



SI_ARCTIC

SI_Arctic

Ecosystem Approach to management in the Arctic: from definition to action.

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The definition

EA is the comprehensive, **integrated management of human activities** based on the **best available scientific** and traditional **knowledge** about **the ecosystem and its dynamics**, in order to identify and **take action on influences that are **critical**** to the health of the ecosystem, thereby achieving sustainable use of ecosystem goods and maintenance of ecosystem integrity.

Arctic Council 2013



Framework for an ECOSYSTEM APPROACH to Ocean Management



Sustainable use of a rich and clean, changing Arctic Ocean

Know the dynamic Ecosystem

Know how human activity impacts the ecosystem

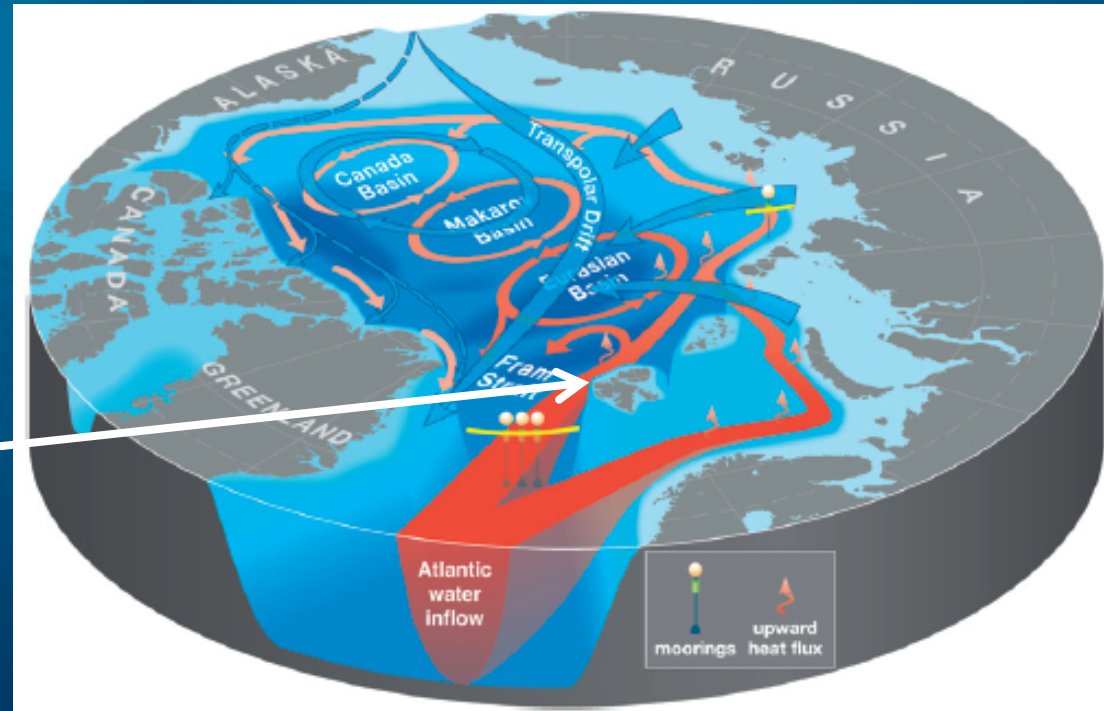
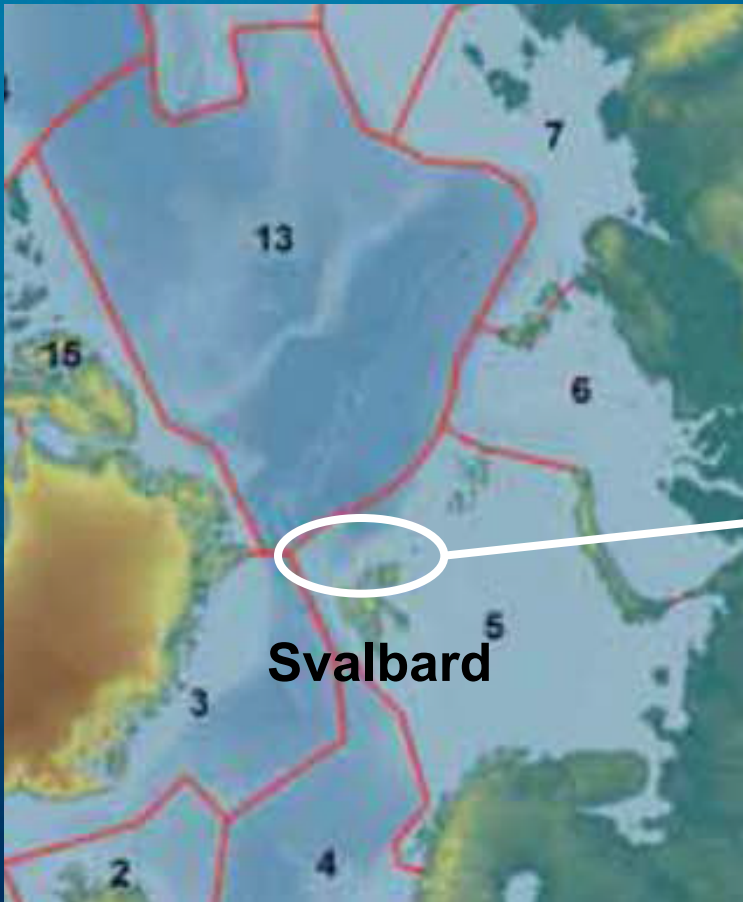
Define "critical level"

