

# Baltic Sea pelagic and demersal fisheries

.... between climate change and  
eutrophication management ....

Bärbel Müller-Karulis, Maciej T. Tomczak  
Stockholm University

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This project has received funding from the European Union's Horizon 2020 research and innovation action under grant agreement no. 677039



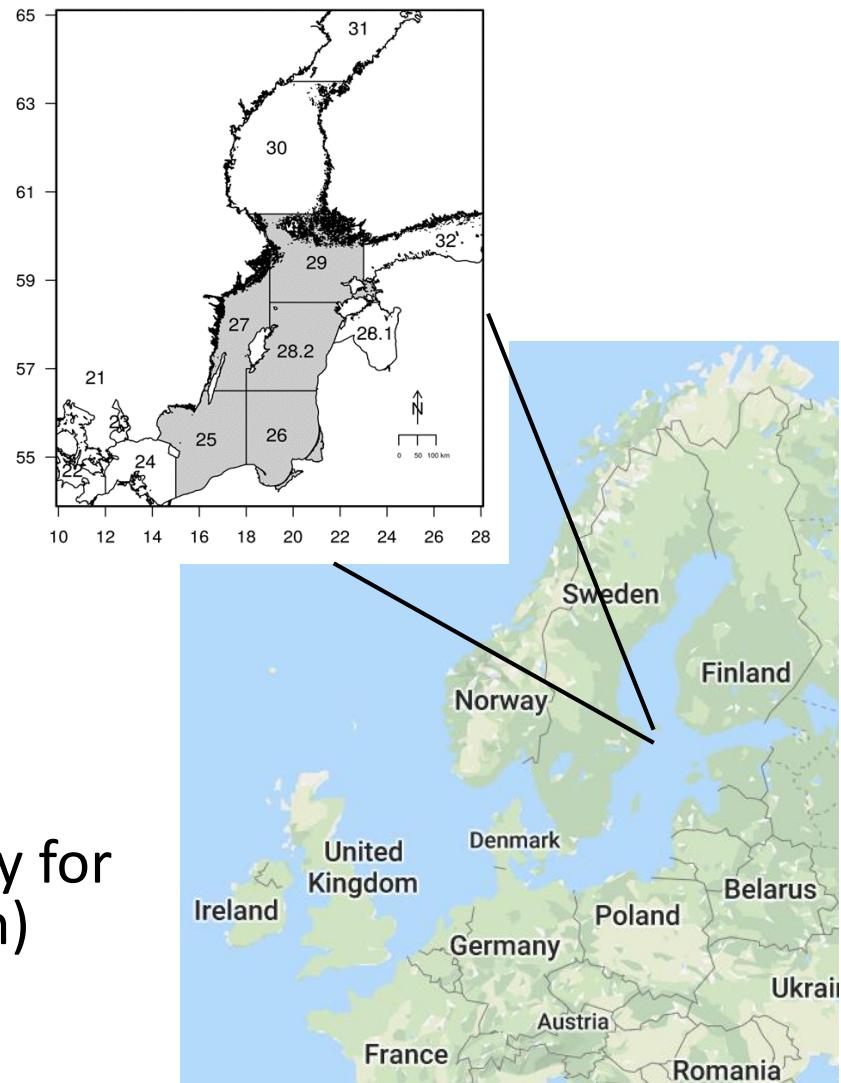
# Central Baltic Sea

## Main commercial fish stocks

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

## Main commercial fisheries

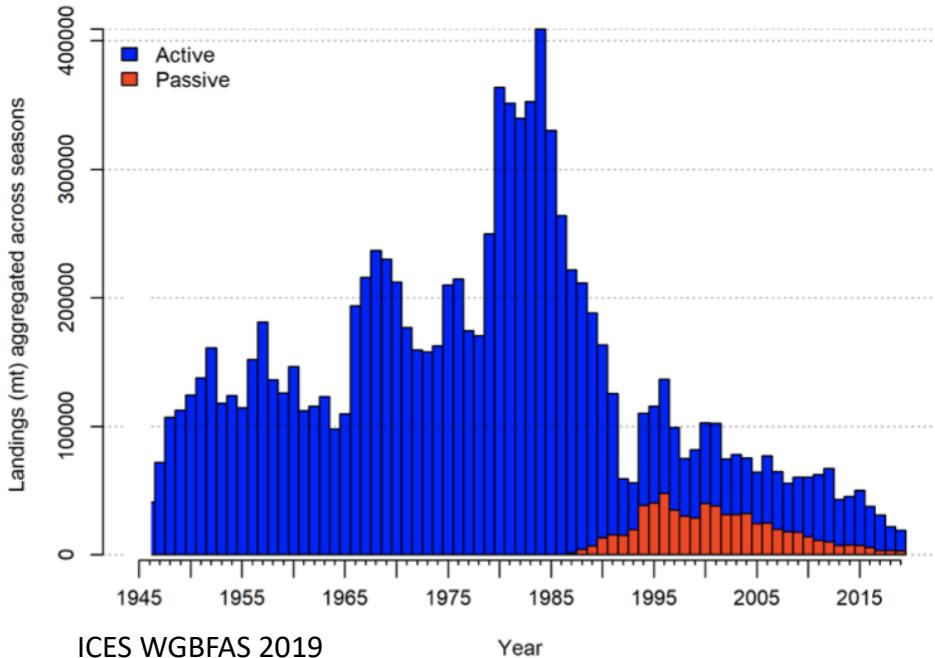
- Pelagic trawl fishery for sprat and herring (fishmeal production)
- Coastal gillnet/trapnet fishery for herring (human consumption)
- Trawl fishery for cod



