Climate Adaptation in Fisheries and Aquaculture in the Arctic

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ACAF Networking webinar on Arctic climate change adaptation
27th May 2021 9:00-12.00 CET
Online meeting

ACAF

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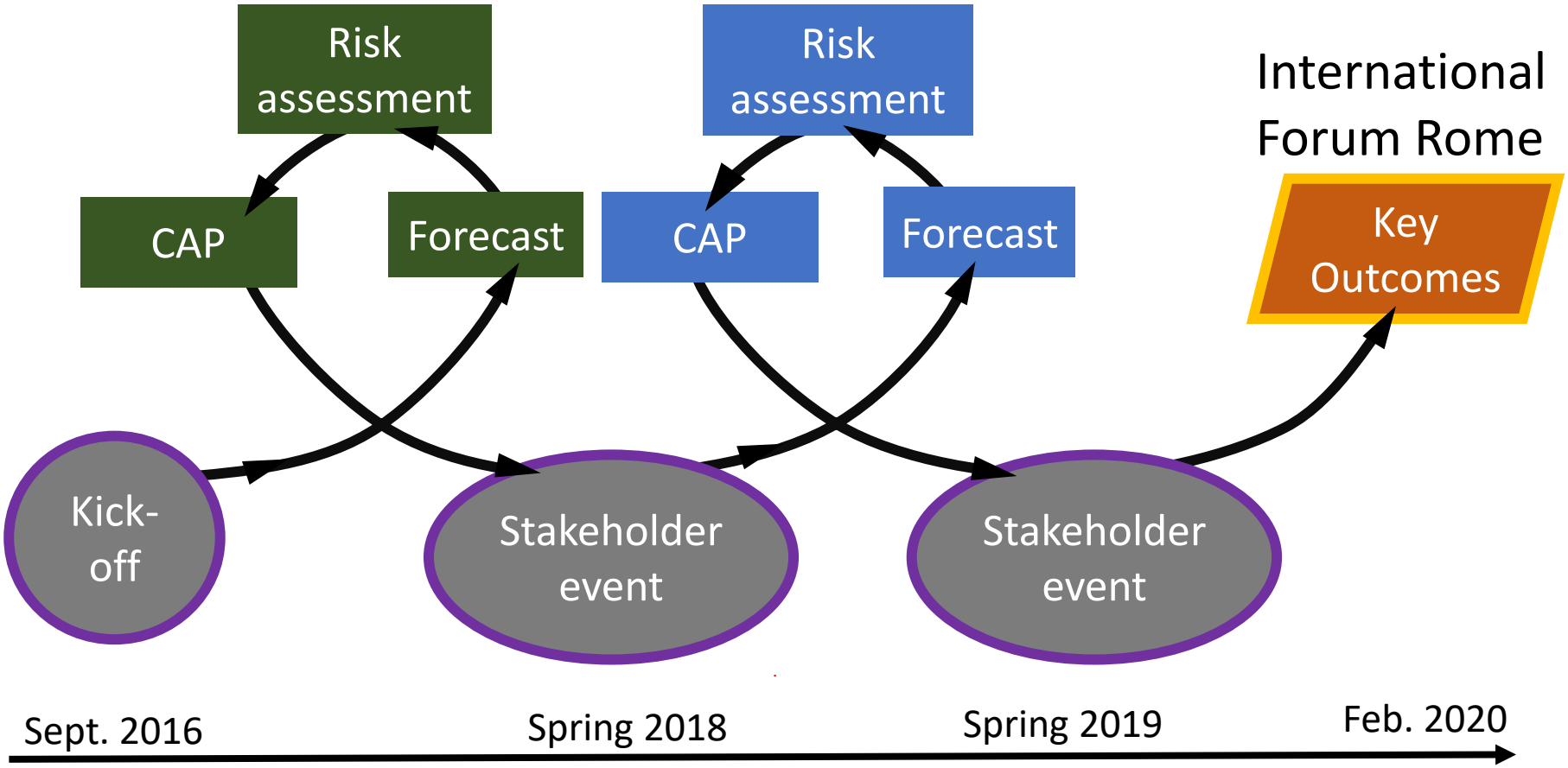
The ClimeFish iterative co-creation approach



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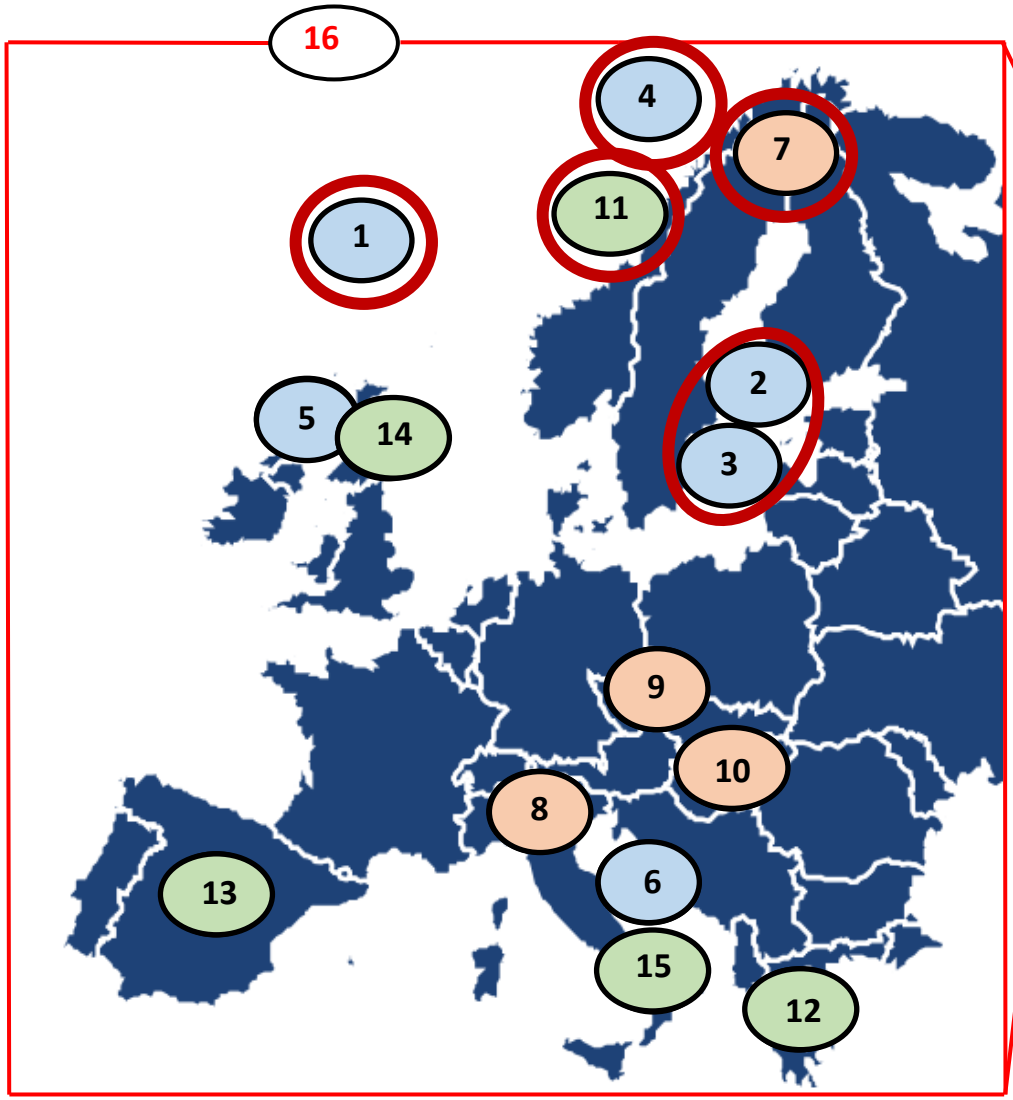
ClimeFish Case Studies in 3 sectors



