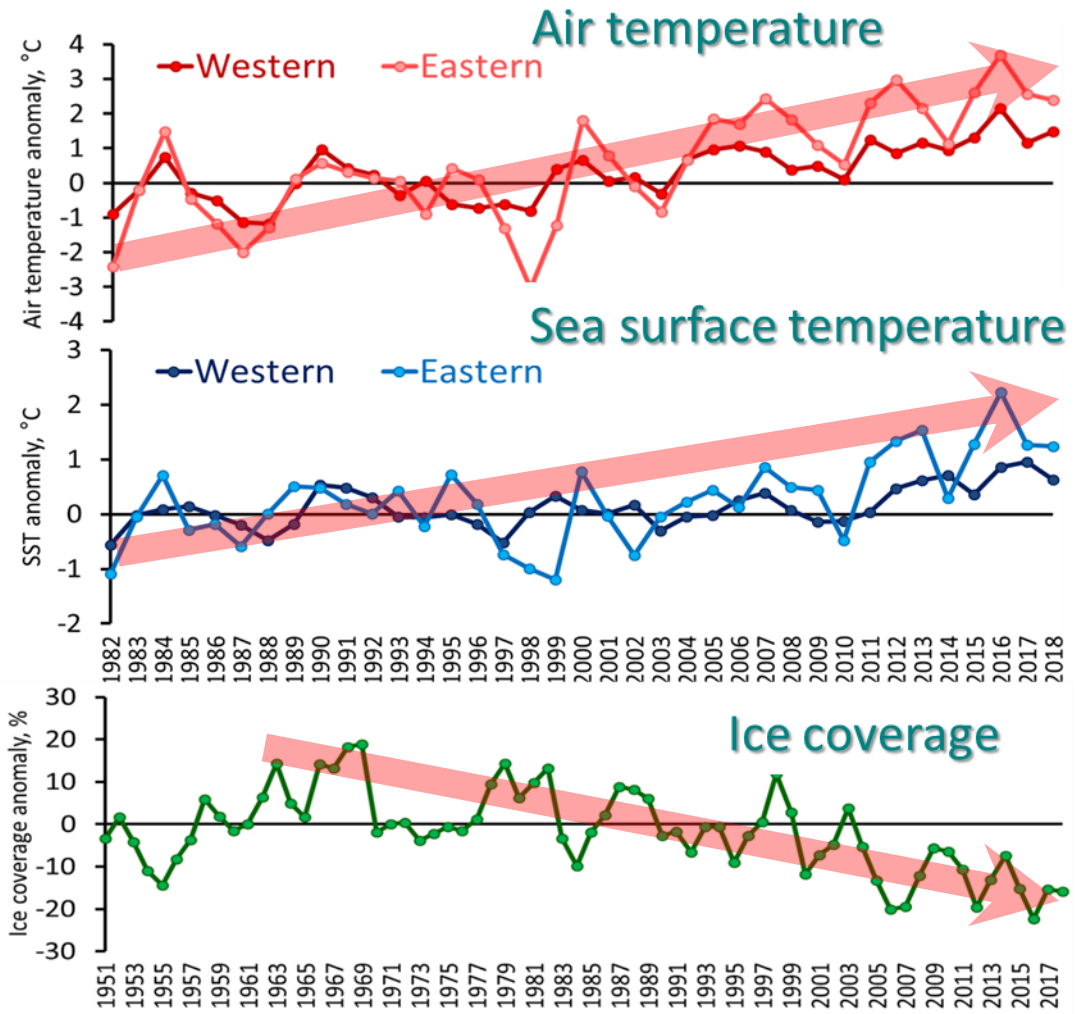
Unique in world context

- 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



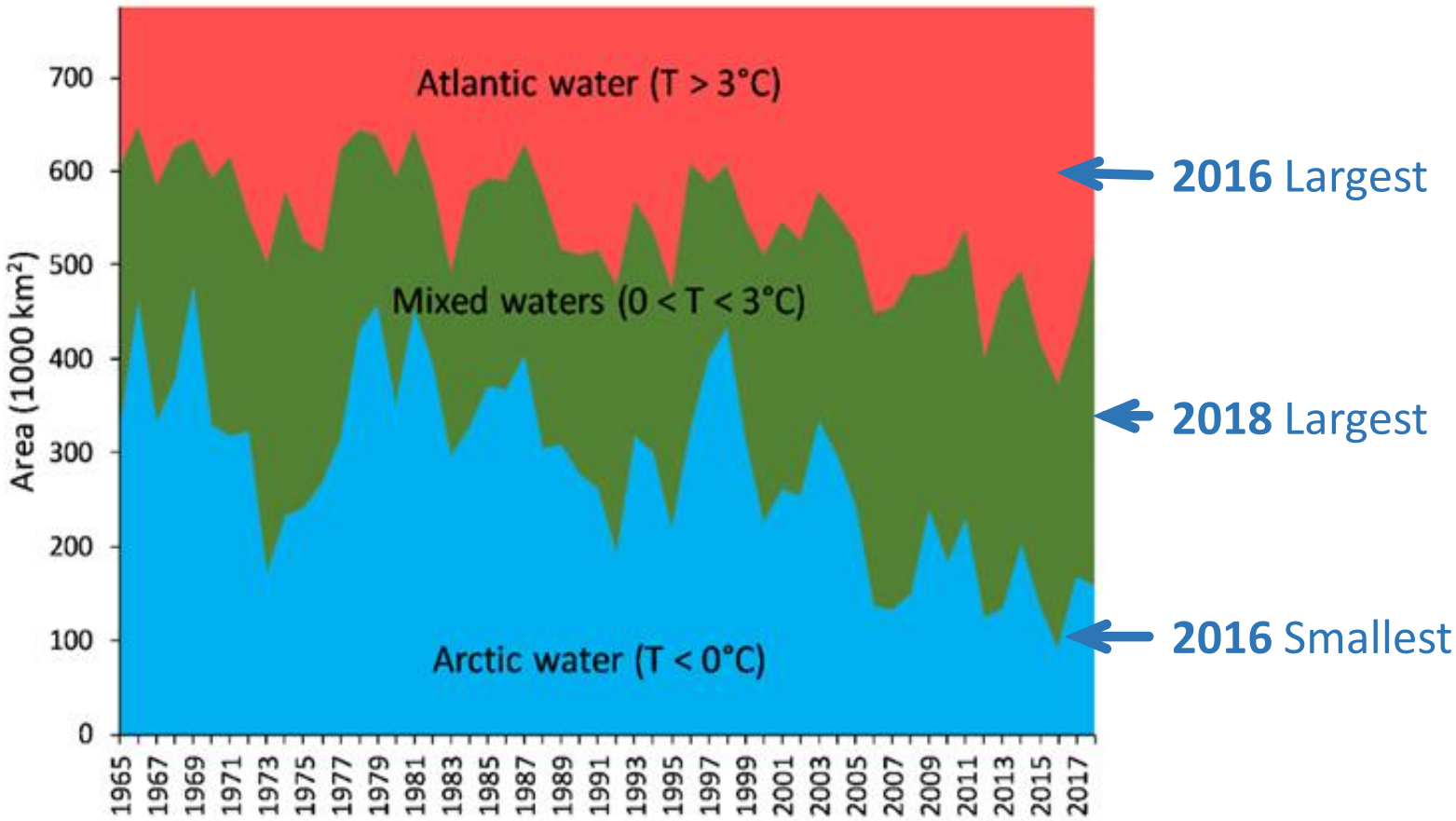
✓ The Barents Sea state and changes

Air and water temperature increased, while ice cover decreased