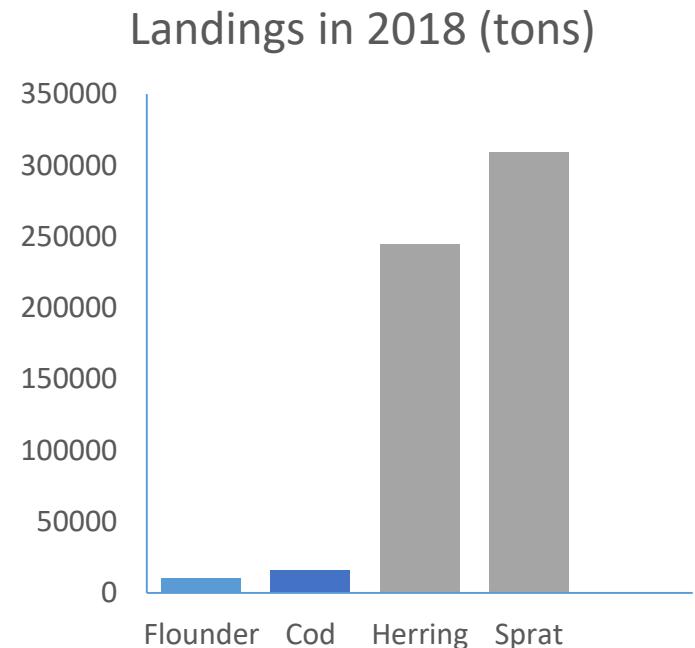
# Fisheries status

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

Historical cod landings in the Central Baltic



Current landings, all species



ICES WGBFAS 2019

Year

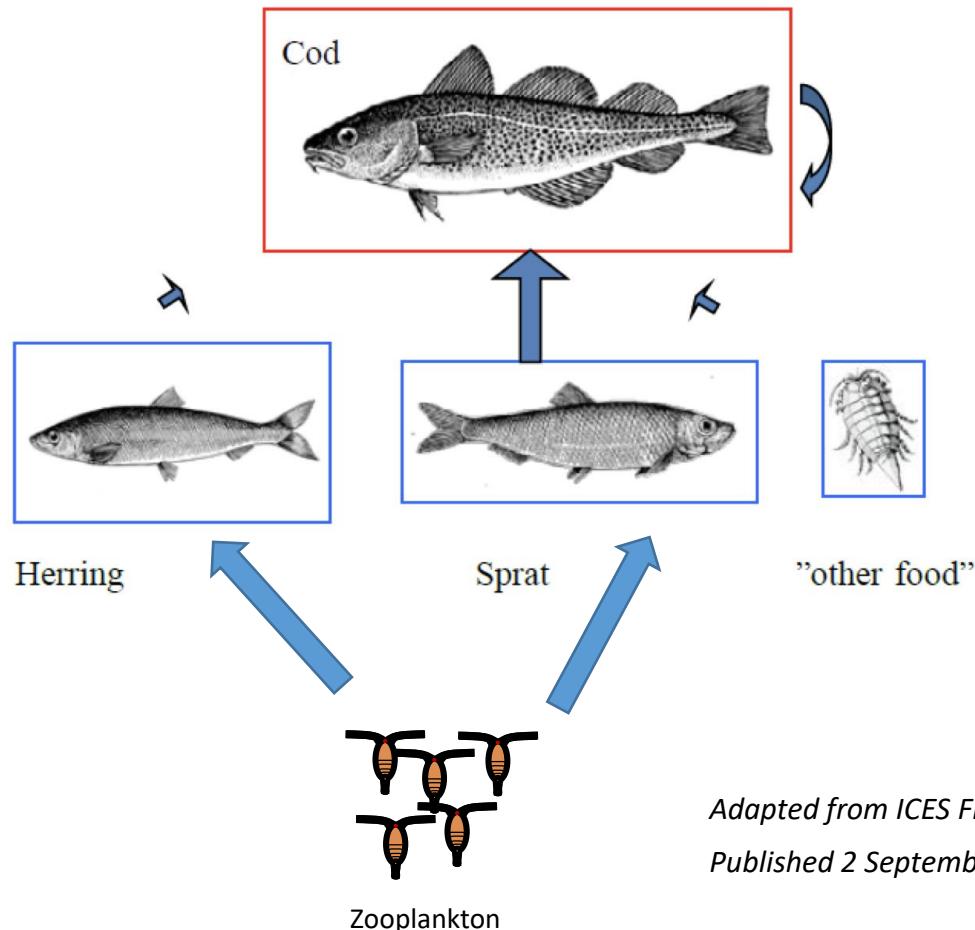


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# Central Baltic foodweb

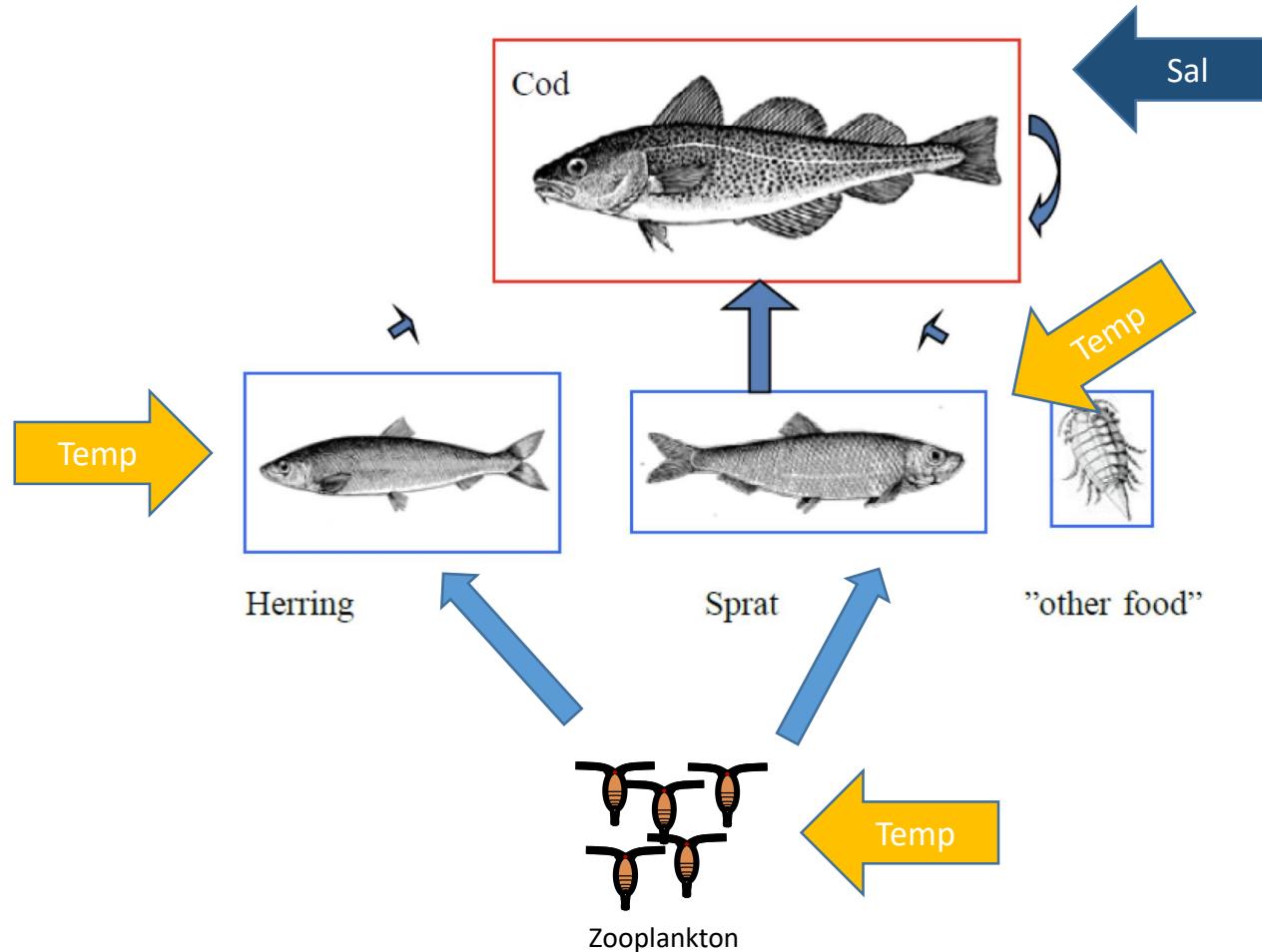


