BLUE MISSION BANOS

1st MISSION ARENA
14-16 November 2023 | Gothenburg, SE

Basin-scale modeling of ecosystem services and impacts by suspended mussel culture

Marie Maar, Aarhus University, Ecoscience

THEME: **Blue biomass production in the region**

#MissionArenaBANOS1

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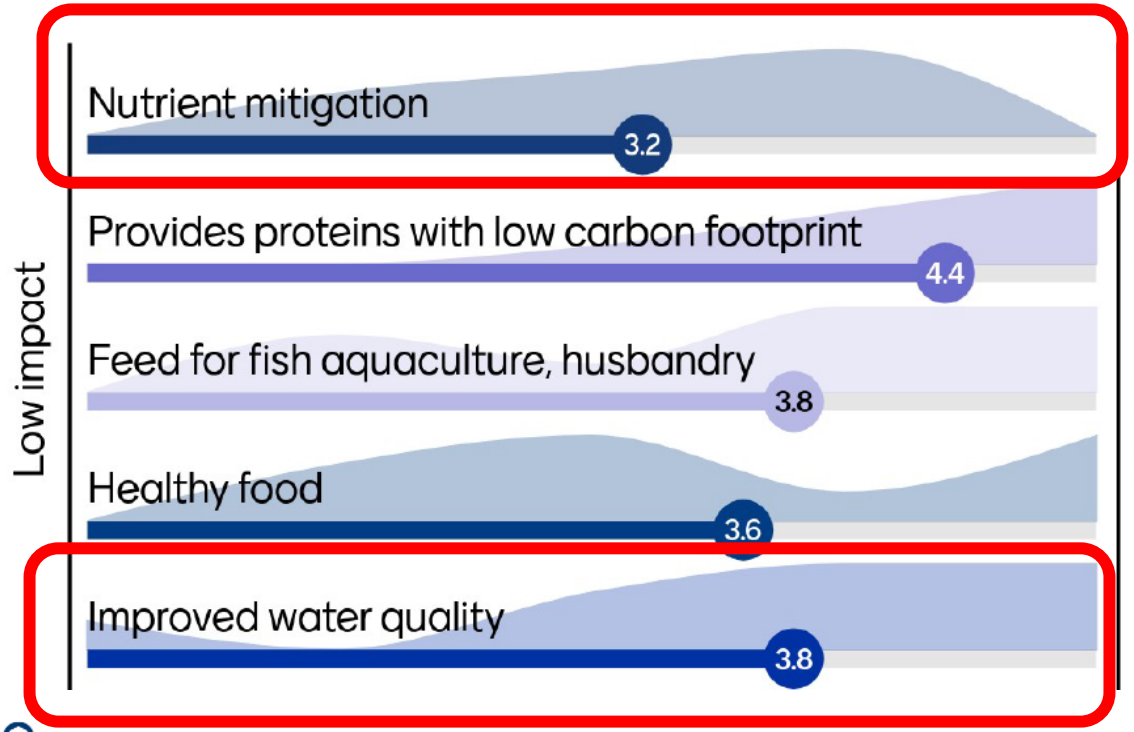
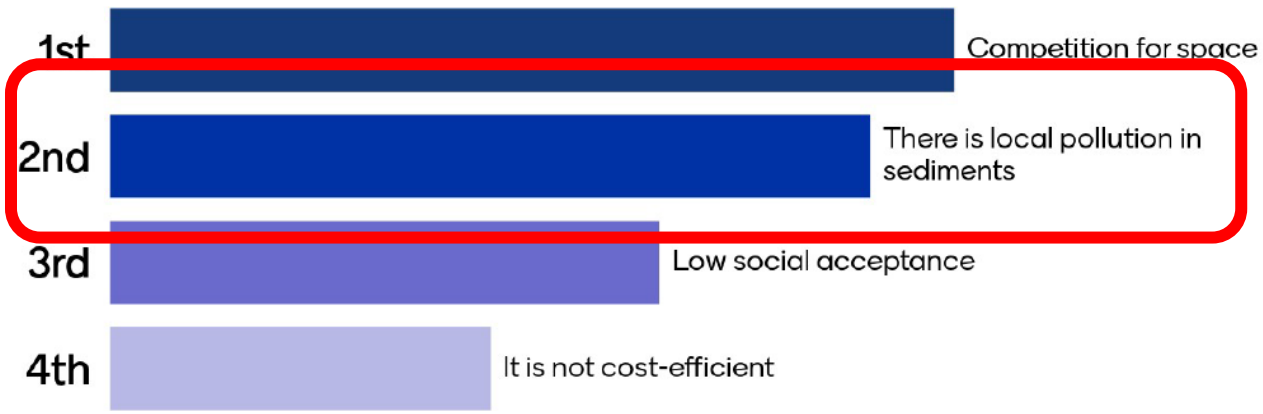
Stakeholder survey on mussel farming

1) What are the main benefits of mussel cultures?