✓ The Barents Sea state and changes

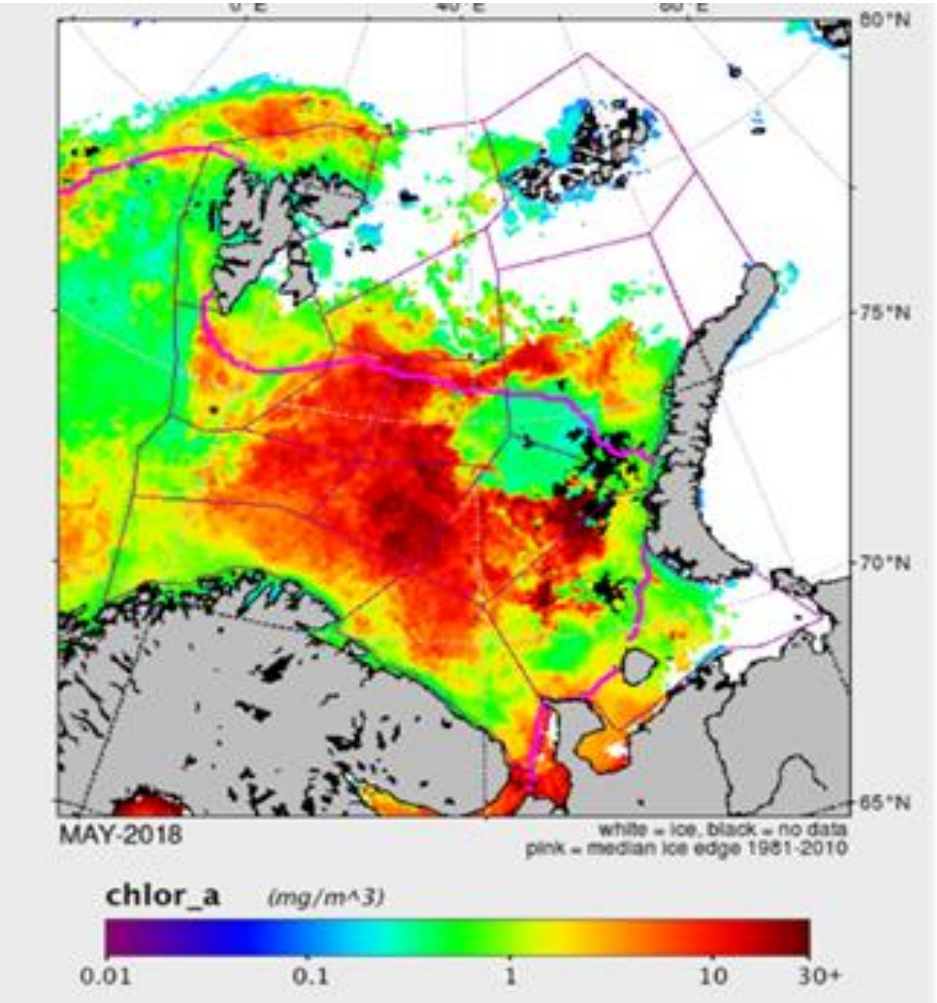
Air and water temperature increased, while ice cover decreased → *Large area covered by warm Atlantic and mixed water masses*