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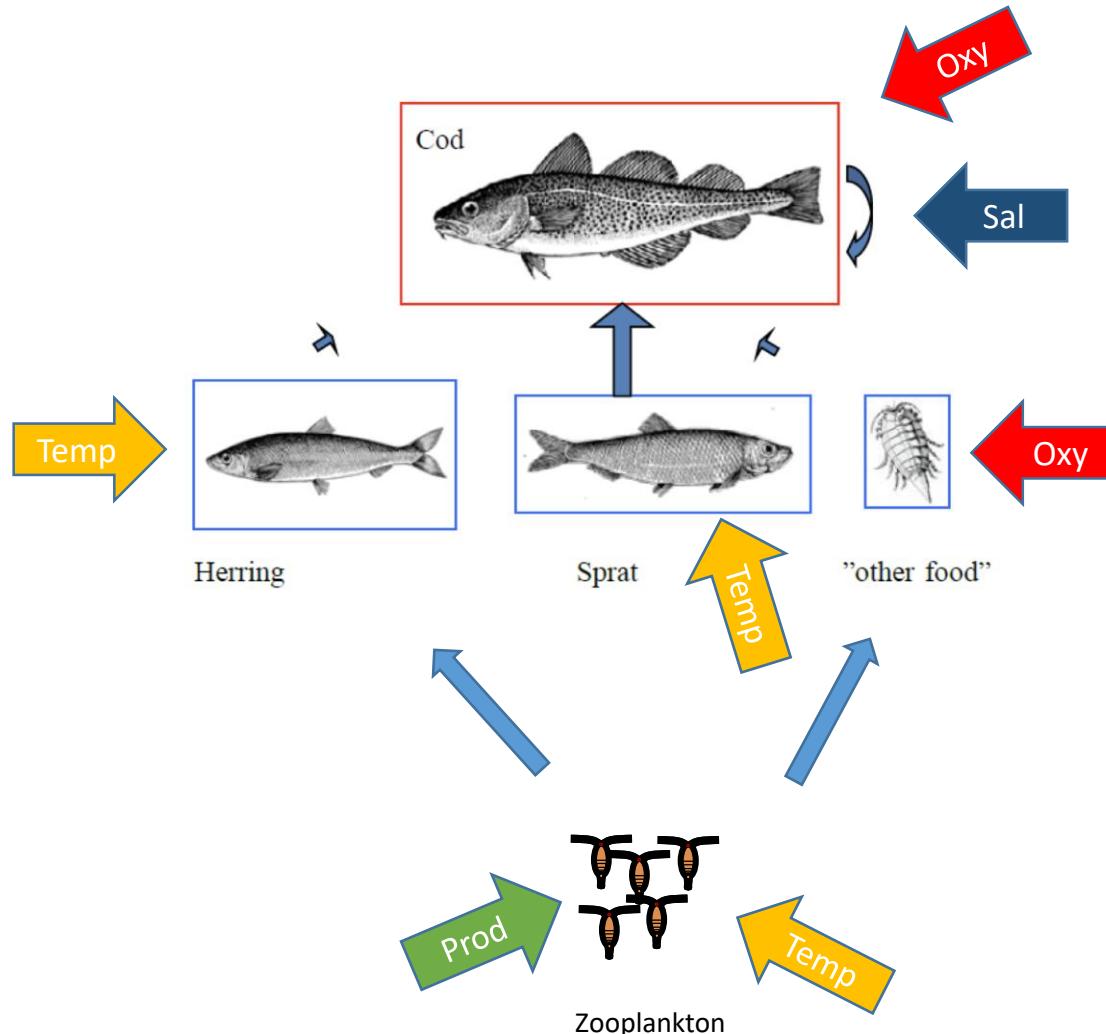
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# Potential climate impacts



# Climate + eutrophication



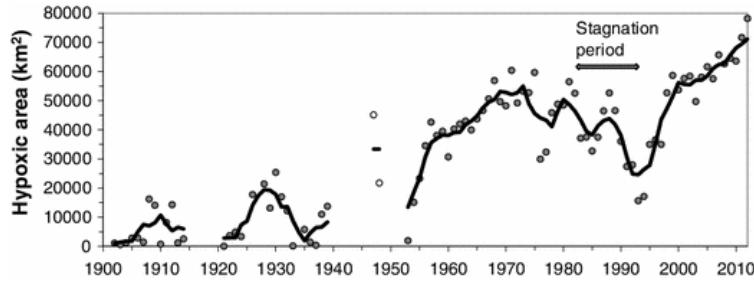
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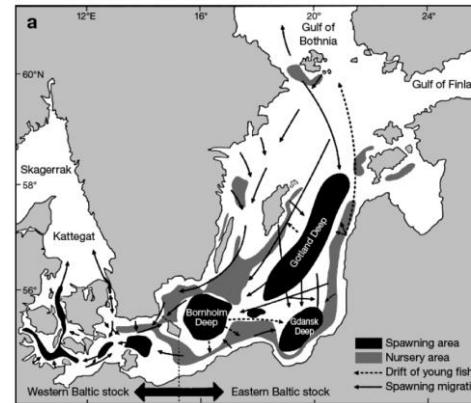
# Low oxygen restricts cod reproduction