Fisheries

Aquaculture

Lakes and ponds

European level

Bottom up

Case study level

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Marine fish in the Arctic

https://climefish.eu/virtual-fact-sheets/

Northeast Atlantic Fisheries

Main results Slight future increase projected in both mackerel and (for some periods) in blue whiting spawning stock...

Baltic Sea Fisheries

Main results Pelagic fish will benefit from future warmer temperatures, but future stock sizes will depend strongly on...

Barents Sea Fisheries

Main results: Sea surface temperature is expected to increase during the next two decades, with a concurrent decrease...

Lakes and aquaculture in the Arctic

https://climefish.eu/virtual-fact-sheets/

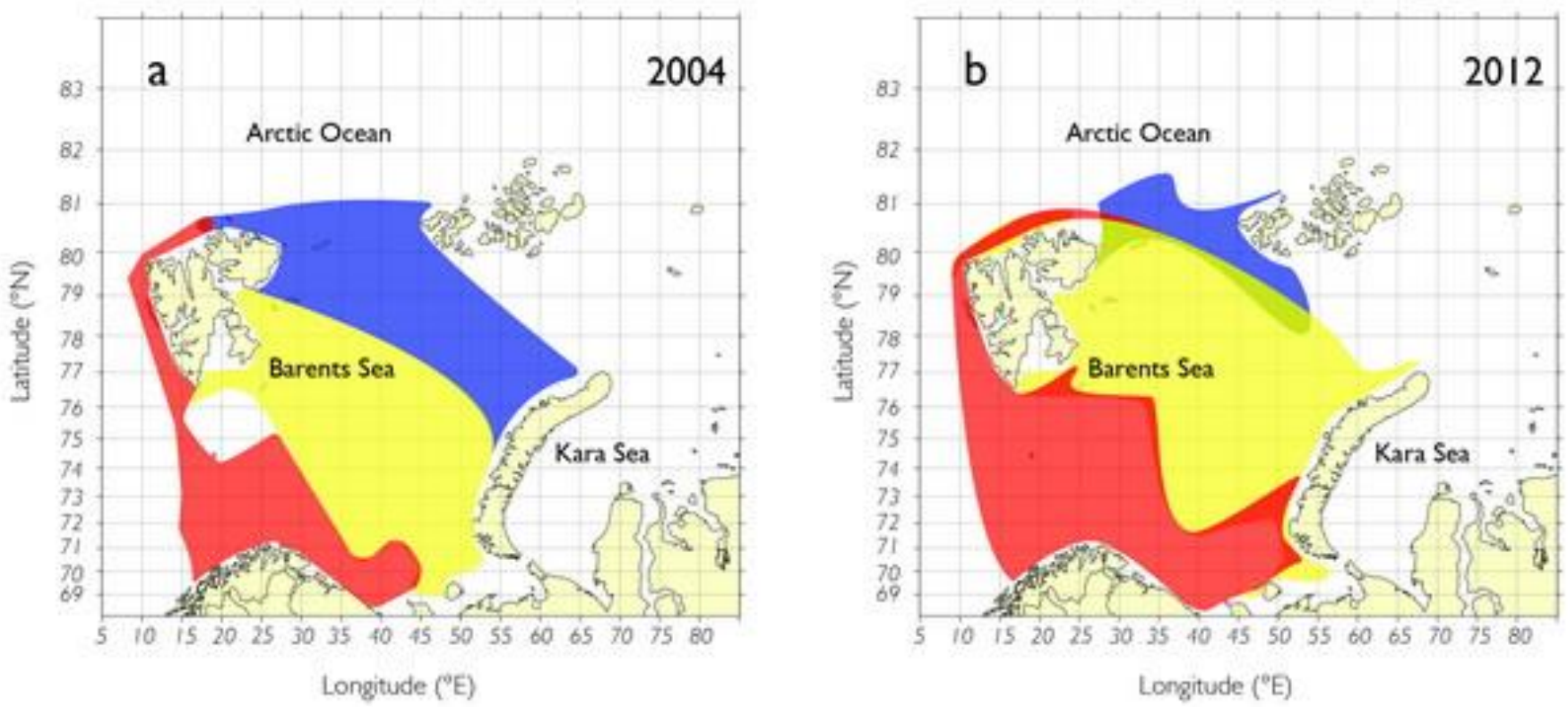
North Norwegian Lakes

Main results Salmonids in Northern lakes will experience rapid and substantial warming resulting in a prolonged ice-free season...

Northeast Atlantic Aquaculture

Main results Salmon are vulnerable to temperature increase due to thermal limitations. In some Norwegian regions, temperature already...

Climate change is pushing boreal fish northwards



Fish communities in the Barents Sea

Ecosystem Survey in the Barents Sea in 2004 (a) and 2012 (b)

Fossheim et al. 2015 Nature Climate Change; Frainer et al. 2021 Royal Society B

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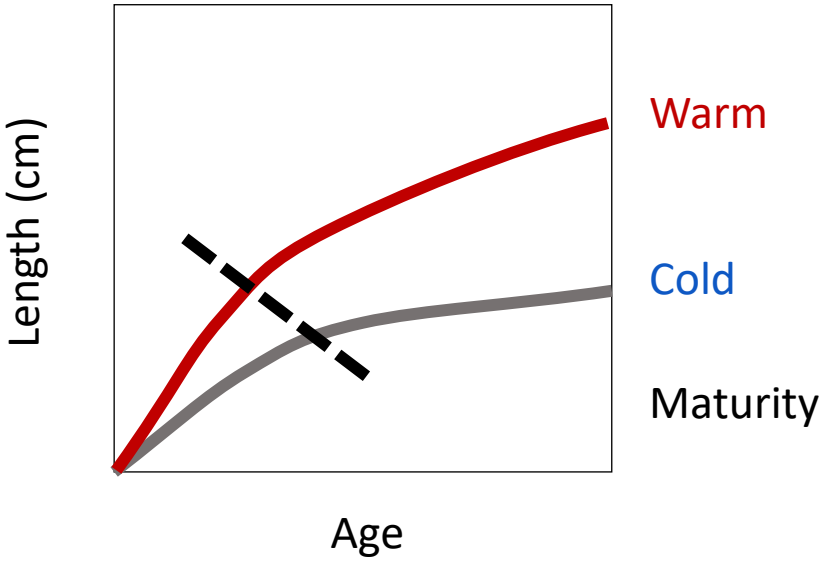
Fish grow faster and mature earlier due to warming