Perform sub-regional IEA

Give advice to managers capable to reduce or increase human activities

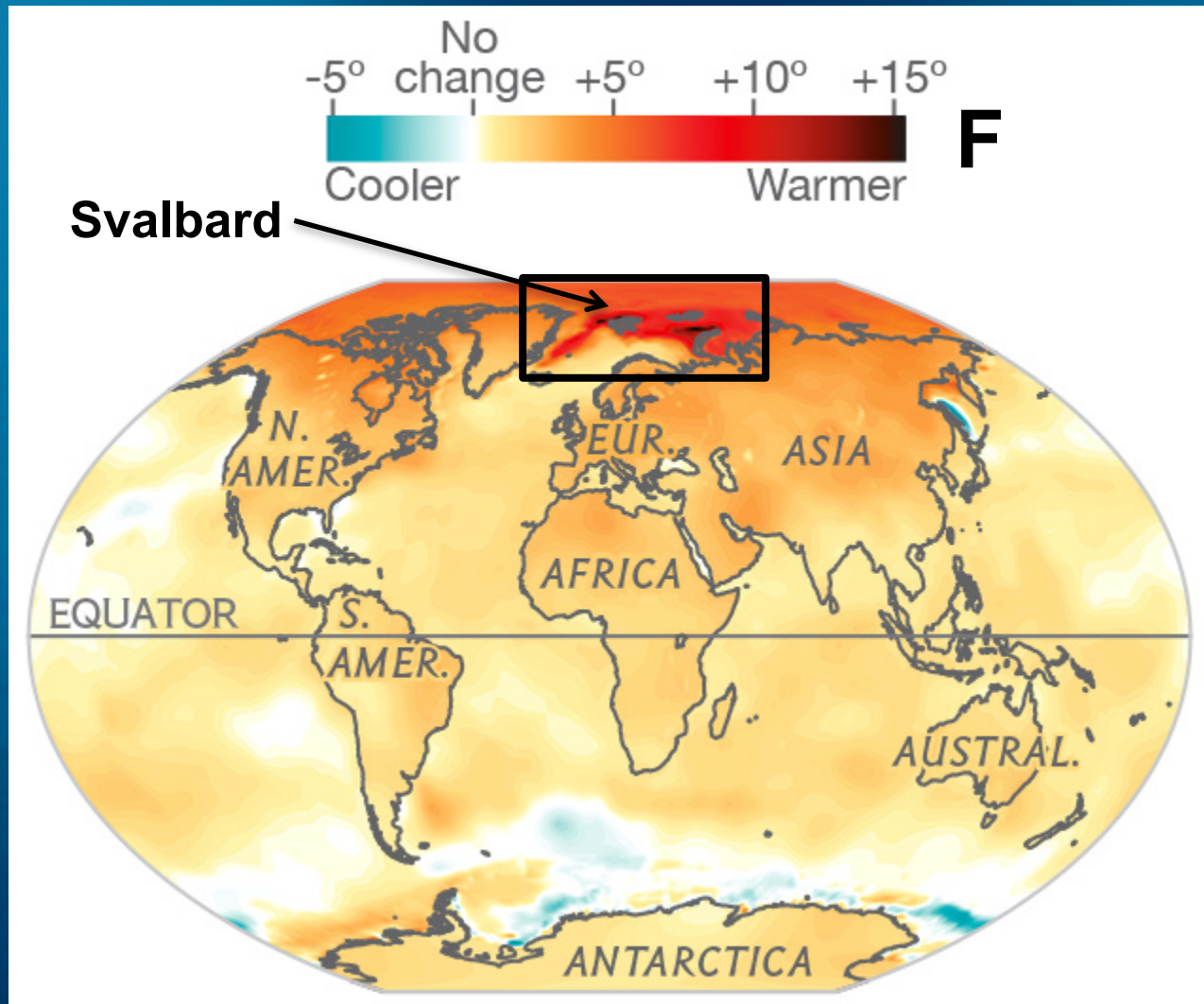


SI_Arctic: the gateway to Arctic

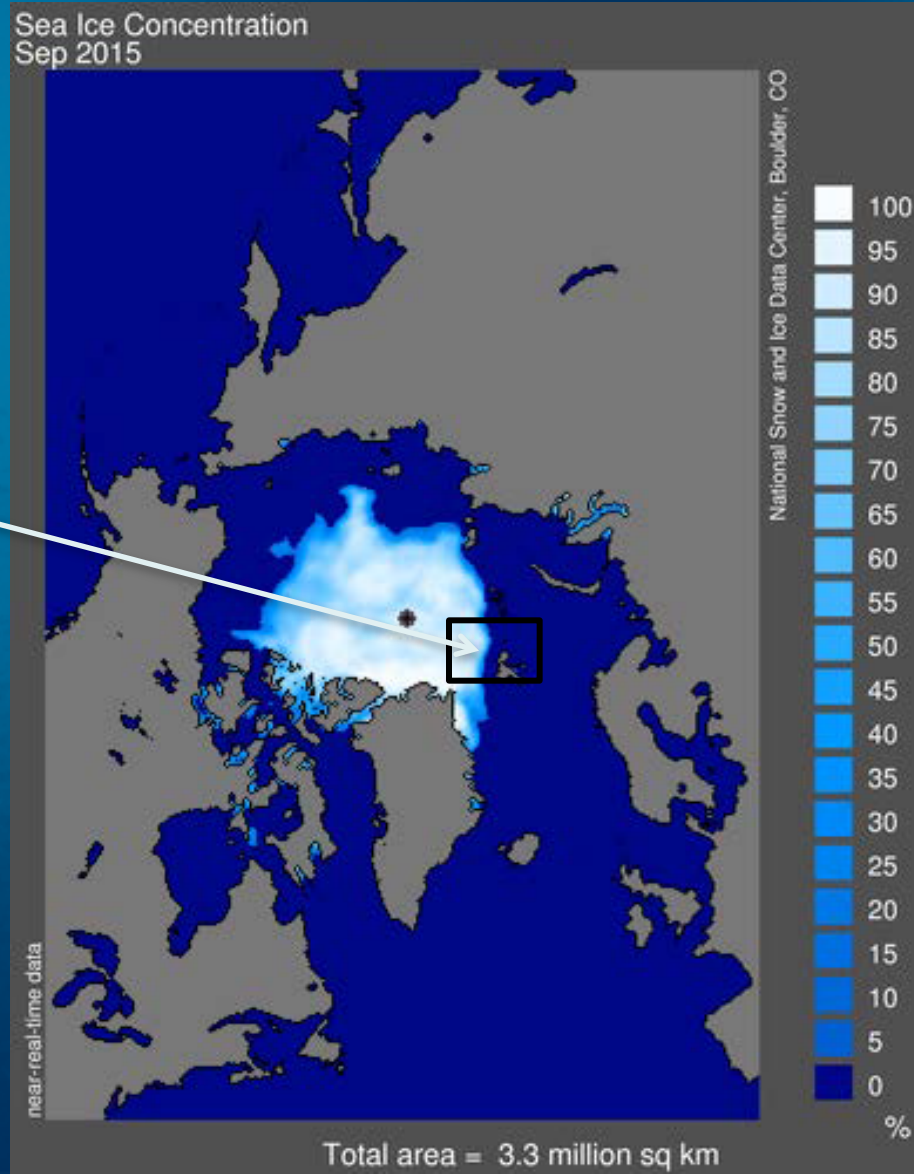