✓ The Barents Sea state and changes

Air and water temperature increased, while ice cover decreased

Large area covered by warm Atlantic and mixed water masses



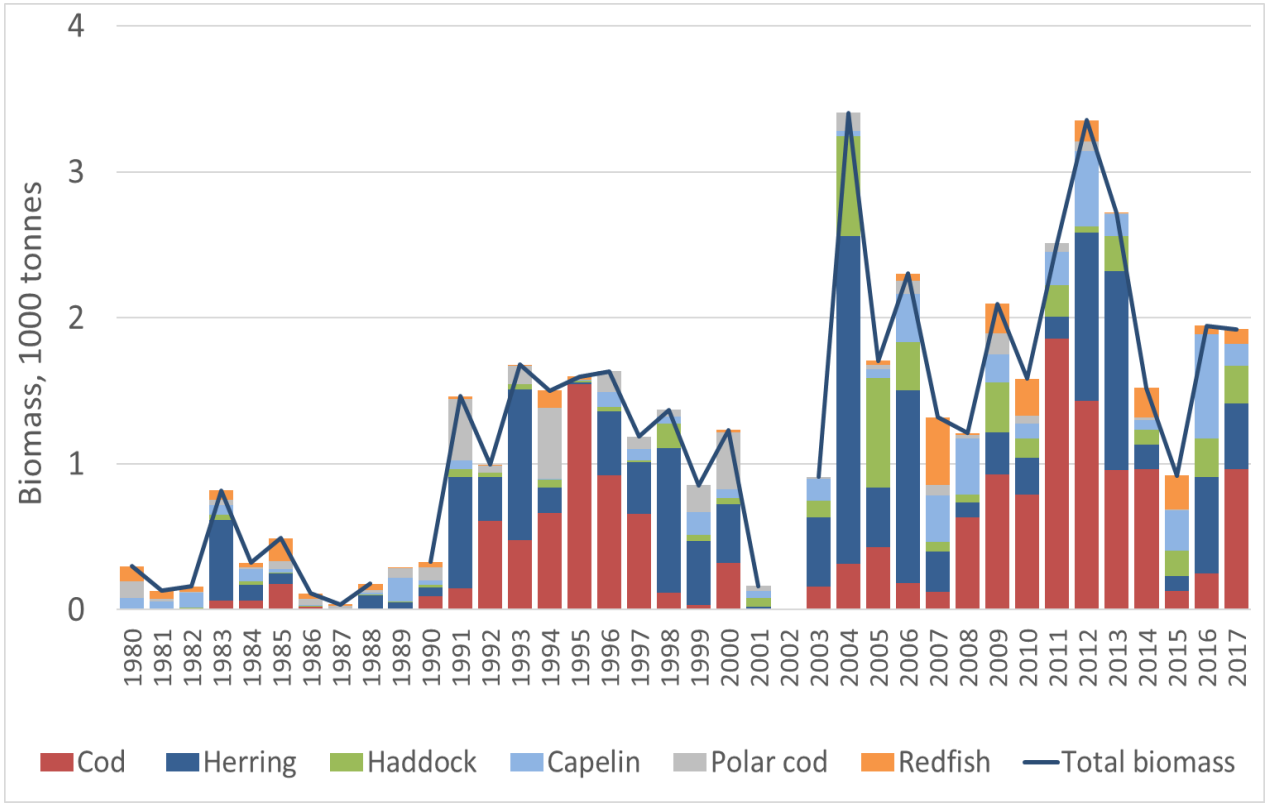
Increase

-> phytoplankton

-> zooplankton(copepods, krill)

✓ The Barents Sea state and changes

Air and water temperature increased, while ice cover decreased → *Large area covered by warm Atlantic and mixed water masses* → ***Increase***



-> phytoplankton

-> zooplankton(copepods, krill)

-> fish recruitment (age 0)