Cod

Salmon



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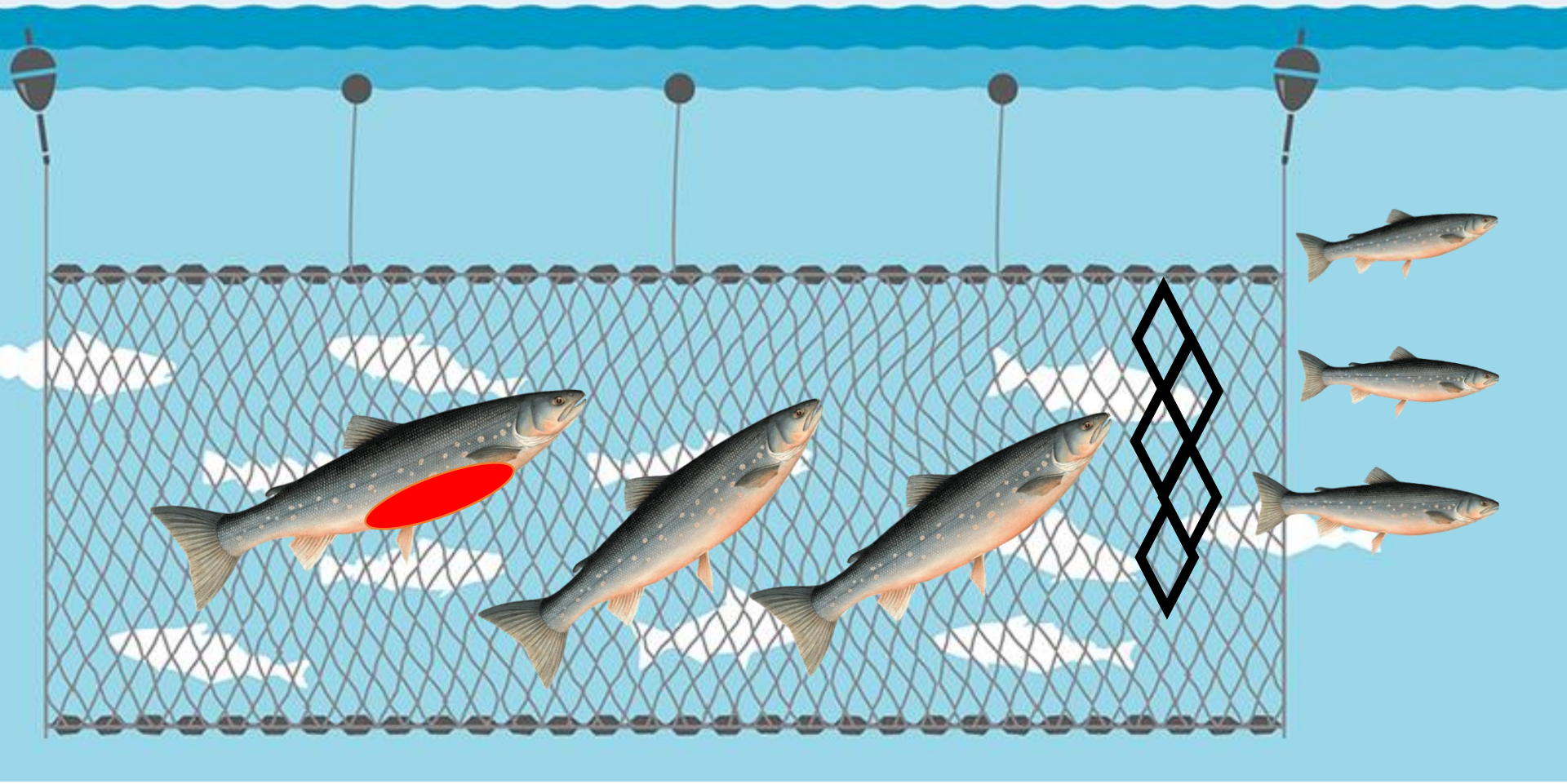
Immature fish becomes larger and gets caught – regulation of gear needed



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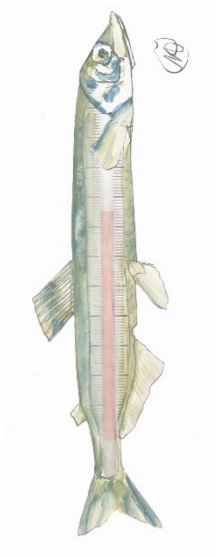
Climate impacts on Fisheries



Climate effects	Adaptation measures
Northwards shift of species	Robust vessels and gear development
Emerging species	Increased marketing effort for new emerging species
Mackerel, Whiting increase Herring decrease	Sharing agreements to prevent overfishing

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Climate impacts on Aquaculture

Climate effects

- Higher growth rates and yields
- More extreme events
- Pathogens, algal-, and jellyfish blooms