Polyakov et al. (2012) Journal of Climate

Largest temperature increase on the planet



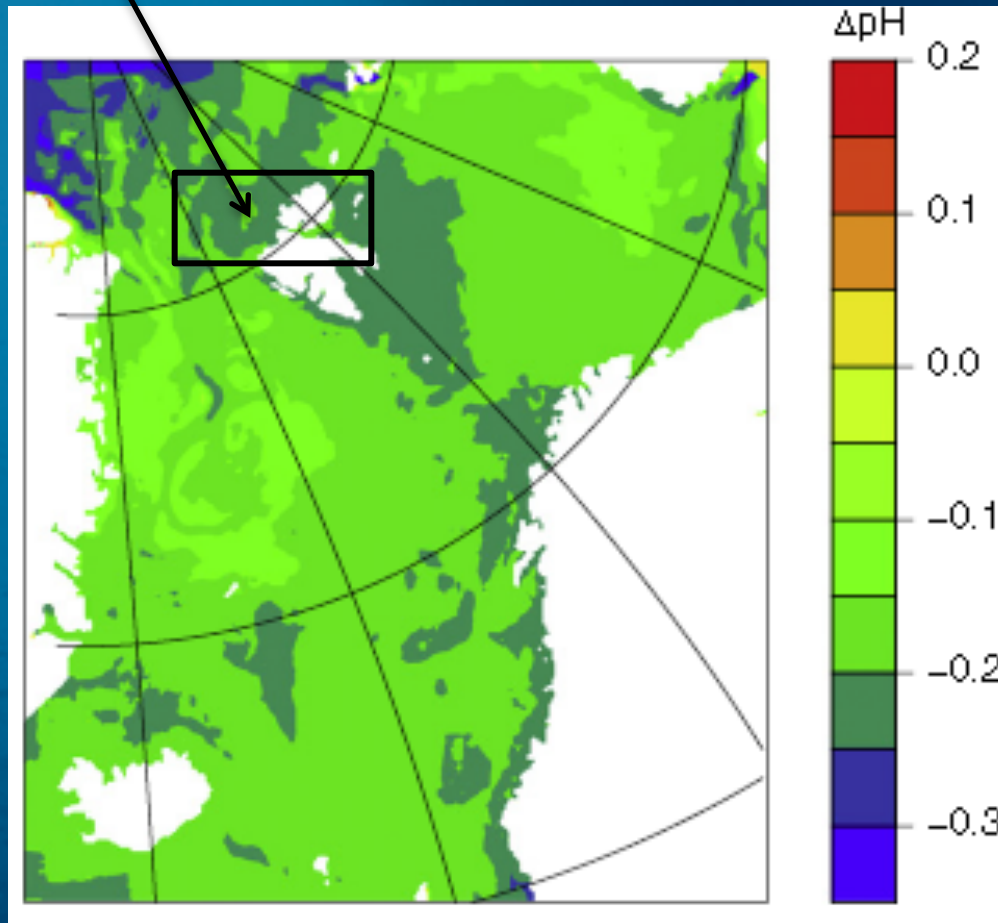
The ice-edge



Svalbard



Svalbard Area of high pH change



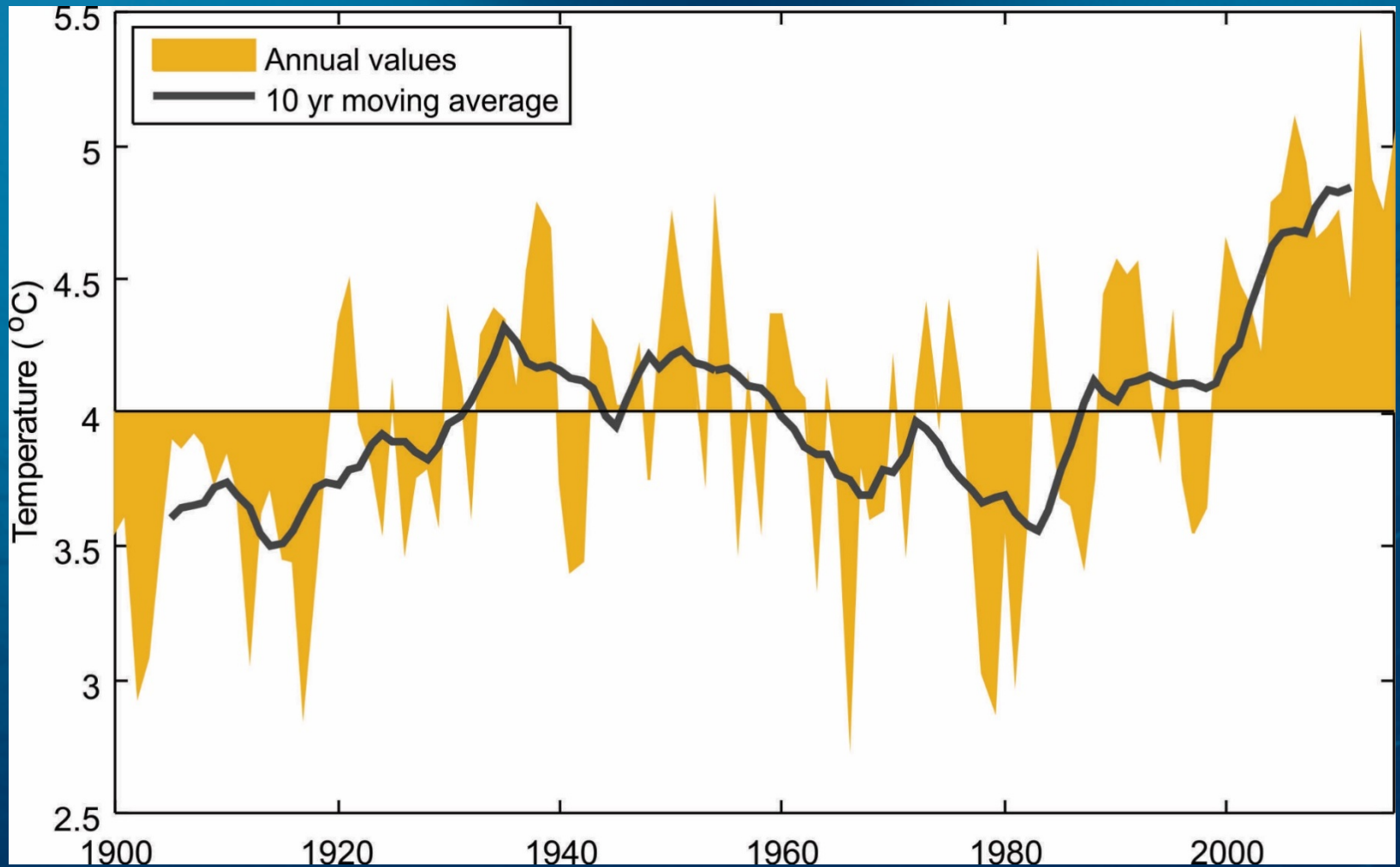
Largest pH decrease:

- Arctic basin: -0.3
- W and N of Svalbard: -0.25
- Barents Sea: -0.1 to -0.2

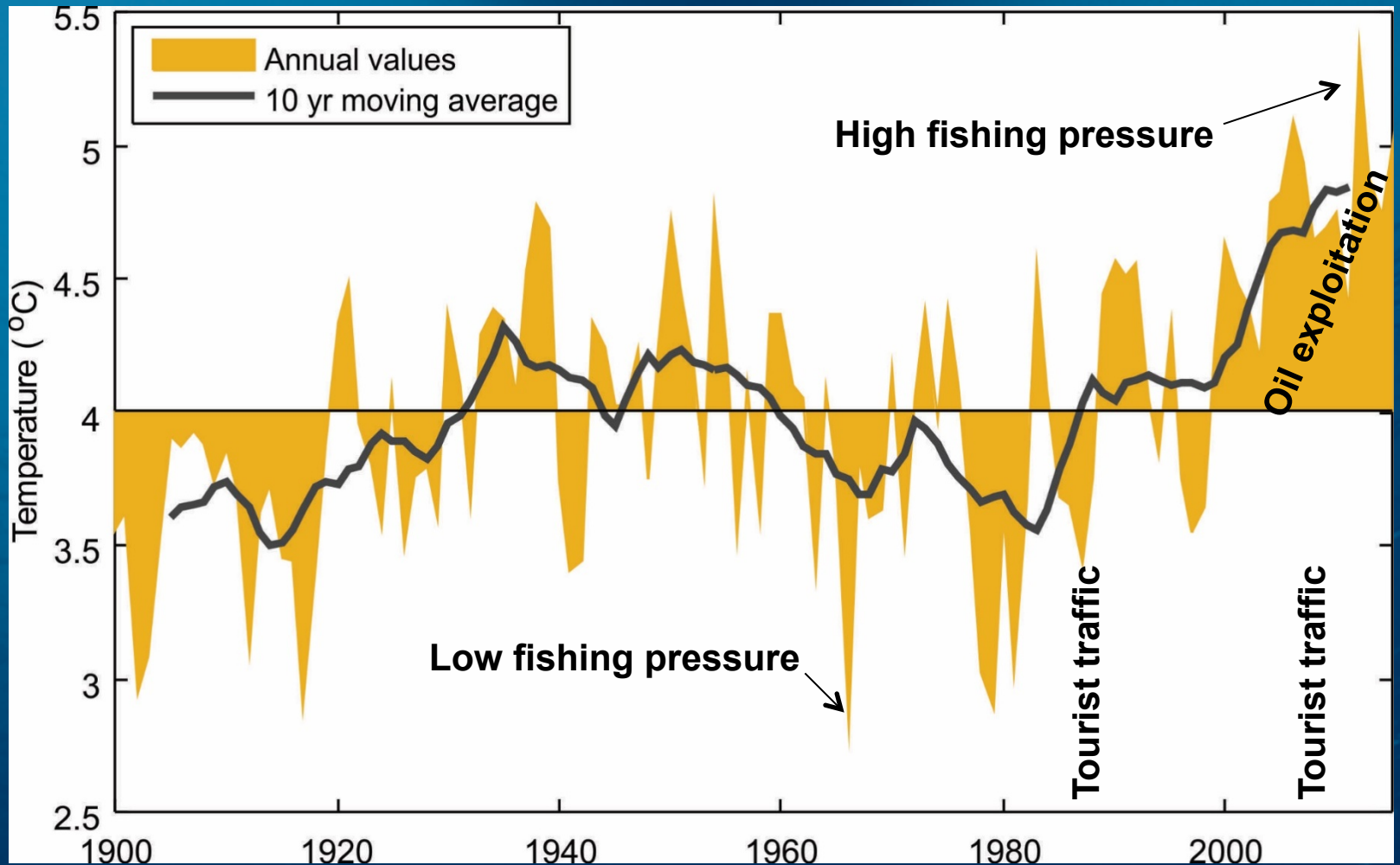
Modelled change in surface pH (1998-2065)



Temperature variations



Temperature variations with human activities



EBM in SI_Arctic

Explore potential options for providing **ecosystem-based scientific advice** and to prepare for a better defined advisory process in IMR:

Step 1: Monitoring program

- Oceanography, biological seasonal patterns, biological key-players

Step 2: Human activities

- What type and fingerprints and division between natural fluc. and human impact

Step 3: IA

- What is “good health” and “critical state”

Step 4: Communication

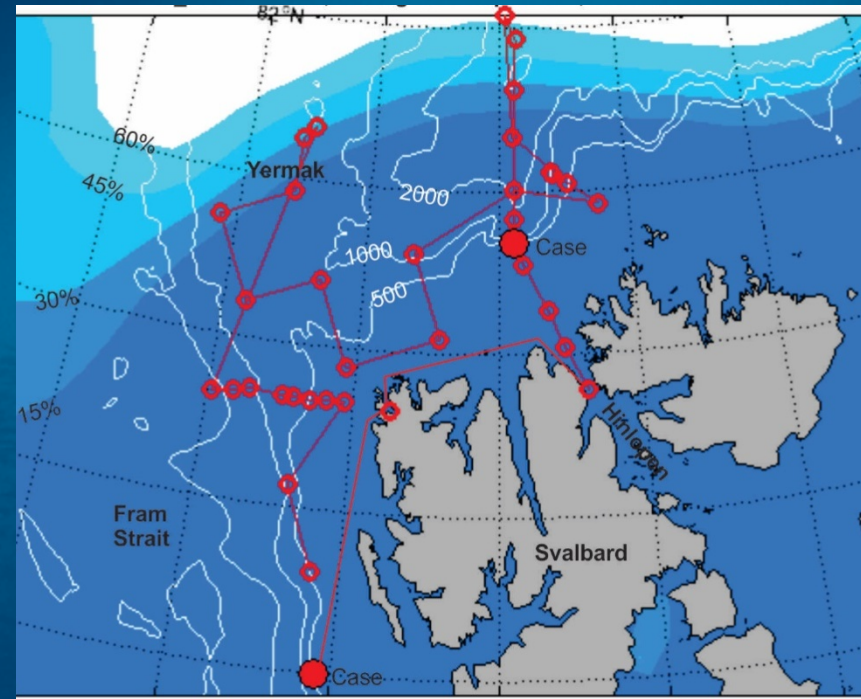
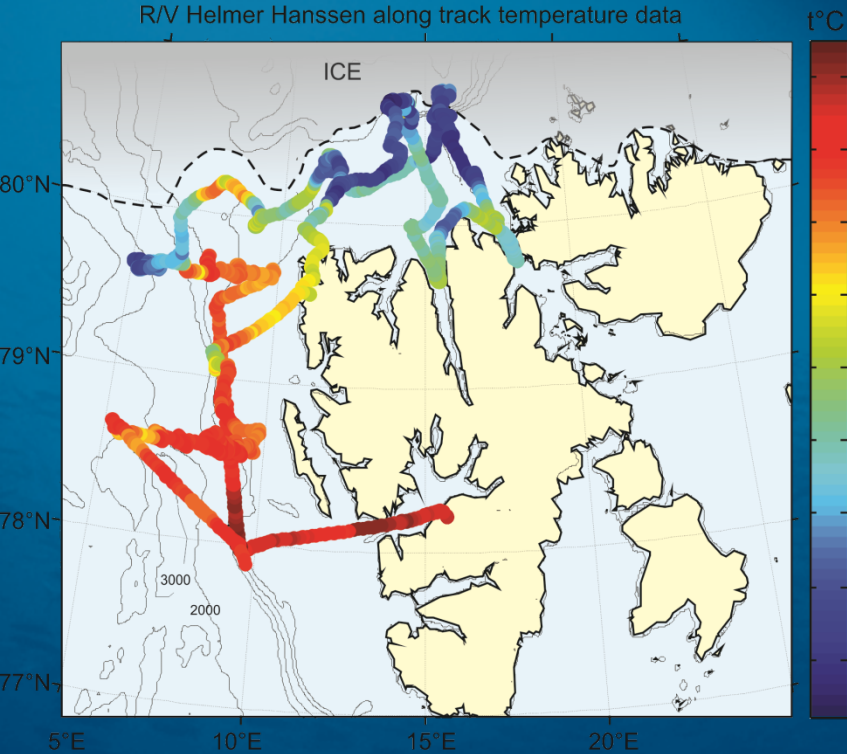
- Ecosystem forecast?