2) What are the trade-offs?



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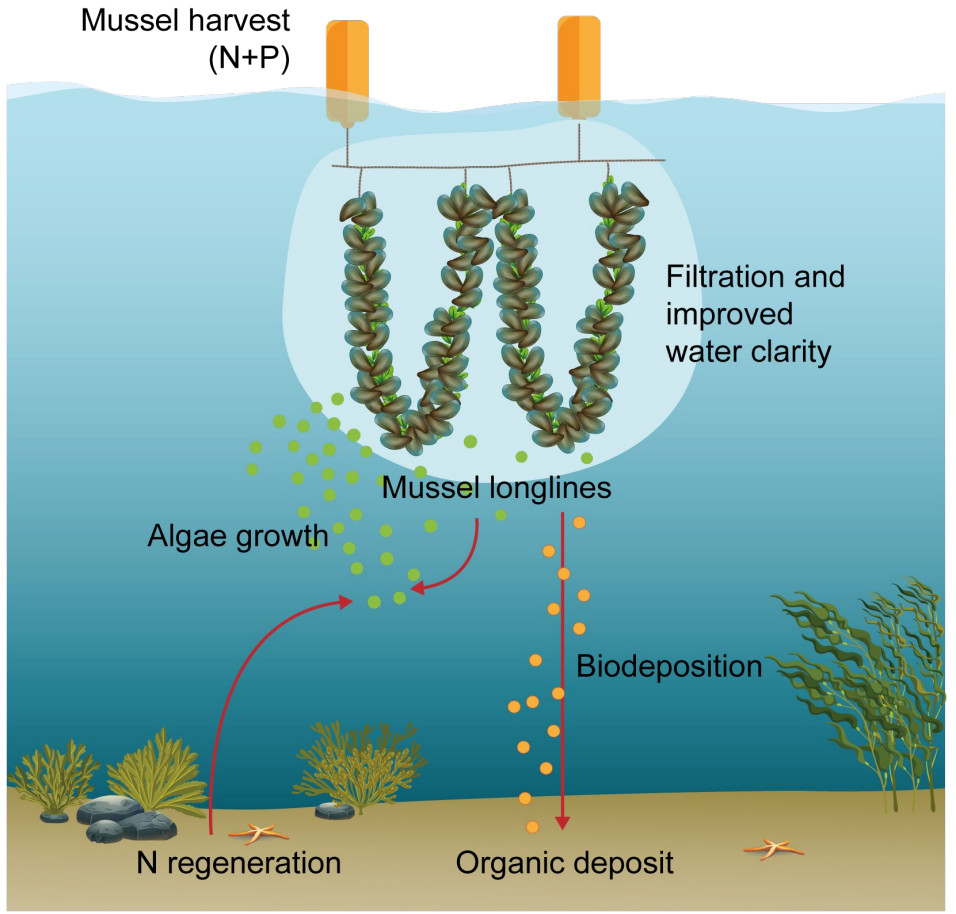
Effects of suspended mussel culture

Services:

- Nutrient extraction
- Higher water clarity
- Lower Chl a concentrations
- Lower sedimentation on basin scale

Impacts:

- Biodeposition below farms
- Oxygen consumption
- Nutrient regeneration in sediment
- Nutrient excretion from mussels
- Carrying capacity



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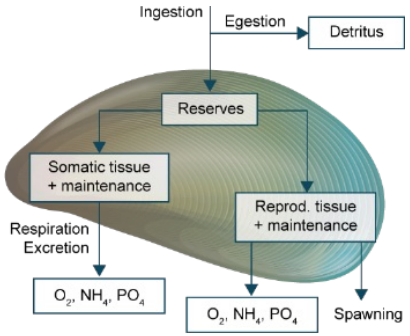
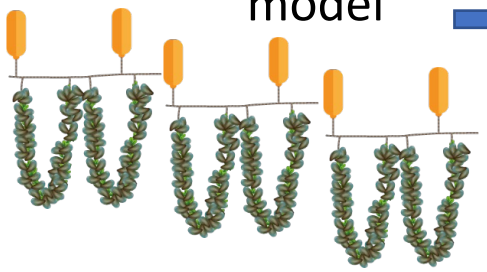
Basin-scale modeling