Adaptation measures

- Higher model resolution
- Better monitoring
- Diversify species and technology

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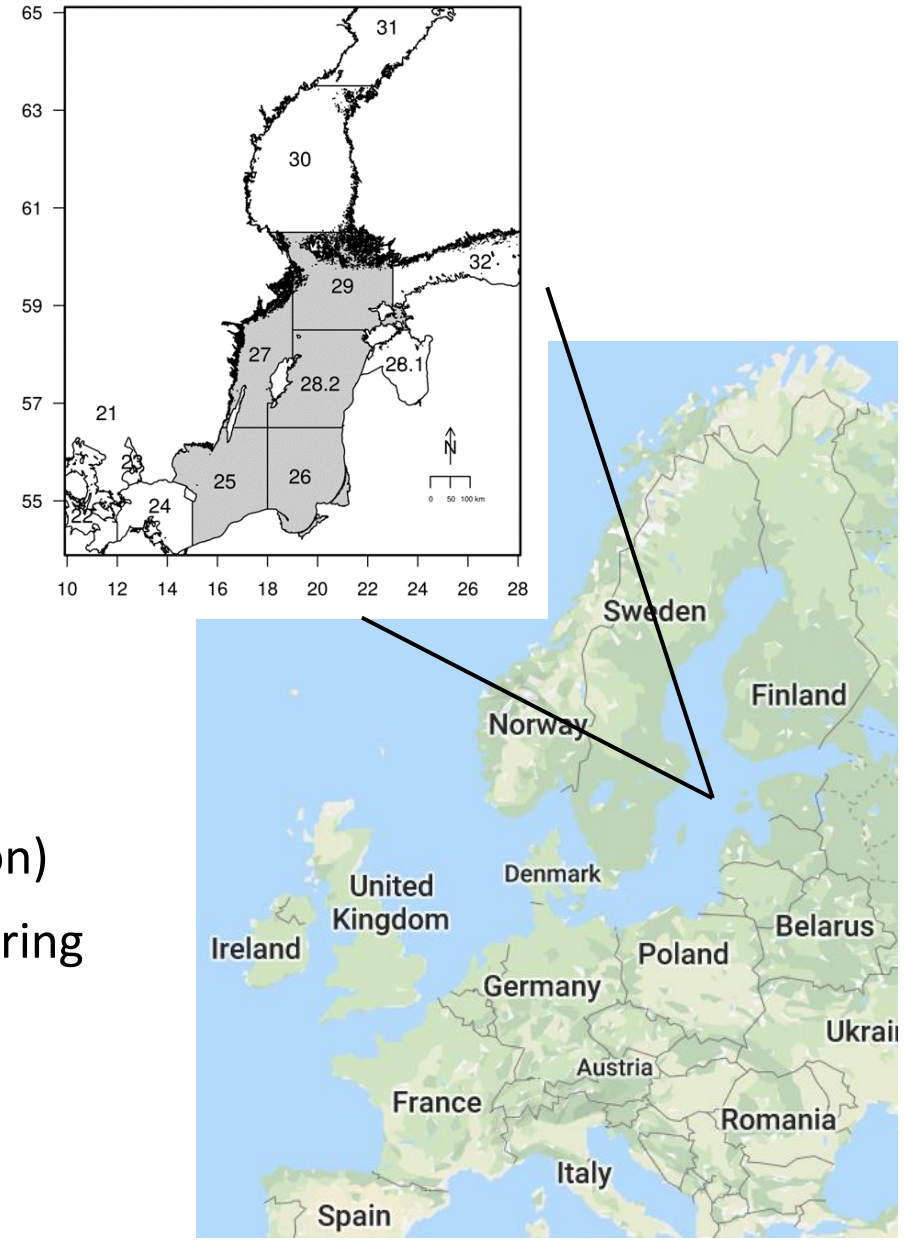
Central Baltic Sea

Main commercial fish stocks

- Sprat, herring (pelagic)
- Cod, flounder (demersal)

Main commercial fisheries

- Pelagic trawl fishery for sprat and herring (fishmeal production)
- Coastal gillnet/trapnet fishery for herring (human consumption)
- Trawl fishery for cod



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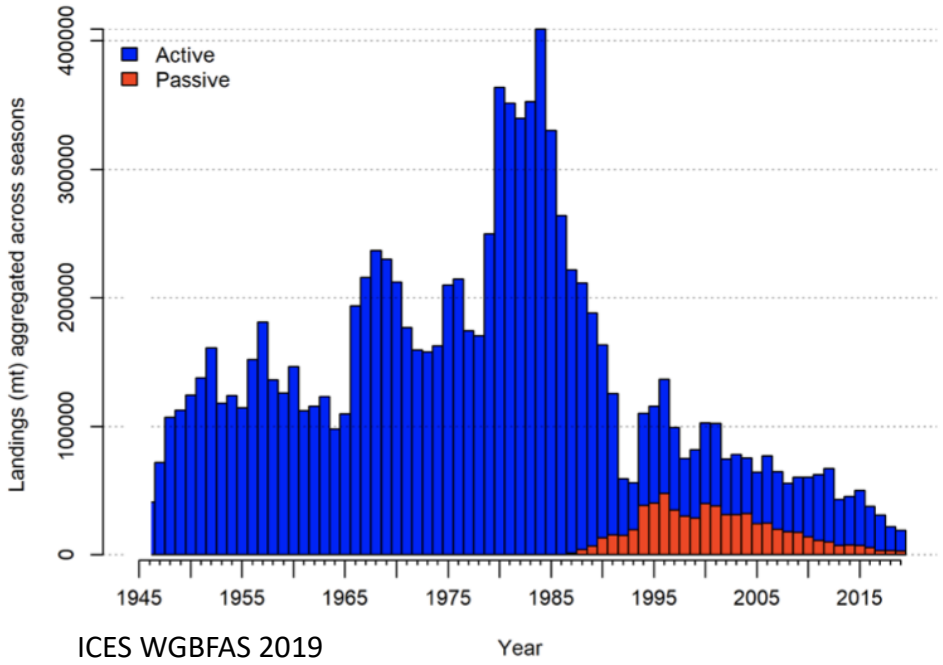
Fisheries status

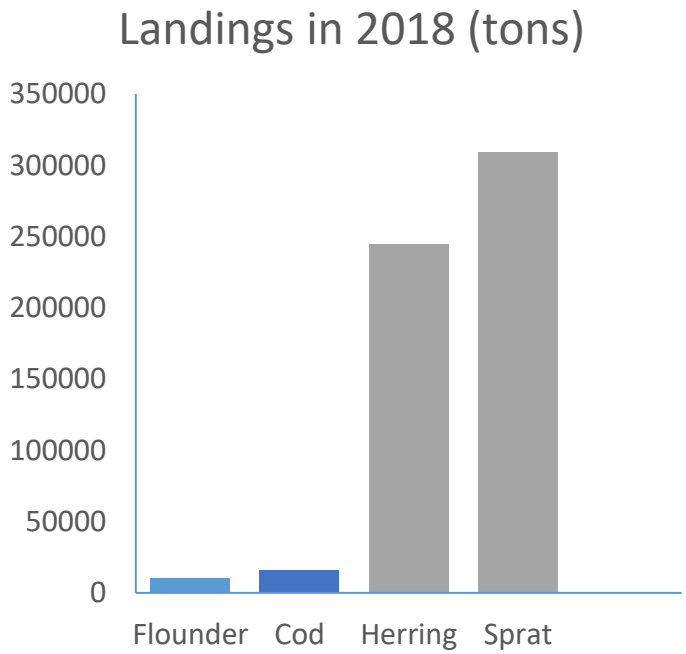
Gross value added ~ 100 Mio Euro, net profit in 2018 ~ 10 Mio Euro (STECF 2019)