Step 5: Management support if necessary



Cruise tracks 2014 and 2015

R/V Helmer Hansen along track temperature data

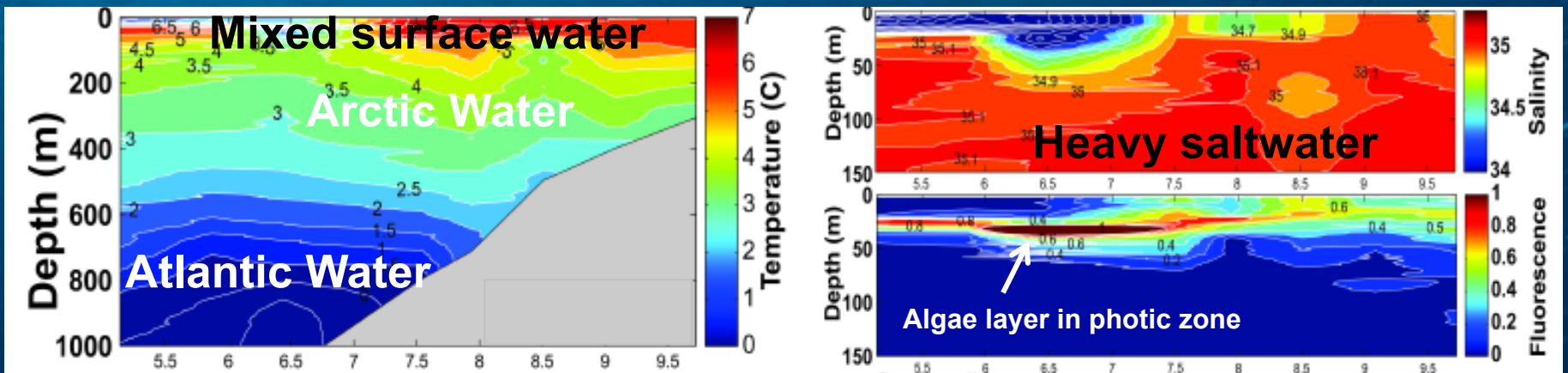
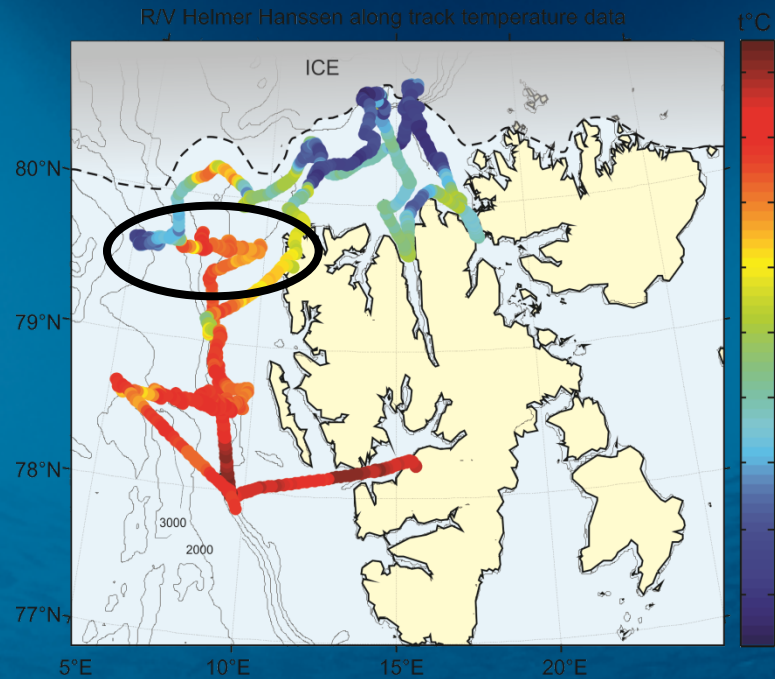


Haug et al. (submitted). Future harvest of marine biological resources on the Northeast Atlantic side of the Arctic Ocean: a review of possibilities and constraints. Fisheries Research.

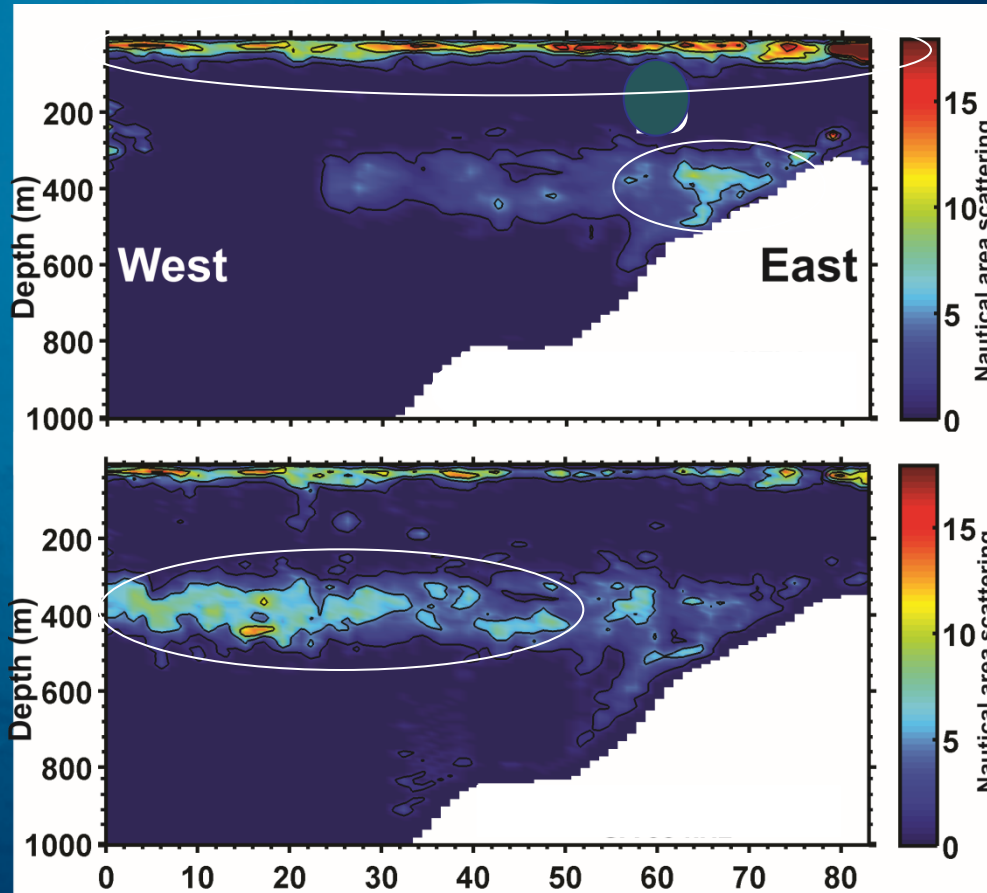
Some preliminary results after 2 surveys