## Hypoxia

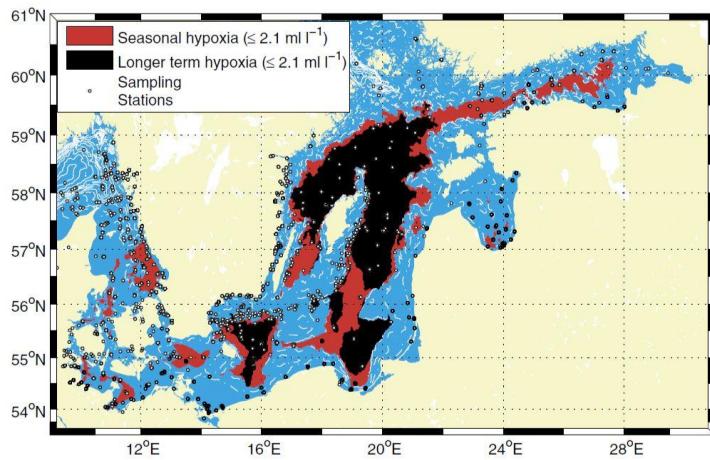


Carstensen et al., 2014

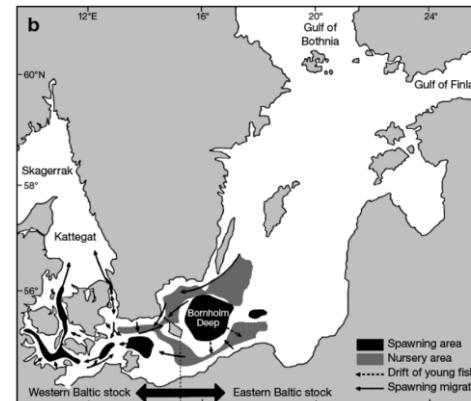
## Cod spawning areas



Until 1980s



HELCOM Report 115B



Present

Cardinale and Svedäng, 2011



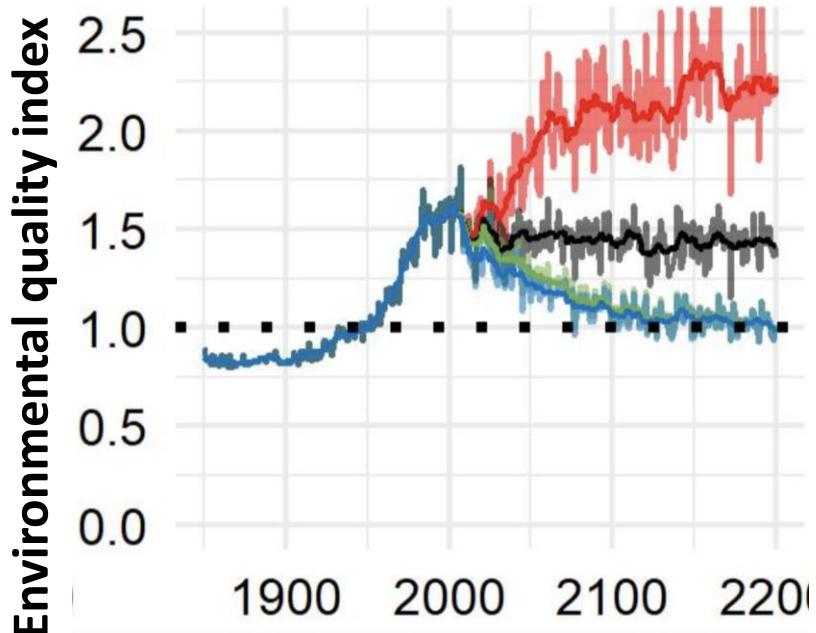
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# Future eutrophication status?

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

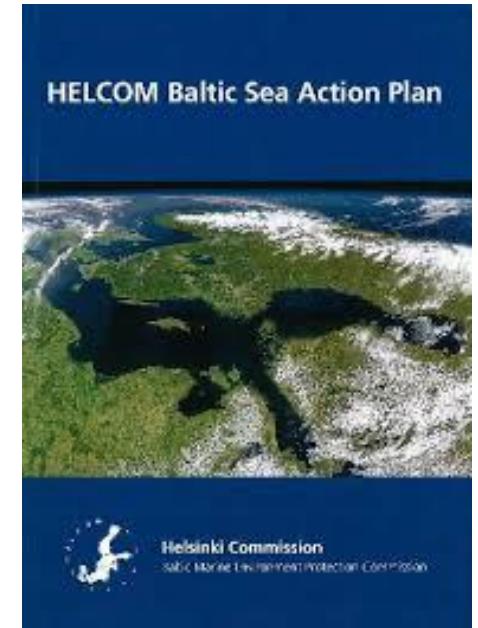


Murray et al. 2018

Load increase  
(unlikely)