✓ The Barents Sea state and changes

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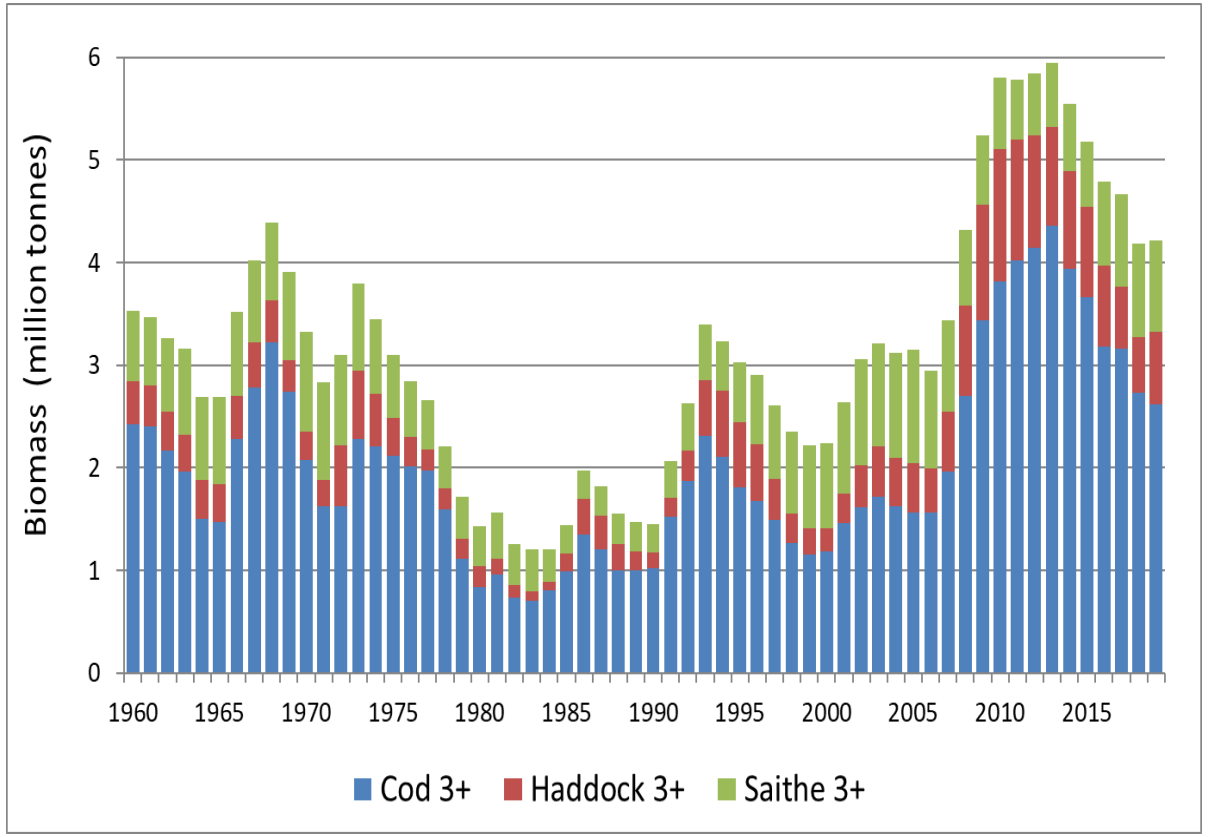


-> phytoplankton

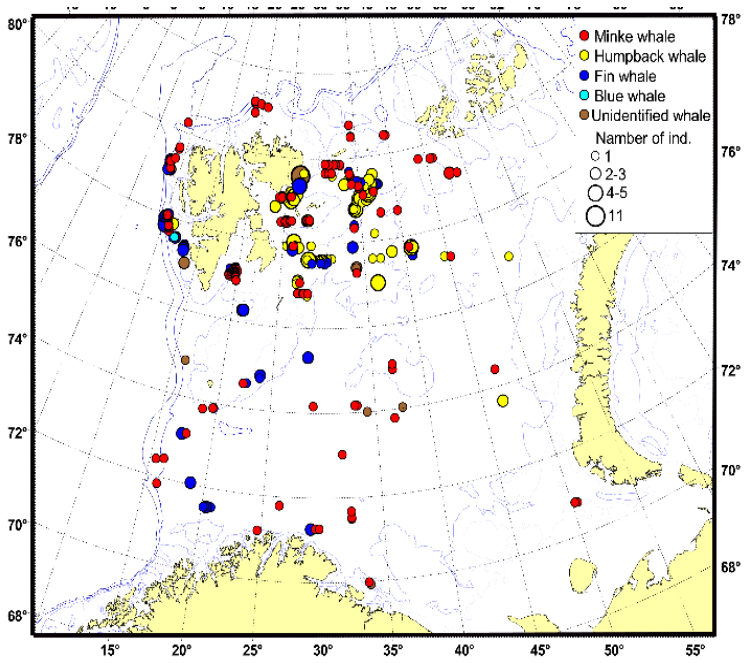
-> zooplankton(copepods, krill)

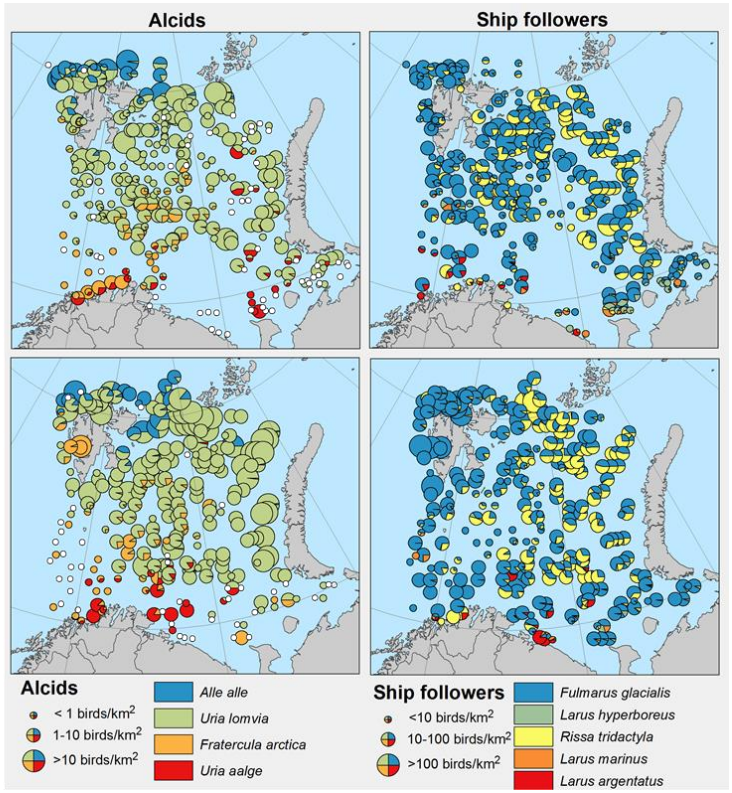
-> fish recruitment (age 0)