Historical cod landings in the Central Baltic



ICES WGBFAS 2019

Current landings, all species



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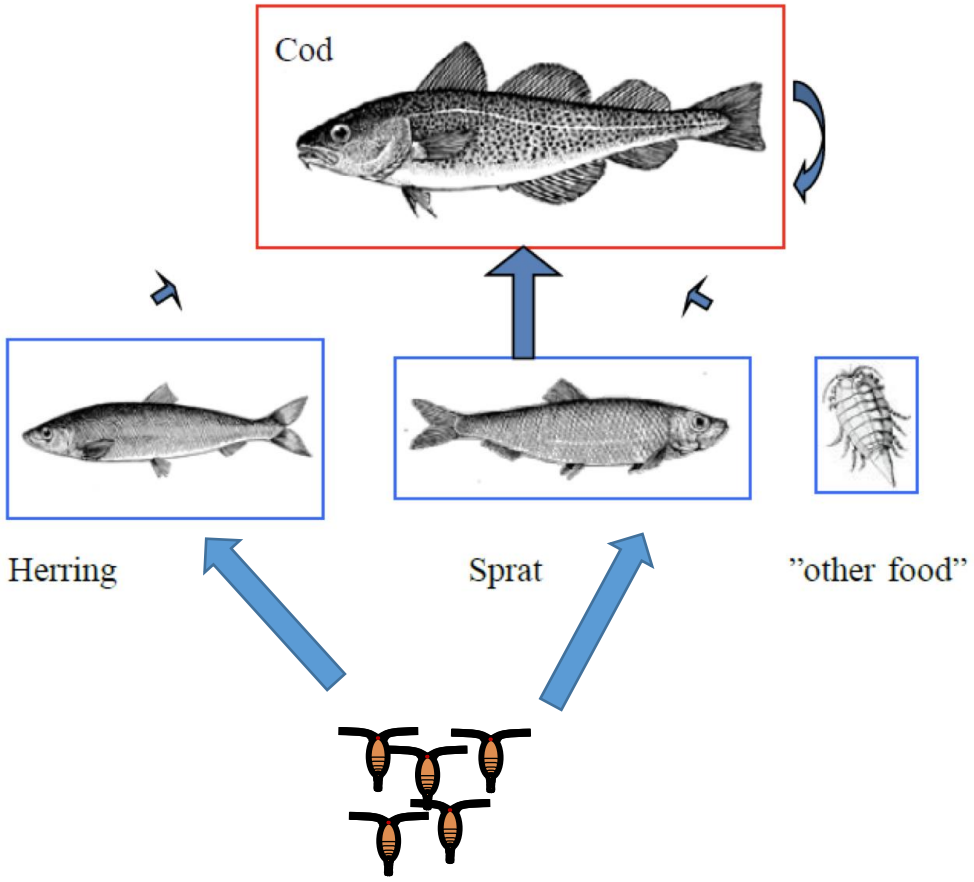
Central Baltic foodweb



Adapted from ICES Fisheries overviews Baltic Sea Ecoregion

Published 2 September 2019 Version 2: 29 November 2019

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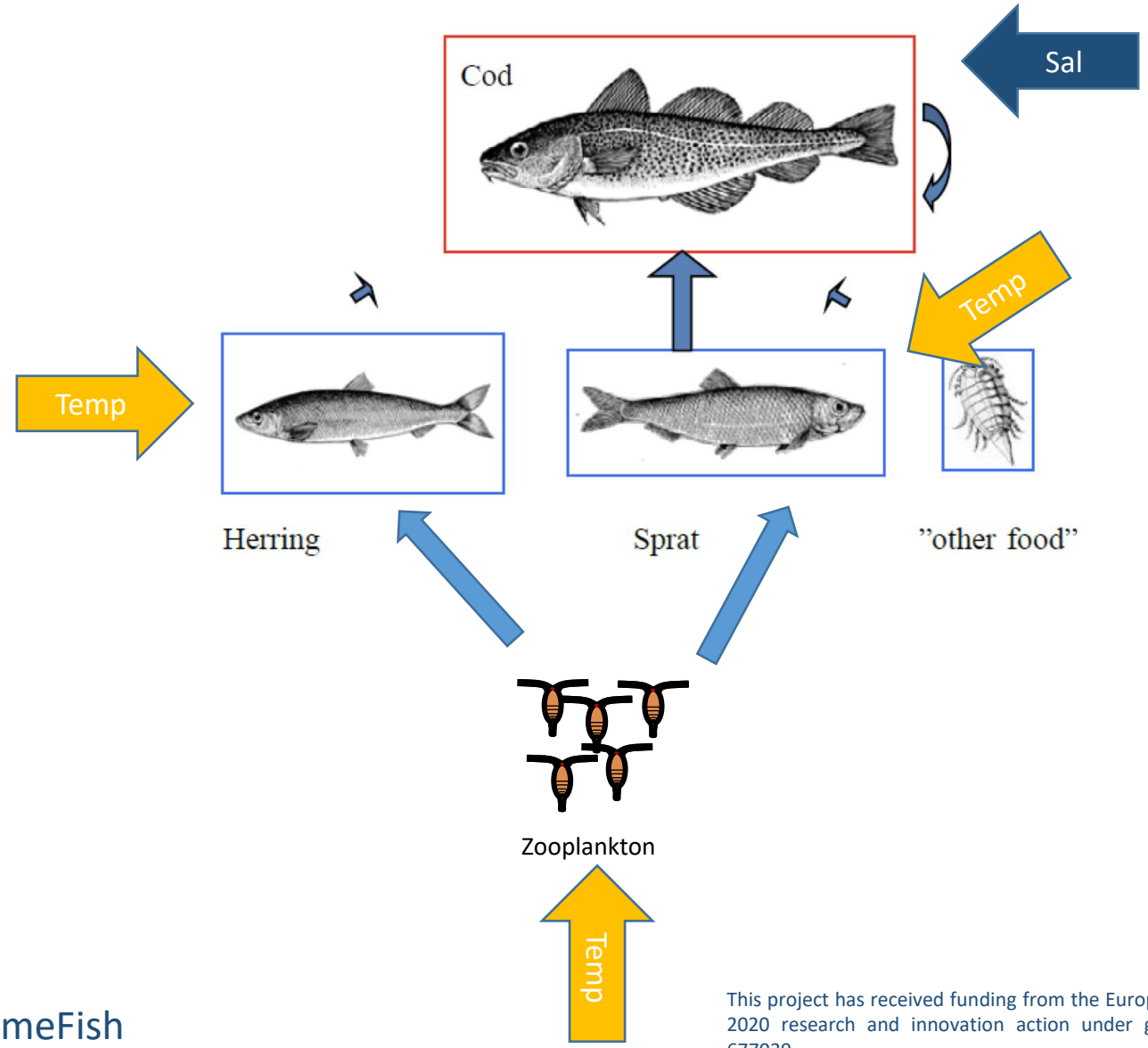
Potential climate impacts