Current loads

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

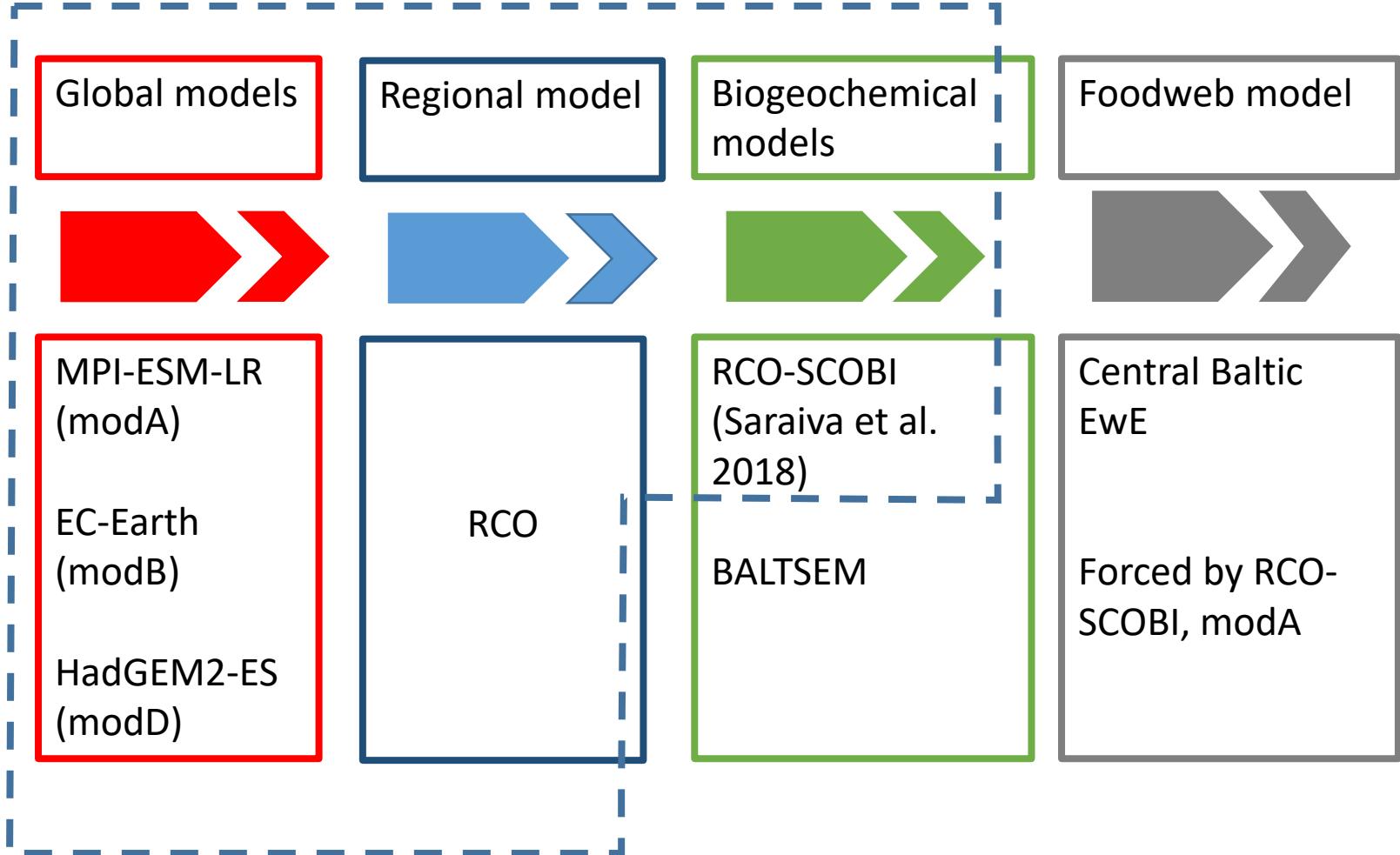


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# Uncertainty in predictions



BONUS BalticAPP (SMHI, Saraiva et al. 2018)

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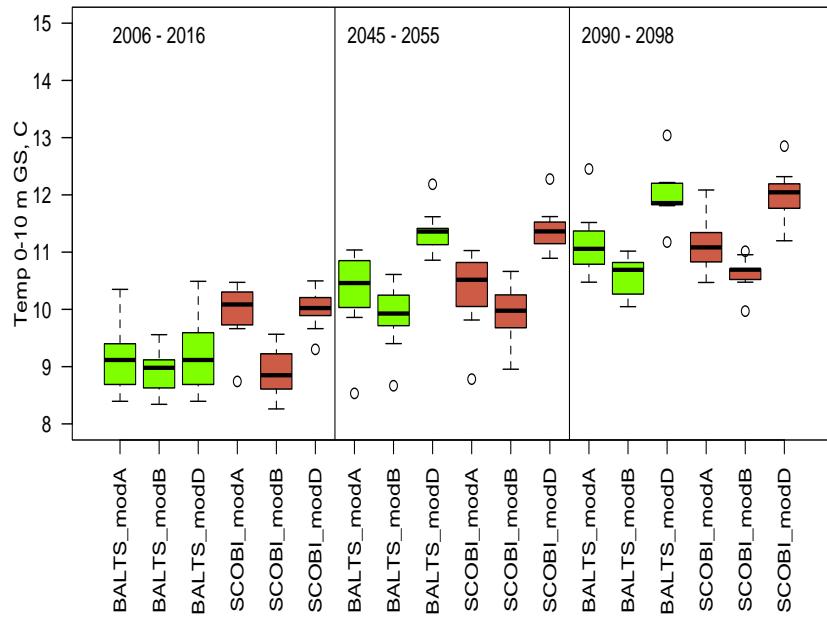


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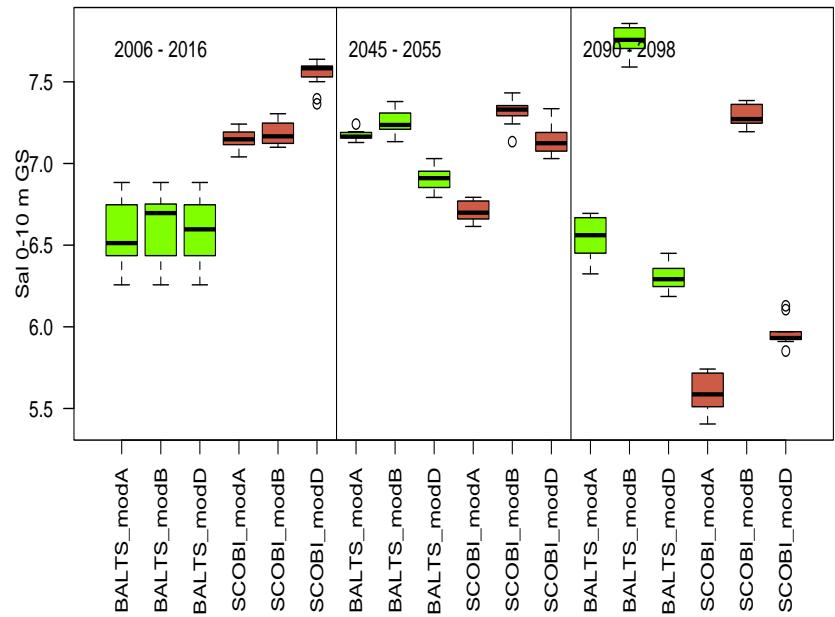