-> together with successful management led to positive development of fish stocks

✓ The Barents Sea state and changes

Air and water temperature increased, while ice cover decreased → *Large area covered by warm Atlantic and mixed water masses* → ***Increase***





-> phytoplankton

-> zooplankton(copepods, krill)

-> fish recruitment

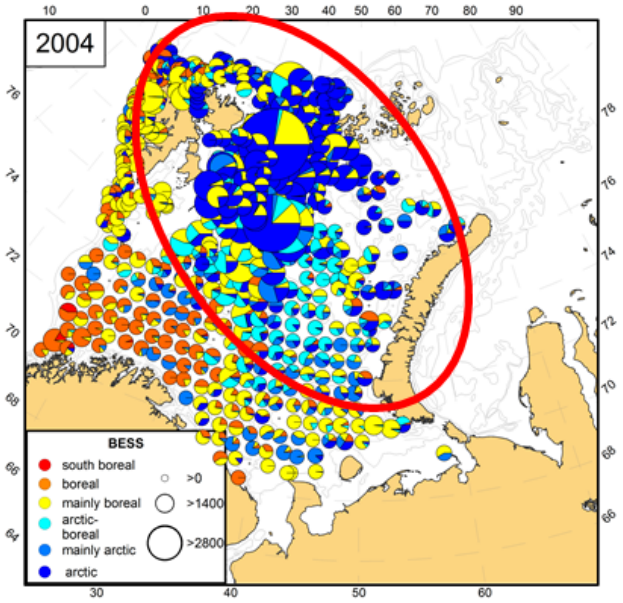
-> led to positive development of fish stocks

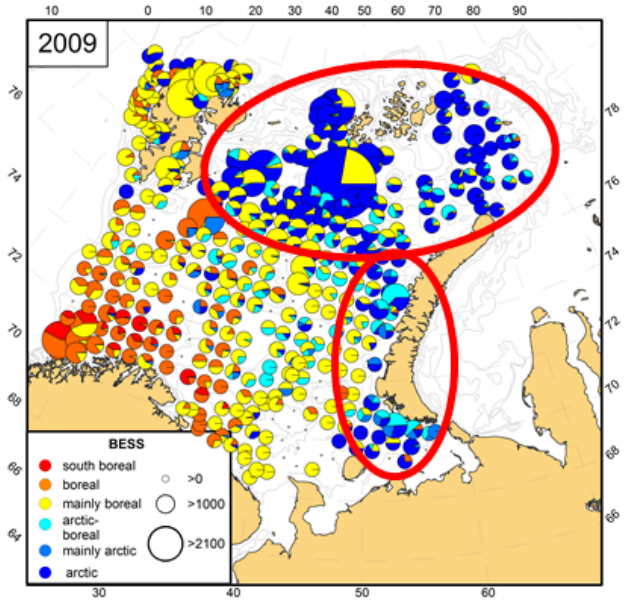
-> better feeding conditions for sea birds and marine mammals

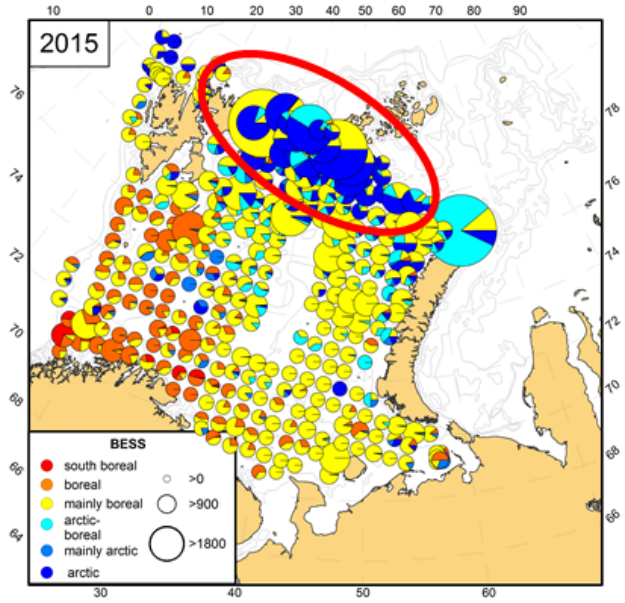
✓ The Barents Sea state and changes

Air and water temperature increased, while ice cover decreased → *Large area covered by warm Atlantic water masses* → ***Decrease***