Water environment



A productive meso-pelagic layer



**0-50 m: 0-group *Sebastes* spp.,
copepods, amphipods, and krill.**

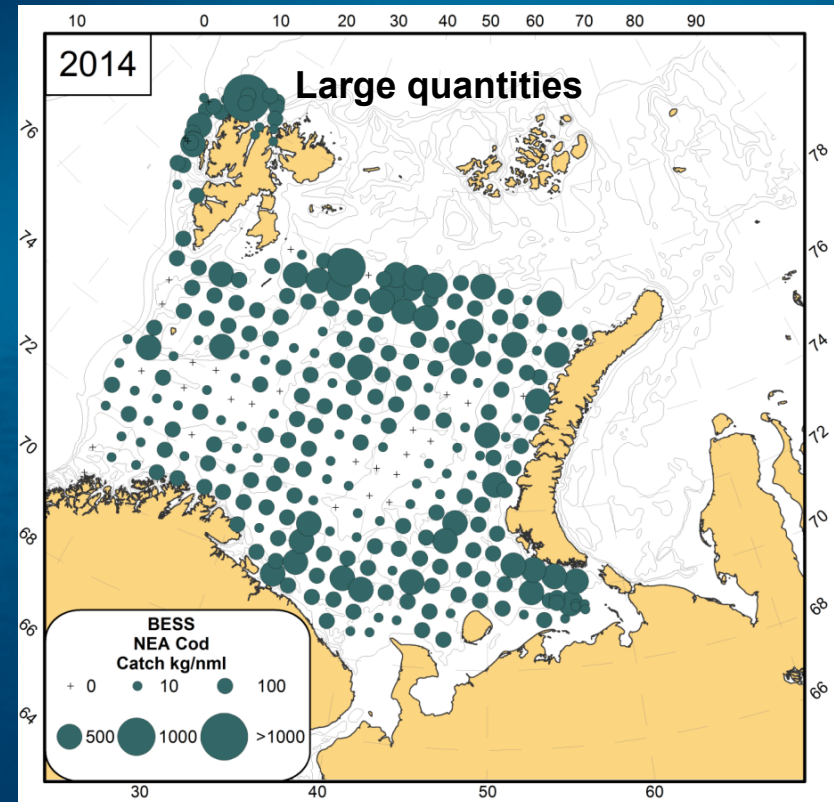
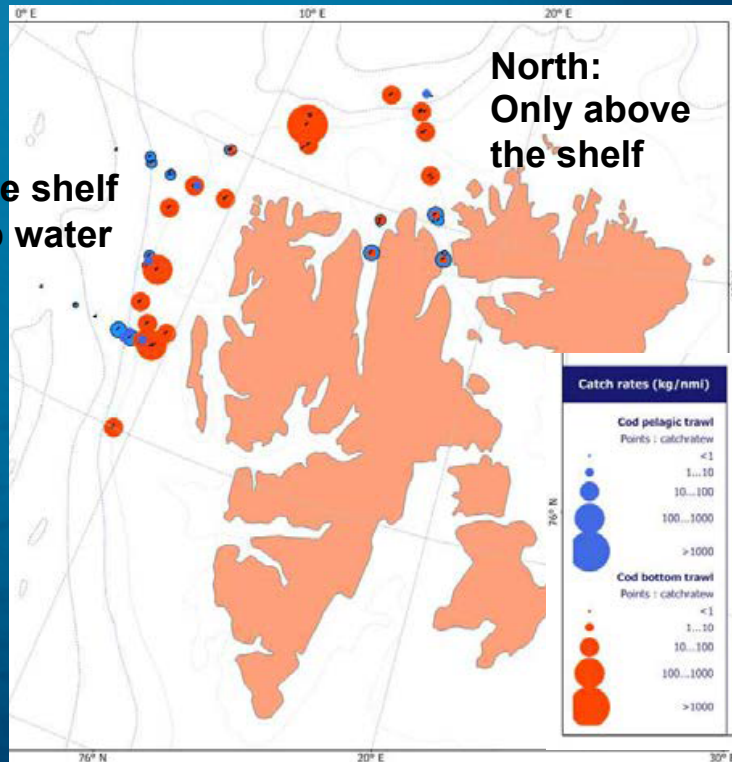
**300 - 500 m: large cod, haddock,
redfish close to the shelf/slope break
in warm Atlantic Water (AW)**

**300 - 500 m: Mesopelagics /
micronekton further offshore.**



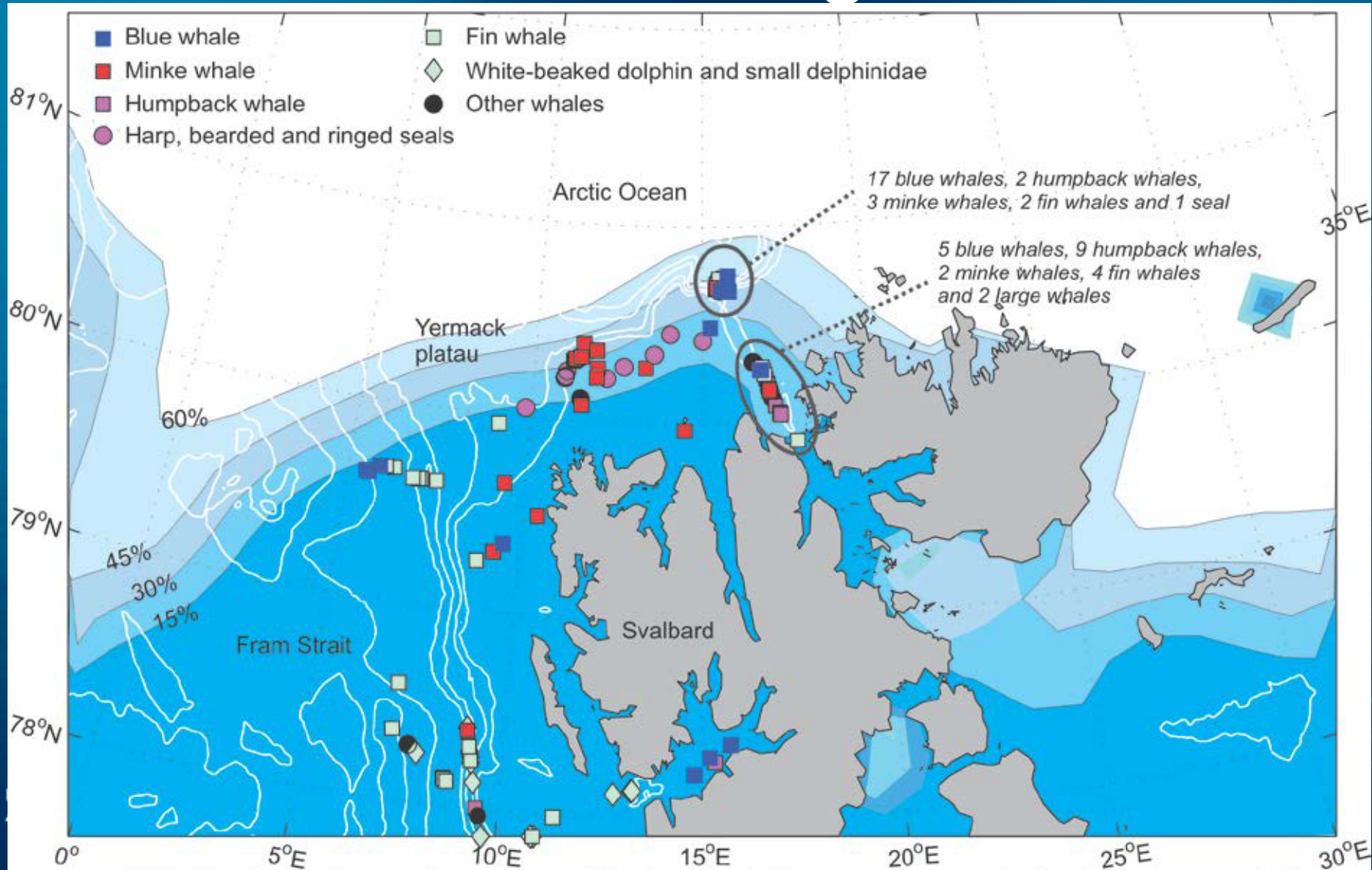
Cod feeding in mesopelagic waters in Arctic Basin?