# Uncertainty: RCP 8.5 example

## Temperature



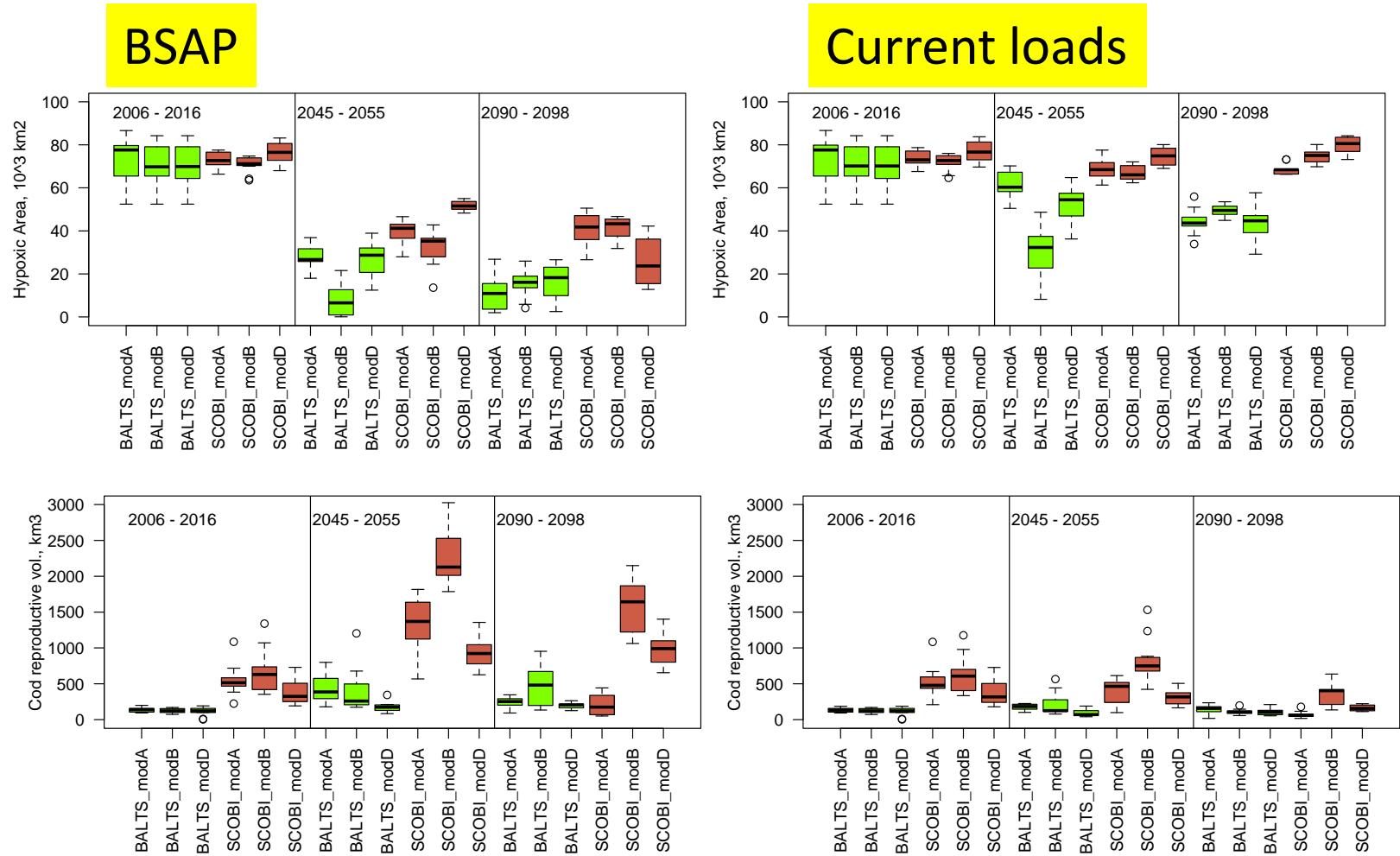
## Salinity



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

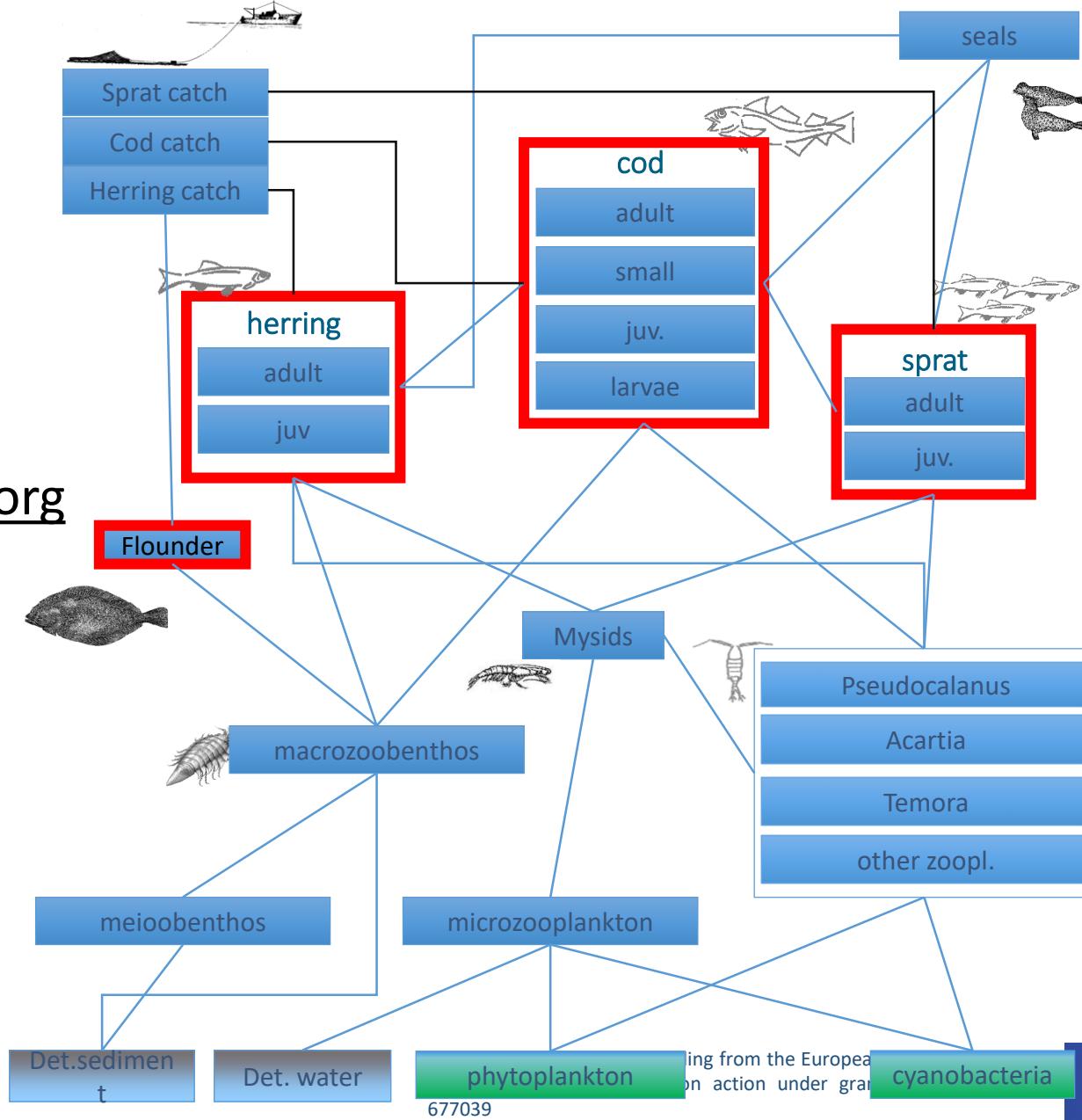


# RCP 8.5 example: Hypoxia and cod reproduction



# Ecopath based foodweb modelling approach

[www.ecopath.org](http://www.ecopath.org)



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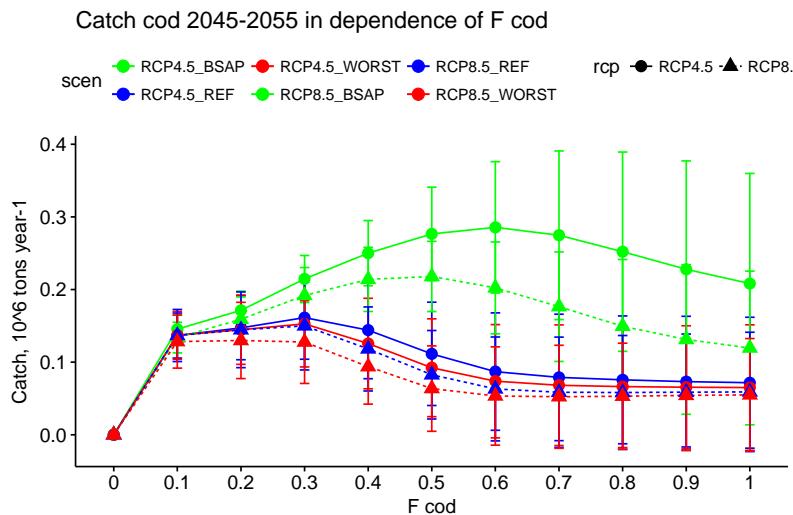
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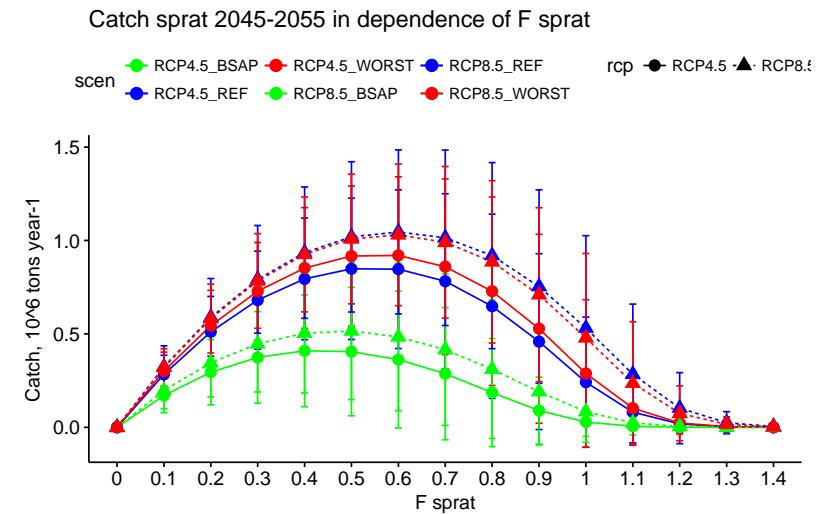
# Predicted mid-term future catches

GCM modA, RCO-SCOBI, Central Baltic EwE

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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# Major risks – driven by cod dynamics

- Collapse/failed recovery of Eastern Baltic cod
  - distant future salinities are highly uncertain
- Ecosystem reorganization
  - Anoxia driven loss of benthic components
  - Loss of top predator cod
  - Dominance of pelagic stocks (sprat and herring)
- Spatial reorganization
  - Cod reproduction focused in Southern part of the Central Baltic
  - Spatial separation between sprat and cod, in particular towards the end of the century
- Uncertain future ecosystem productivity