Temperature
Salinity
Food

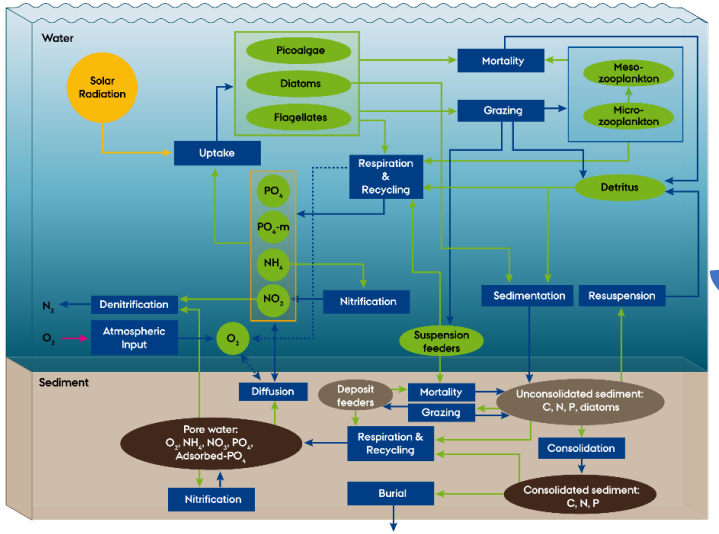


Mussel growth model

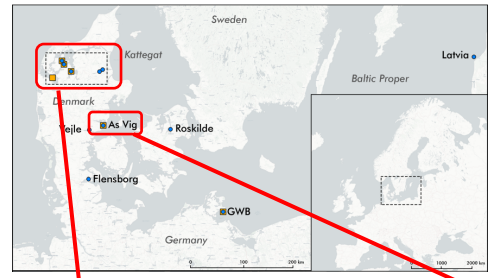
Mussel farm model

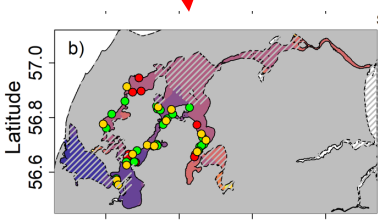


3D ecosystem model

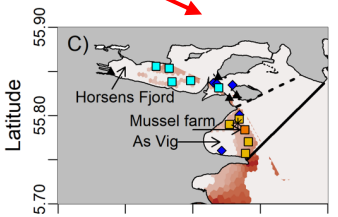


Scenarios with mussel culture





Limfjorden



Horsens Fjord

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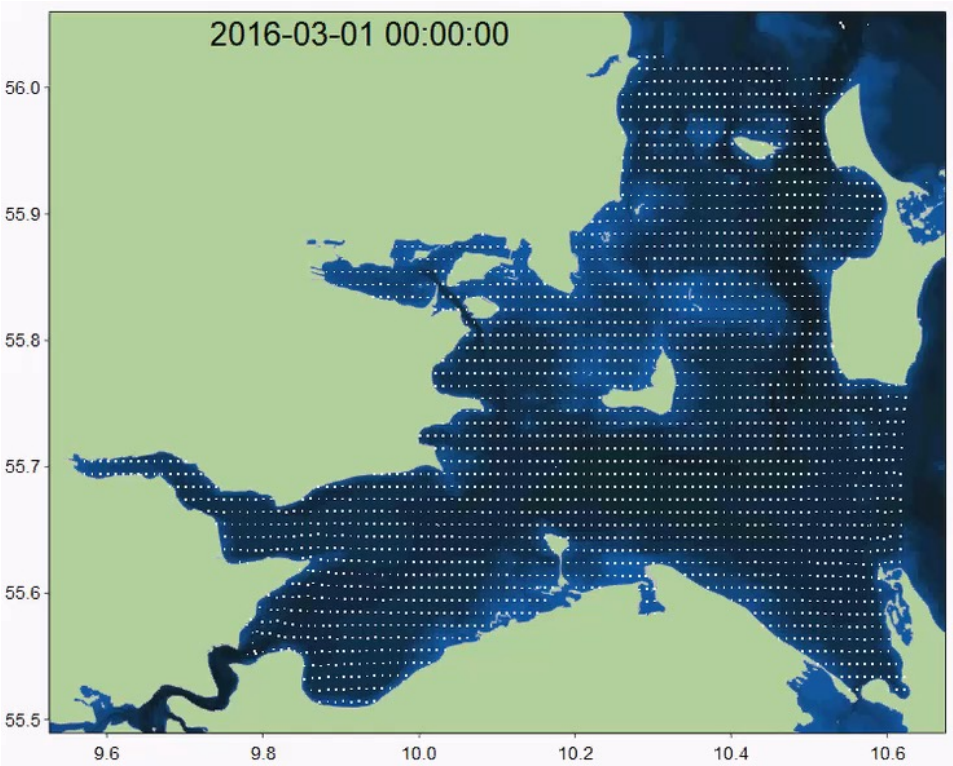
Model animations

Limfjorden
Summer algae biomass (Chl a)