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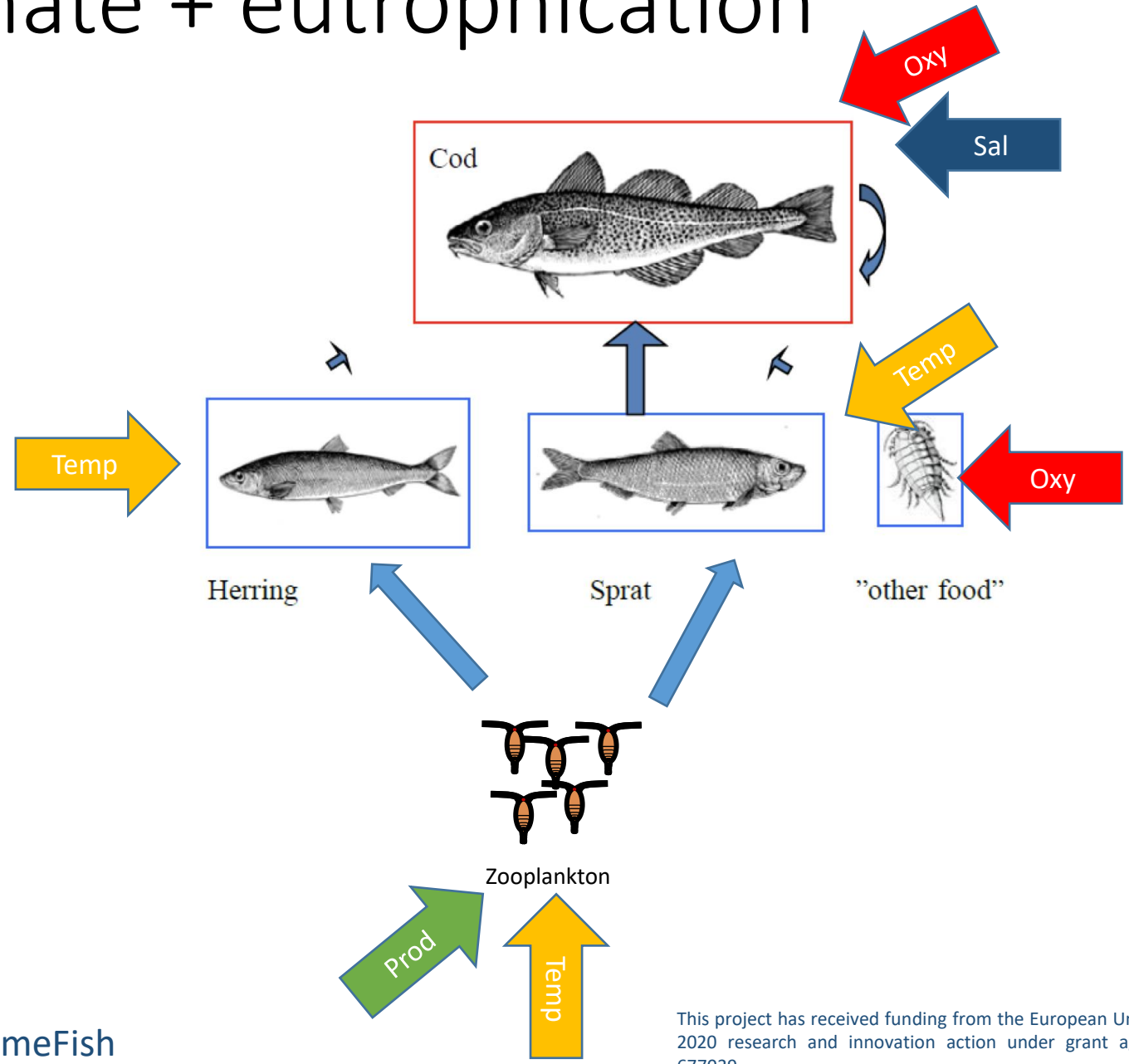
Climate + eutrophication



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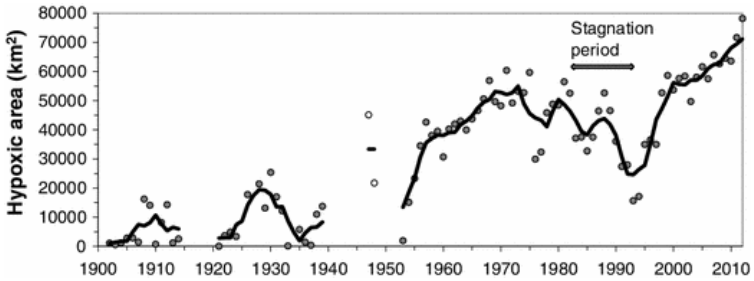
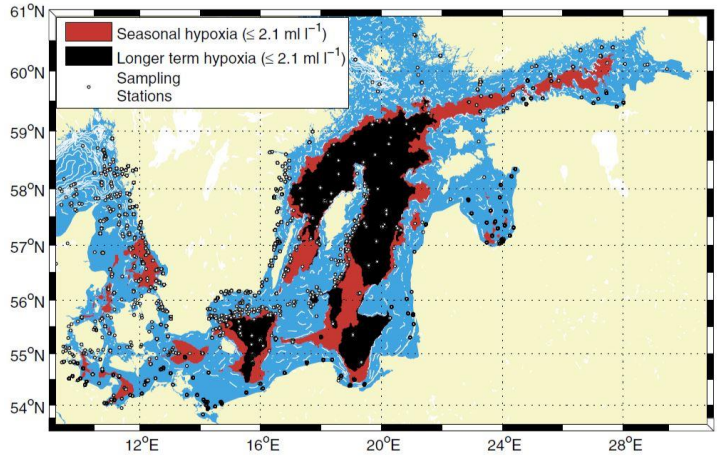
Low oxygen restricts cod reproduction