biomass and distribution of arctic and mainly arctic species







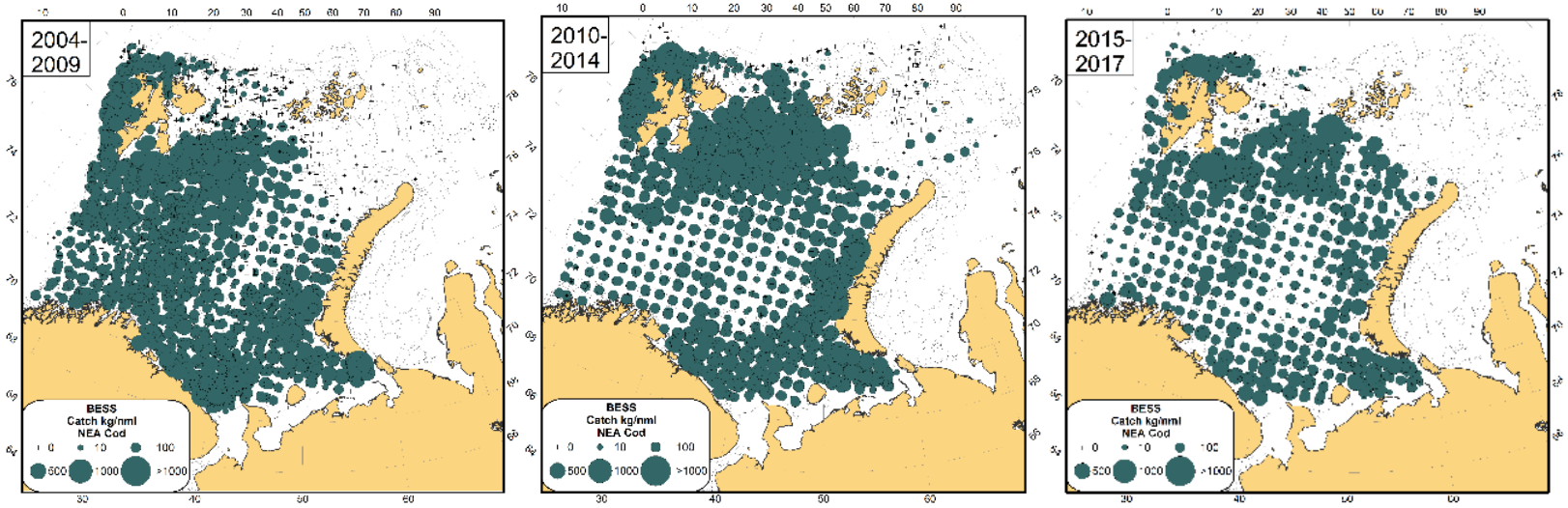
✓ The Barents Sea key species: cod

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

record large stock expanded the area occupied in 2011-2014

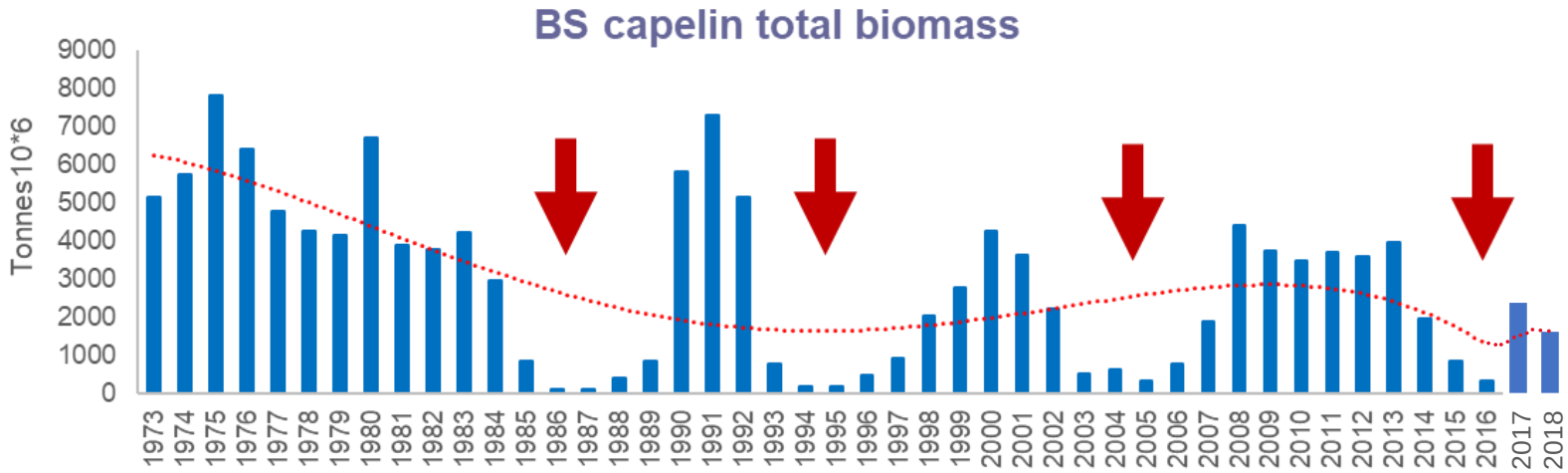
due to warming the northern area were suitable for cod
new food resources and larger overlap with polar cod