West:
Above the shelf
and deep water

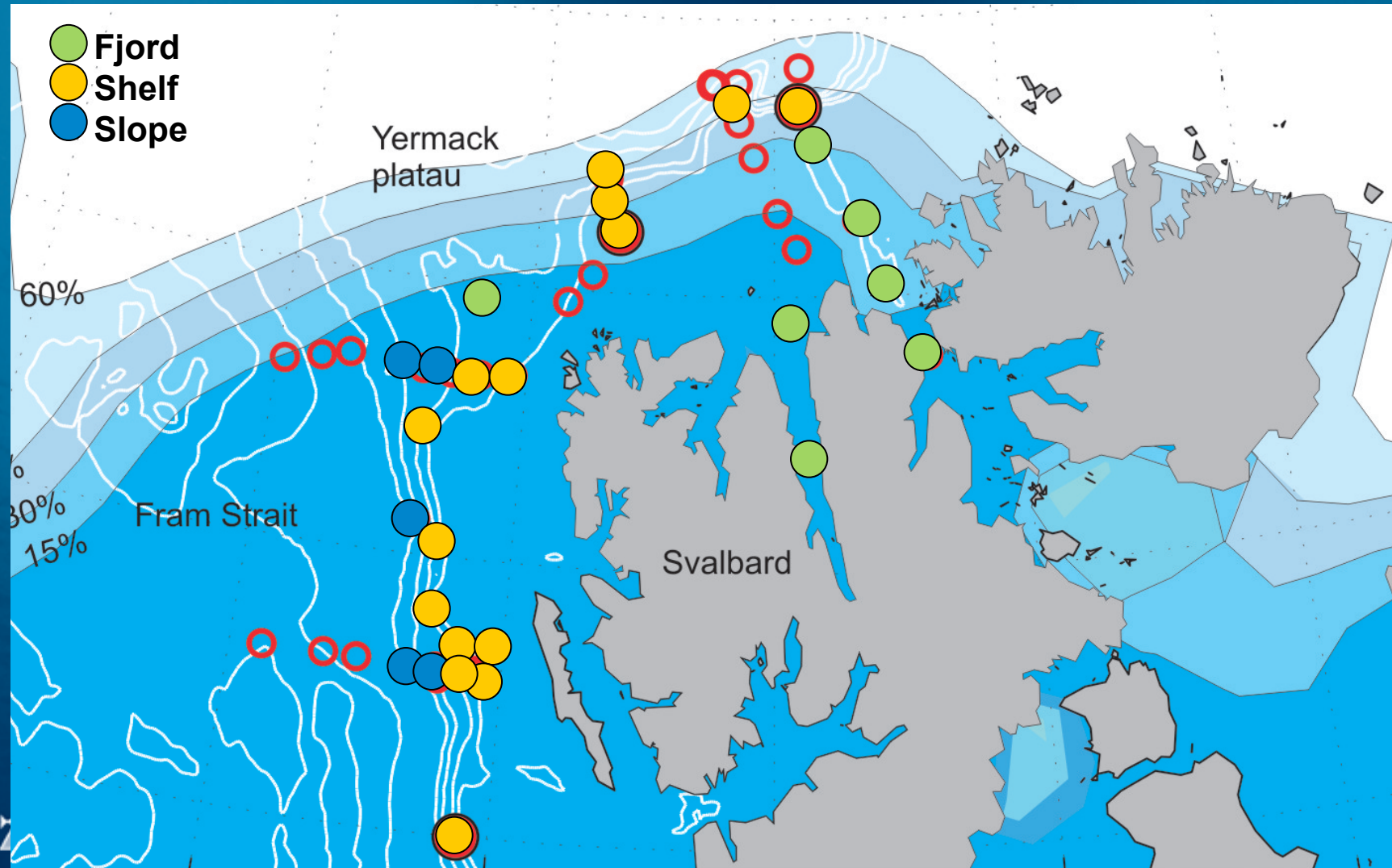


Ingvaldsen et al (submitted). Atlantic cod feeding over deep water in the high Arctic. Polar Biology.