Hypoxia

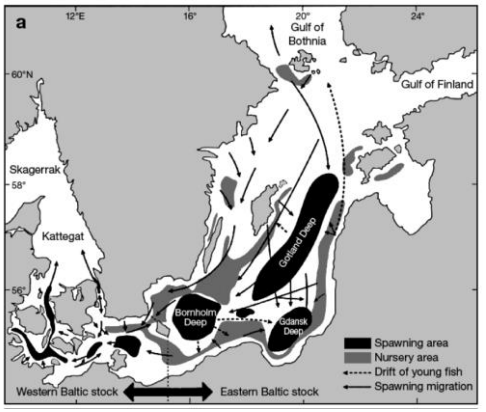


Carstensen et al., 2014

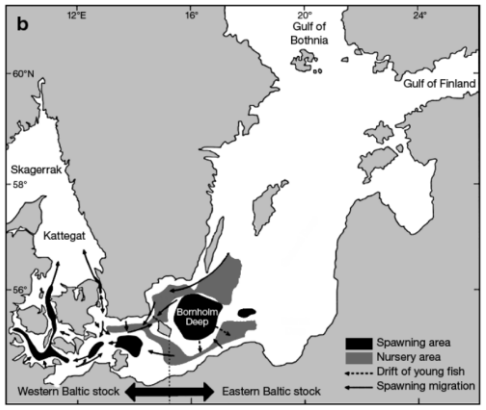


HELCOM Report 115B

Cod spawning areas



Until 1980s



Present

Cardinale and Svedäng, 2011

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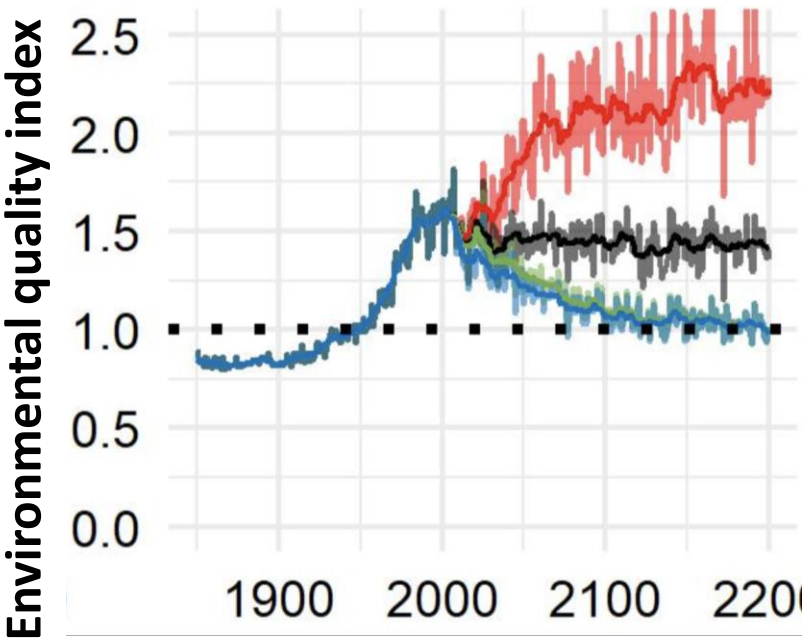
Future eutrophication status?

Management goal by riparian countries: Baltic Sea unaffected by eutrophication -> HELCOM Baltic Sea Action Plan



Murray et al. 2018

Load increase (unlikely)

Current loads

Baltic Sea Action plan, nutrient loads/status ~ as 1950s

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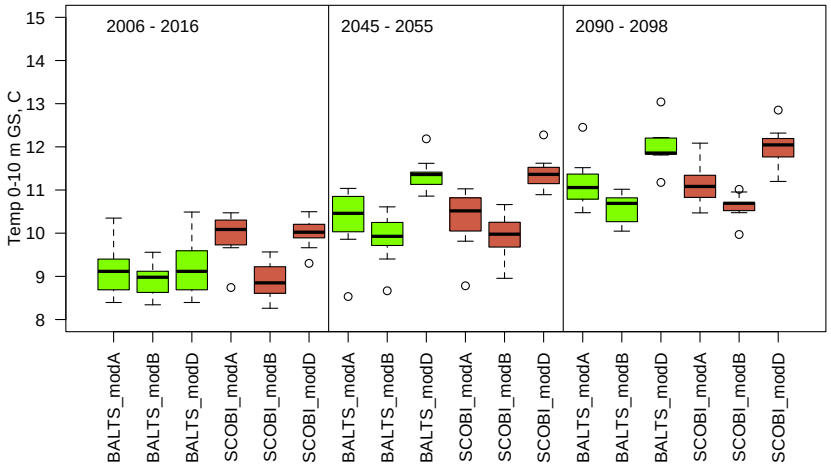
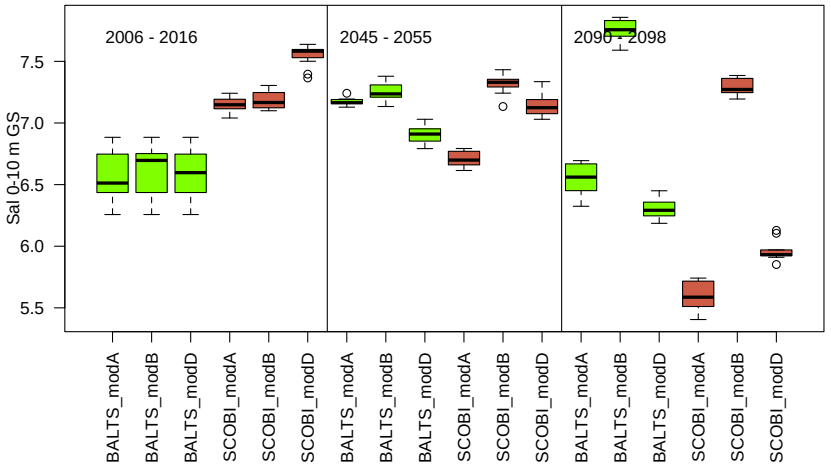
Uncertainty: RCP 8.5 example

Temperature



Salinity



Model spread is larger for salinity than for temperature
Uncertainty increases towards the end of the century

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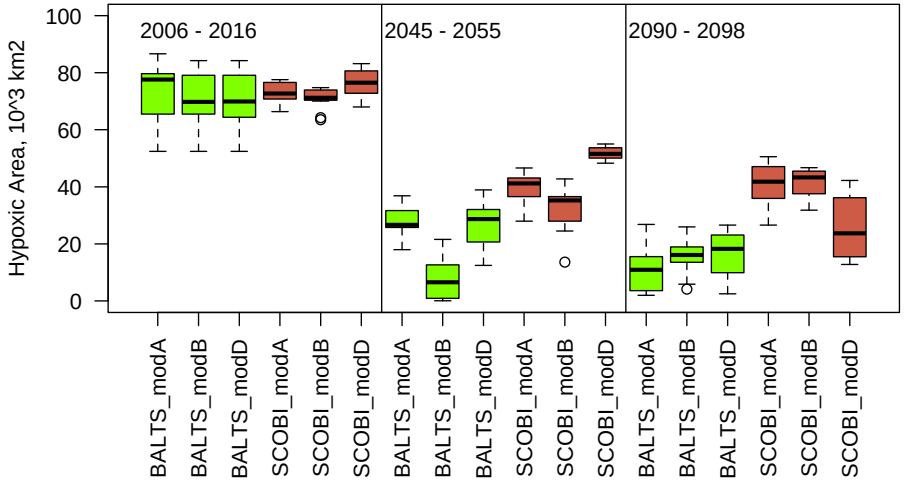
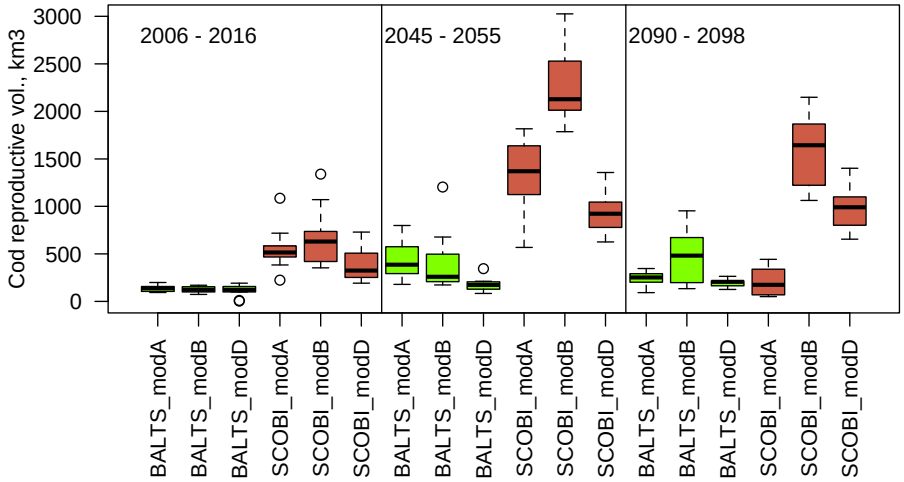
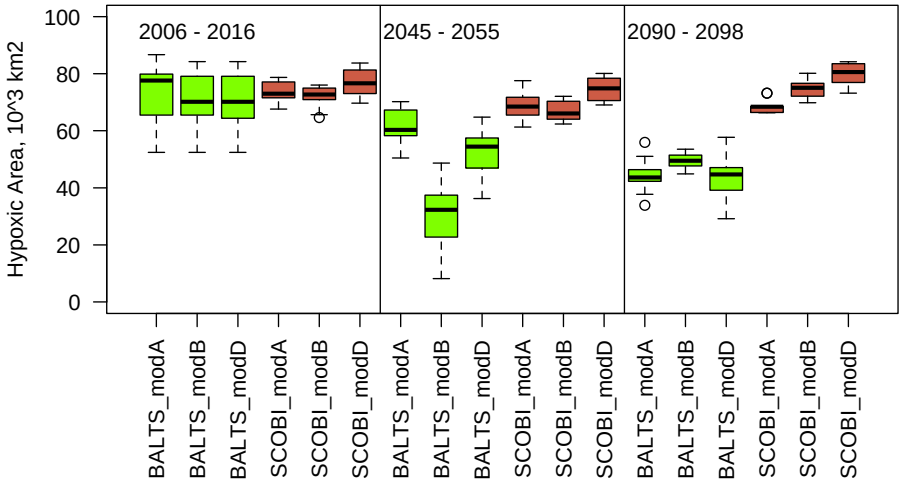
RCP 8.5 example: Hypoxia and cod reproduction