✓ The Barents Sea key species: capelin

Since 1970s, stock experienced 4 collapses

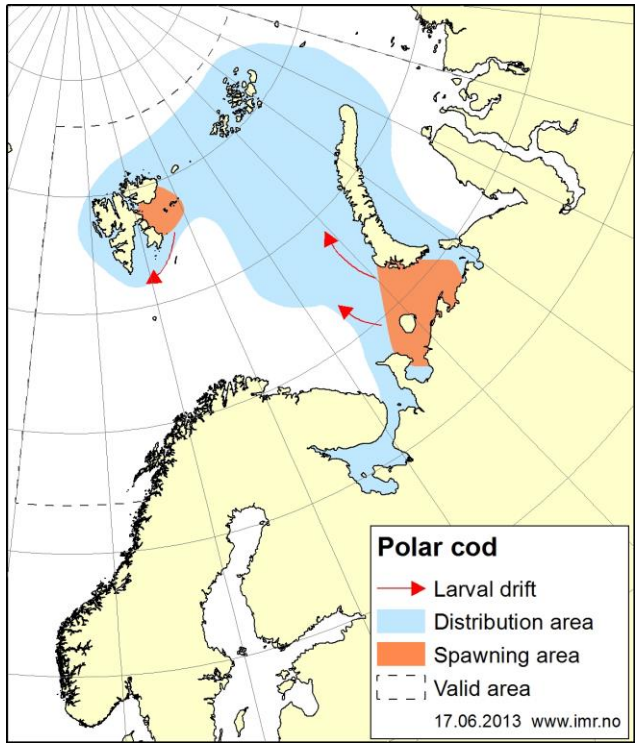
First three collapses have had serious effects on the food-web (both ways)



Last mini-collapse occurred due to
still high predation pressure
poor recruitment (age 1) in combination with low growth

No dramatic consequences on ecosystem

✓ The Barents Sea key species: polar cod

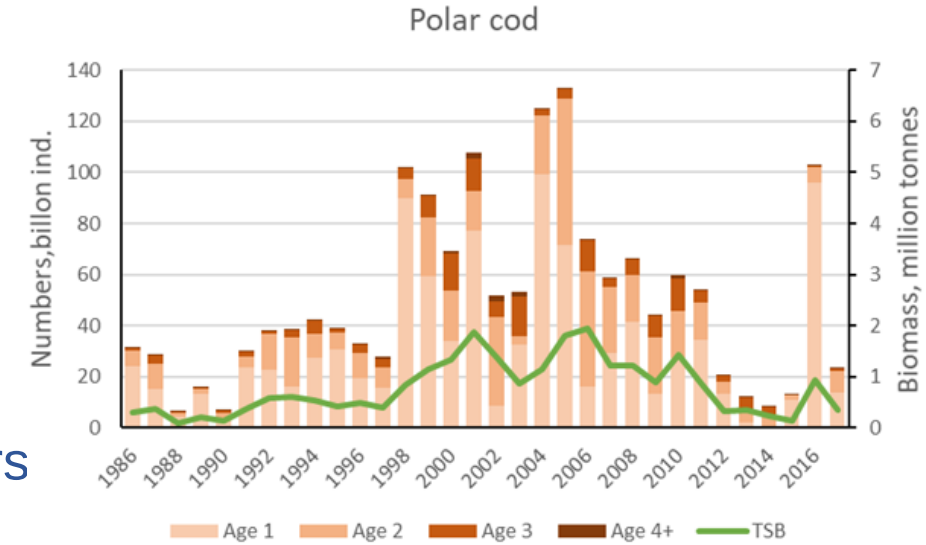


Polar cod stock was at low level in 1980s

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

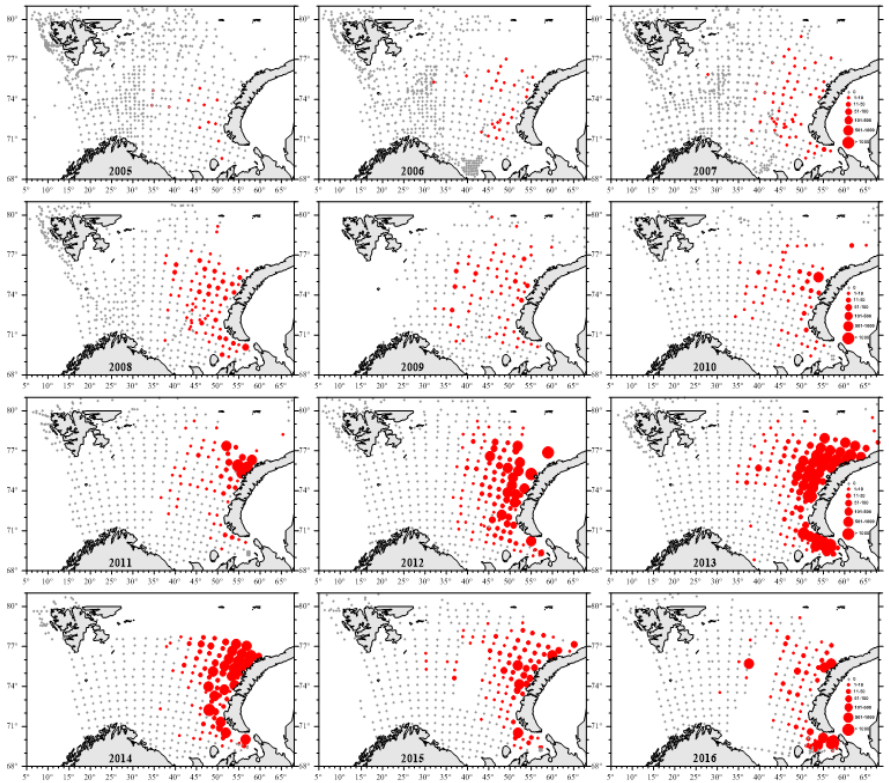


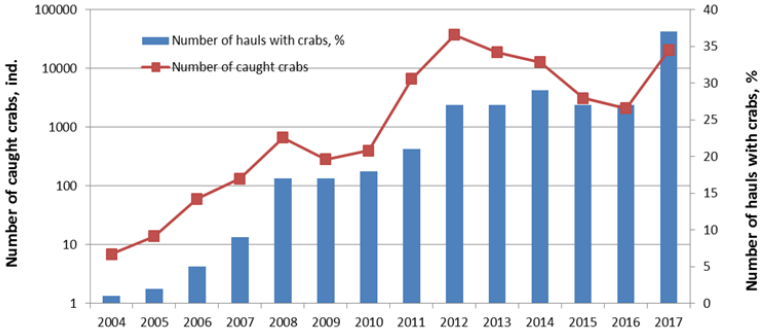
✓ New species in the Barents Sea: snow crab