# Opportunities

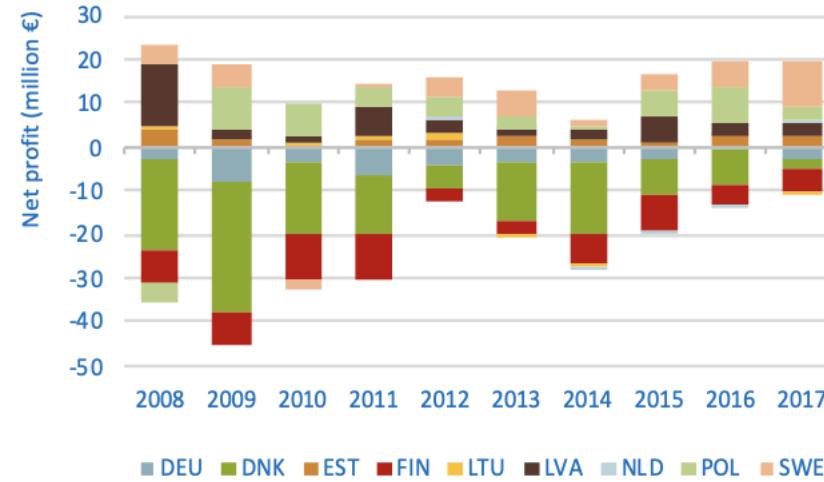
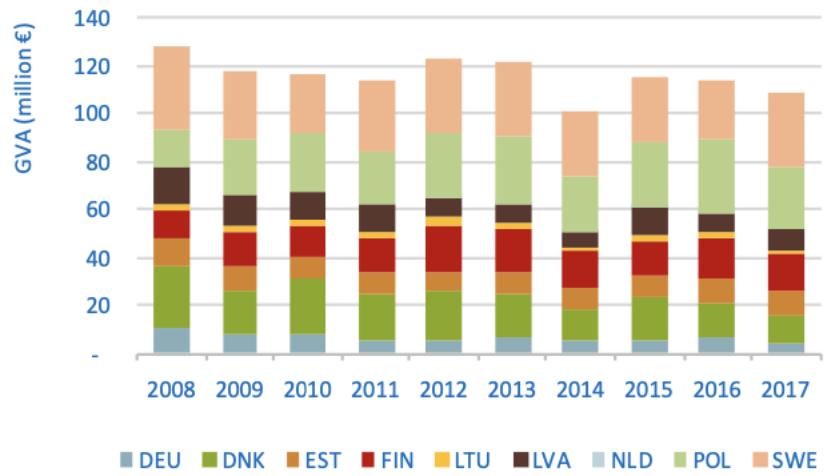
- Warming increases the productivity of pelagic stocks (sprat and herring)



# 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
- Uncertainty
  - increases towards end of century





Scientific, Technical and Economic Committee for Fisheries (STECF): The 2019 Annual Economic Report on the EU Fishing Fleet (STECF 19-06) [



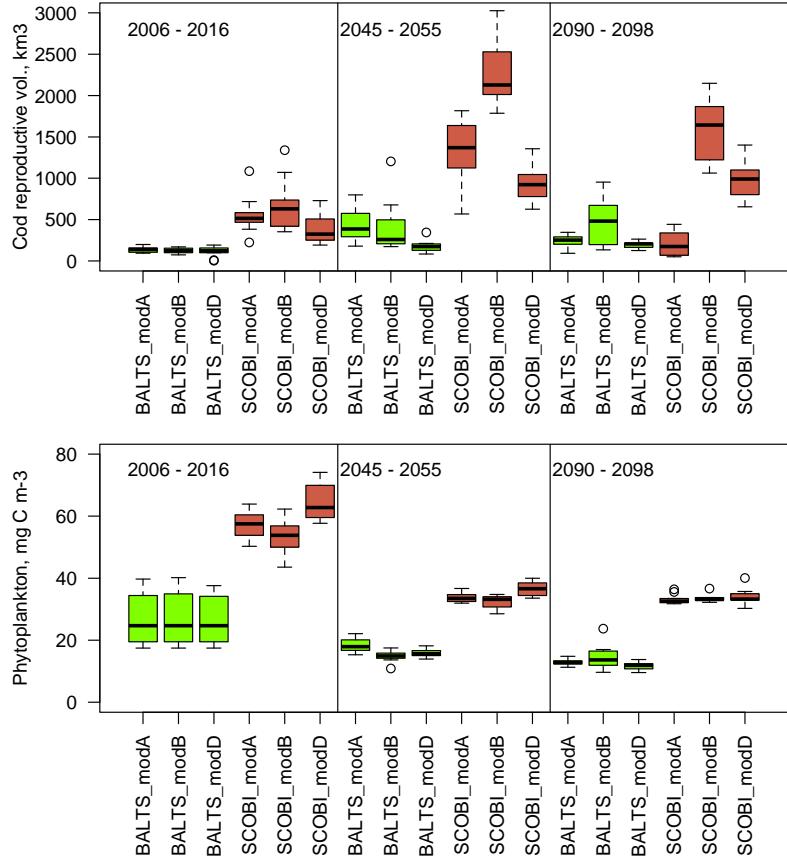
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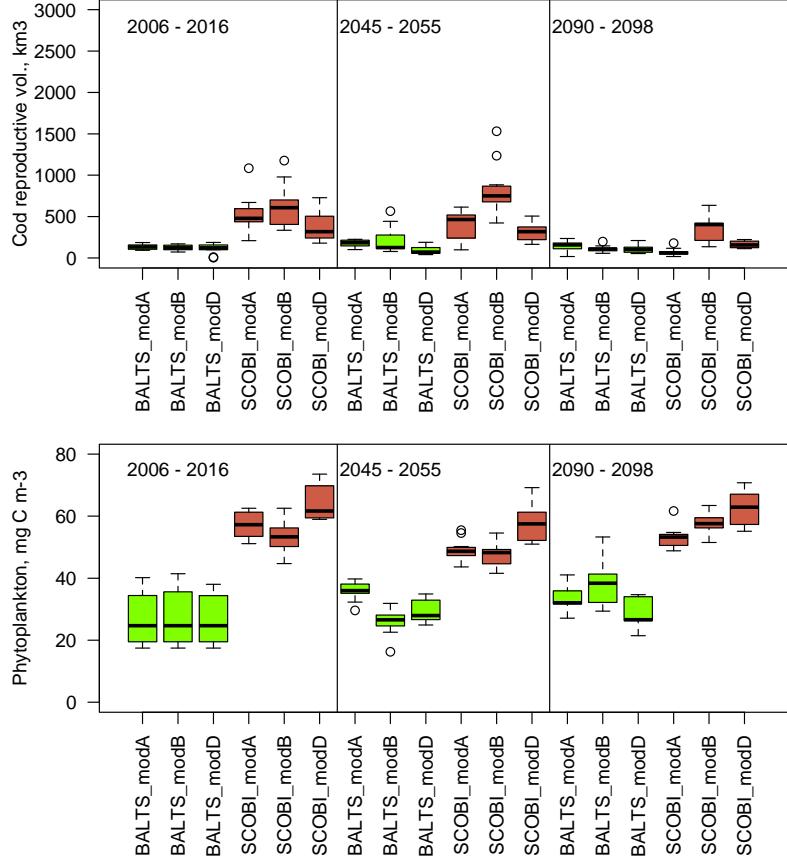


# RCP8.5 example

BSAP



Current loads



Model spread is larger for salinity than for temperature  
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