Sea mammals feeding along the ice-edge



Geographic distribution of the benthic faunal communities



The seabed fauna adopted to various environment

Vertical zonation of animals

Fjord

Pandalus borealis

Brittle stars

Ctenodiscus stars

Geodia sponges

Giant sea spider

Shelf

Basket stars

Slope

Gleippides quadricuspis

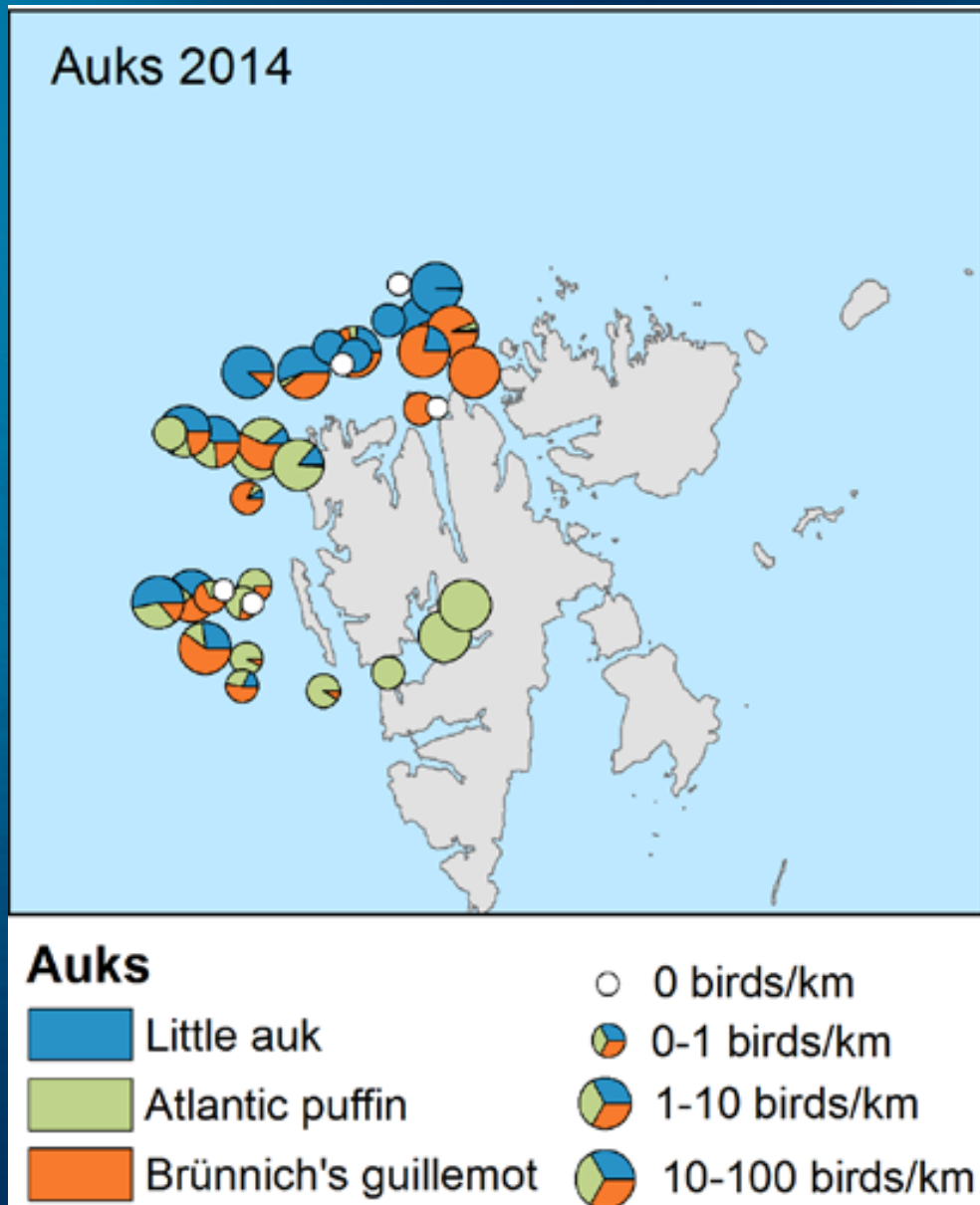
Seapen

Carnivore giant sponge

Eurythenes gryllus



Sea birds, nesting and feeding



Fish stomach – who eats who

Amphipoda Forams Sea urchins
Worms Sea cucumber Bryozoans
Bivalves Sea stars
Snails Sea lilies
Brittle stars
Shrimps



Hippoglossoides platessoides - 63 prey

Shrimps
Brittle stars Worms Sea stars
Sea urchins
Bivalves



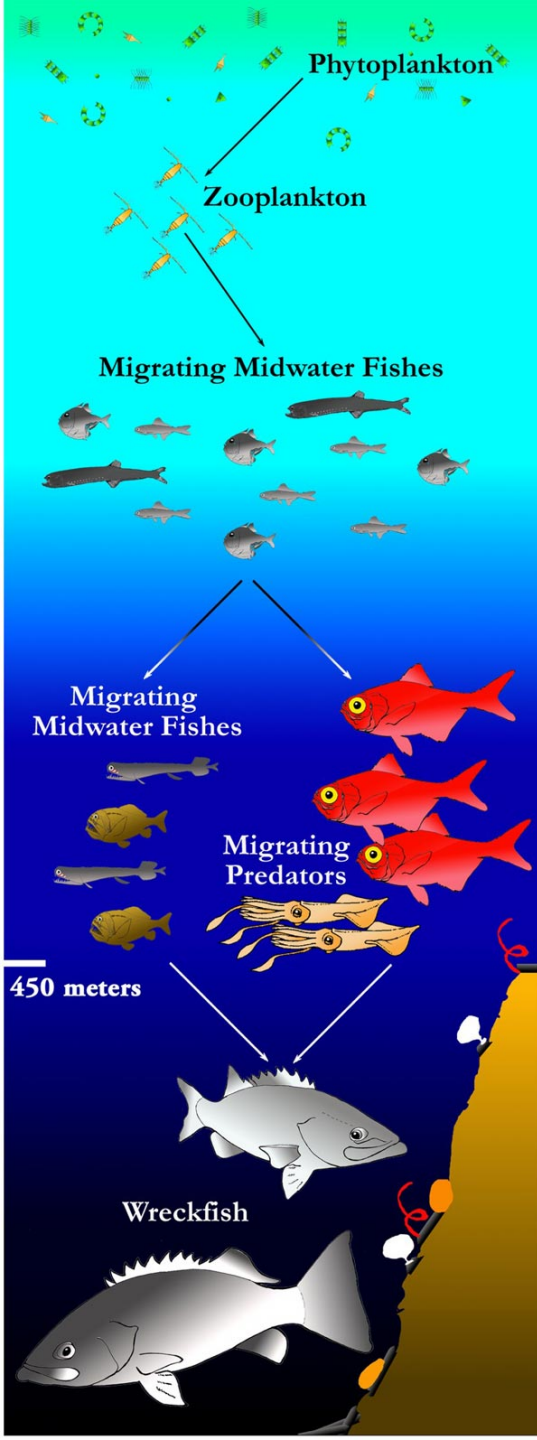
Anarchichas lupus - 17 prey

Fish Krill Cephalopods
Worms Amphipods
Mysids
Shrimps



Gadus morhua - 34 prey





Benthic-Pelagic coupling

Stable isotopes is used to investigate to which degree benthic consumers are coupled to primary production (Hobson et al. 1995, Iken et al. 2001, Tamelander et al. 2006).

2014 and 2015
> 1000 species samples for stable isotopes

from demersal and pelagic fish, shark, benthos, zooplankton, filtrated water, sediment.

Future work

Fisheries impact on:

- Target population
- Cascading ecosystem impact
- Benthos biodiversity (speech from this morning)



Goal

Advise given in **space and time** in order to manage the whole ecosystem from **benthos**, **zooplankton**, **fish**, **mammals** and **seabirds** as a consequence of fishing



Next SI_Arctic Cruise

03-16 Sep 2016



Main goal

- Continue the baseline investigations of the marine ecosystem north of Svalbard
- Sampling from harp seals
- Extend the sampling in the marginal ice zone on the Yermarc Plateau and above the deeper basins (compared to 2014 and 2015)
- Get data for evaluating interannual variations 2014-2018