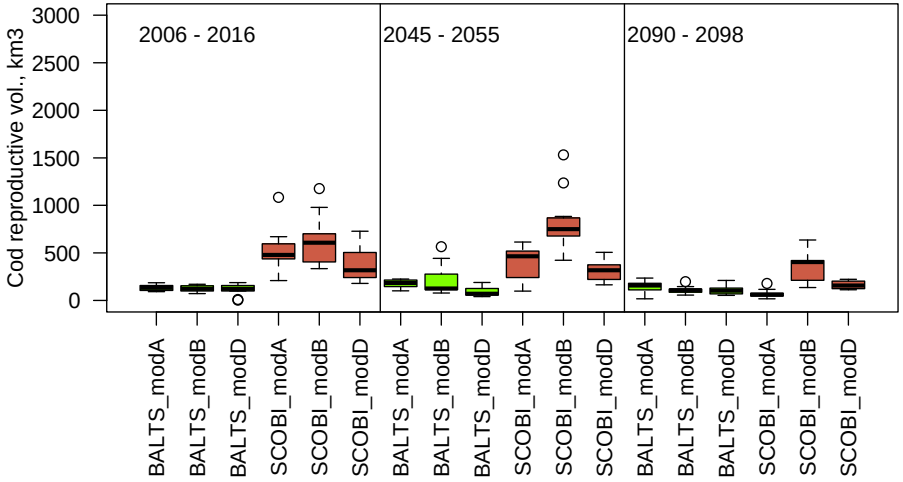
BSAP





Current loads





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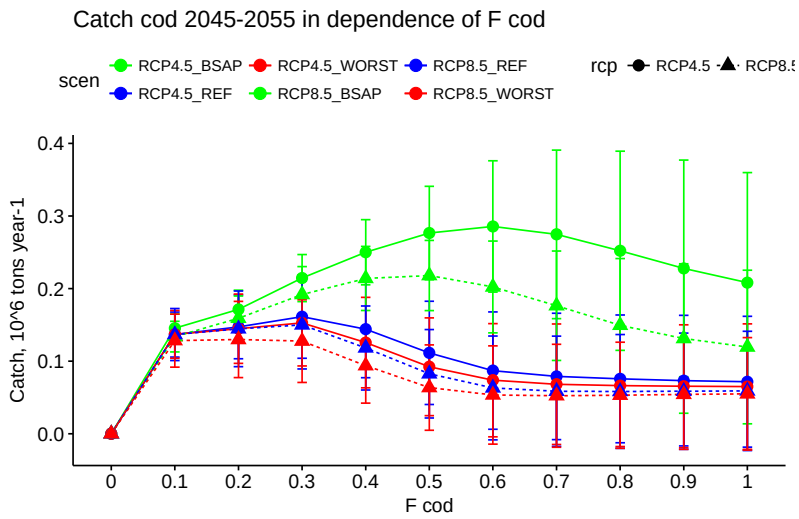
Predicted mid-term future catches

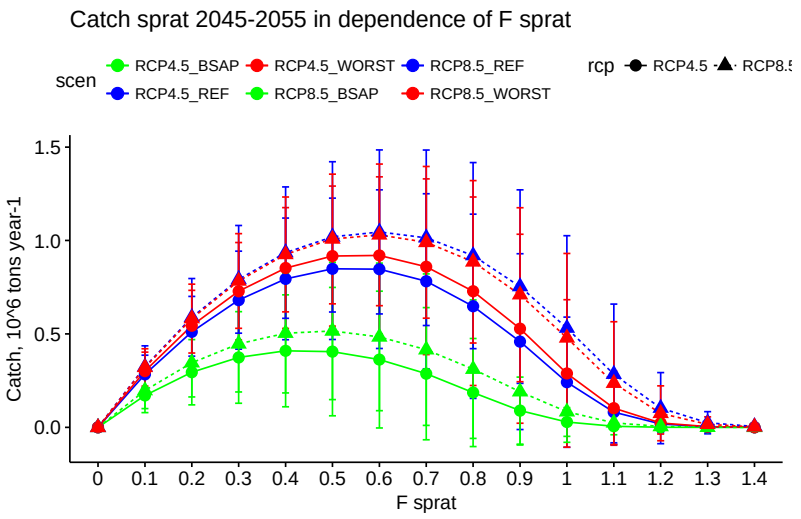
GCM modA, RCO-SCOBI, Central Baltic EwE

Bauer et al. 2019, 2020

Cod catch ~ 2050



Sprat catch ~ 2050



- Differences between load scenarios are larger than differences between climate scenarios
- Cod recovery with BSAP implementation

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Baltic case study summary

- Future nutrient load management
  - has larger impact than climate change, at least until mid century
- Cod recovery
  - only in nutrient load reduction scenarios
  - drives ecosystem and fish stock changes
  - drives spatial dynamics of pelagic stocks
  - uncertain salinity dynamics
- Pelagic stocks (sprat)
  - Benefit from warming
  - Uncertain future primary production
- Uncertainty
  - increases towards end of century

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Join us on the adaption journey!

www.ClimeFish.eu

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