First recorded in 1996 on the Goose Bank area

Since 2004, a regular annual monitoring of the snow crab

The snow crab population has increased spreading and stock size





Limiting factors:

temperature

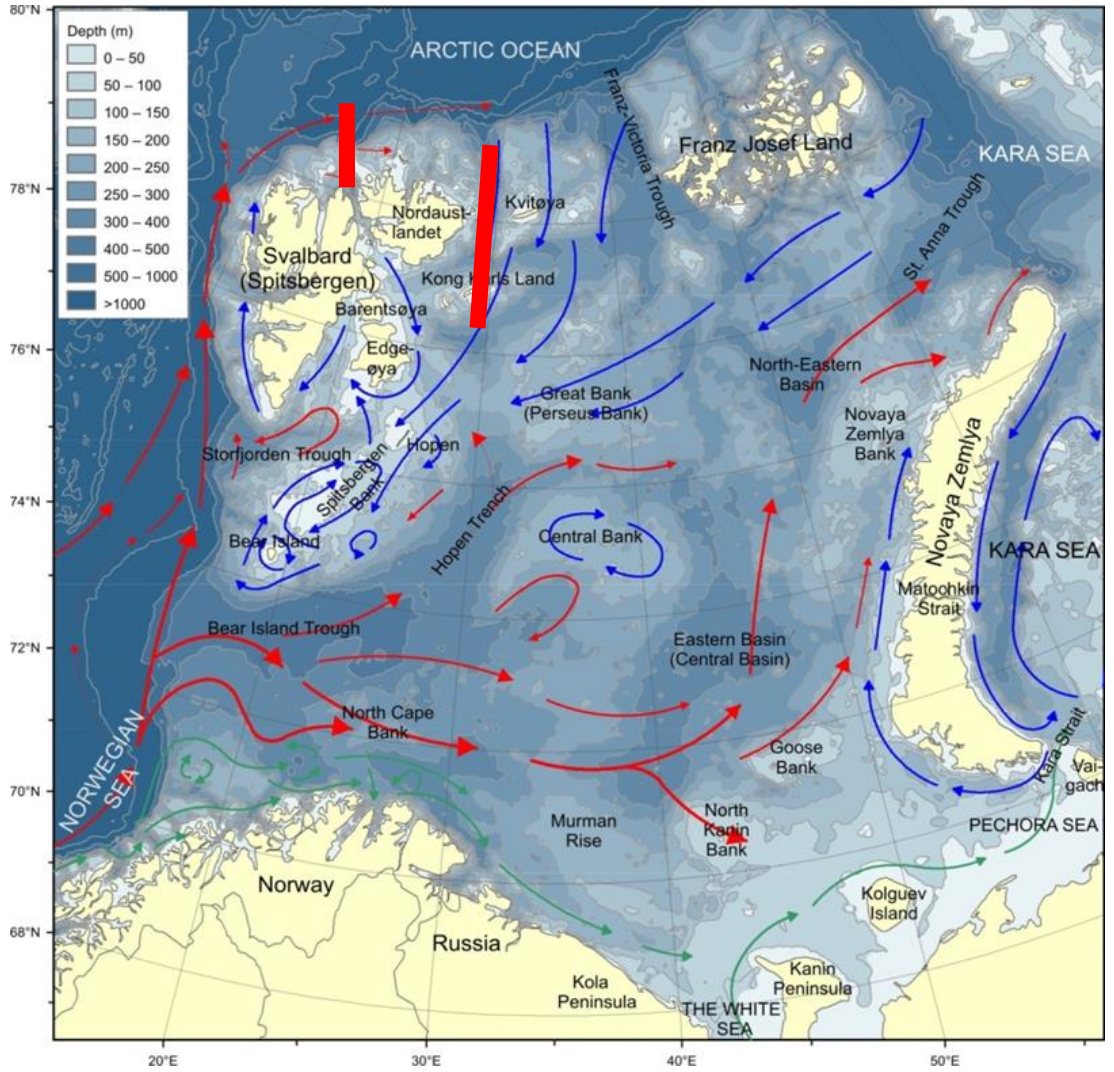
cod

✓ Contribution to WGICA

The Atlantic water that flows through the BS forms the Barents branch of Atlantic water in the CAO

- *Variability of these branches of Atlantic water monitored and assessed by WGIBAR and is important information for WGICA*
- *Transport of Calanus species into the CAO and expansion of distribution of fish in the Atlantic gateway area is also essential for the WGICA*

While information on circulation in CAO e.g. Beaufort Gyre can be of value for WGIBAR



Thank you very much for your attention

ICES WGIBAR https://www.ices.dk/community/groups/Pages/WGIBAR.aspx