Horsens Fjord
Particle spreading by currents



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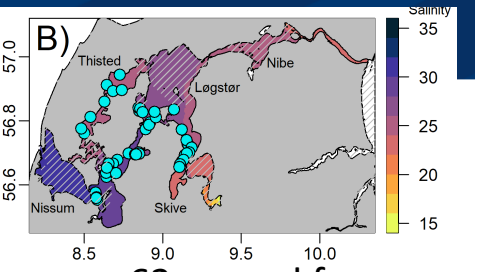
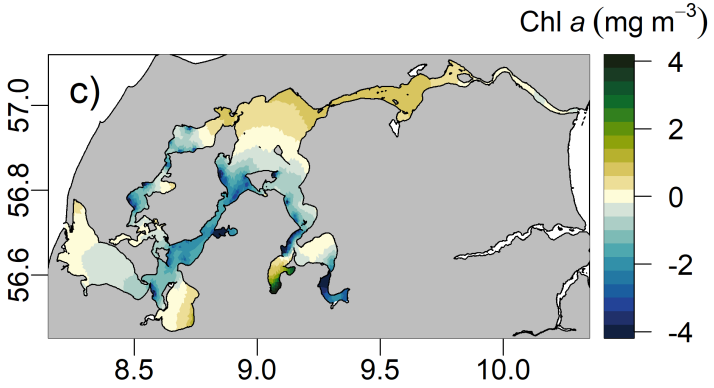
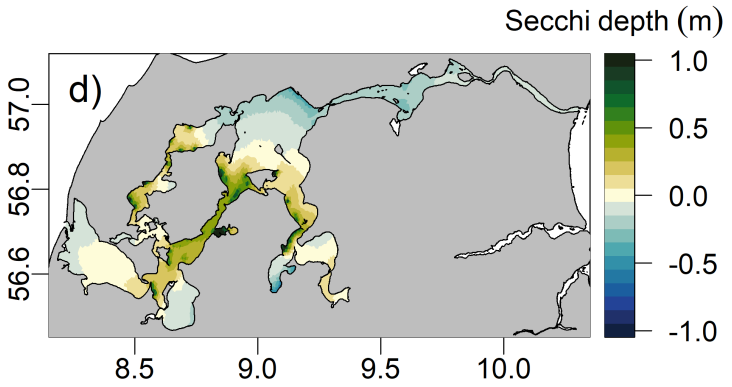
Mussel farming in the Limfjorden



= 62 mussel farms

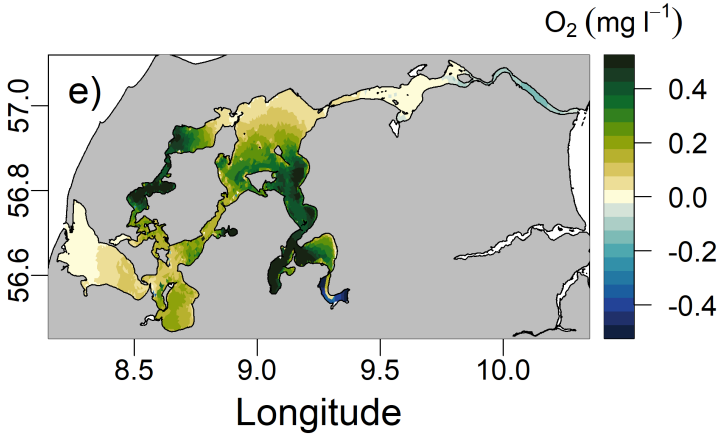
Lower Chl a

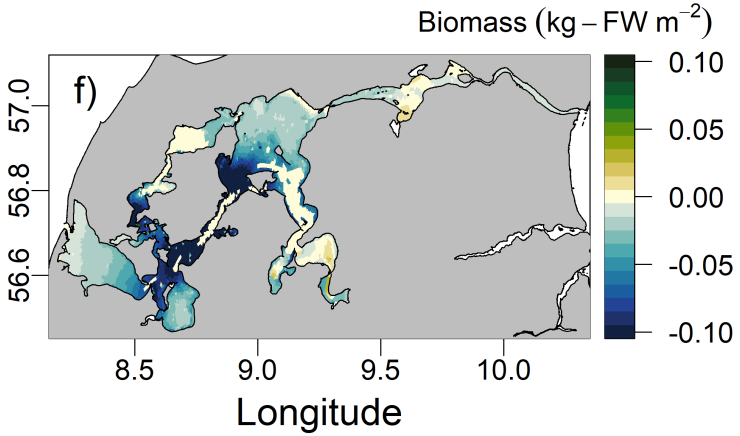




Higher water clarity

Higher oxygen





Lower benthic biomass

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Maar et al. 2023.

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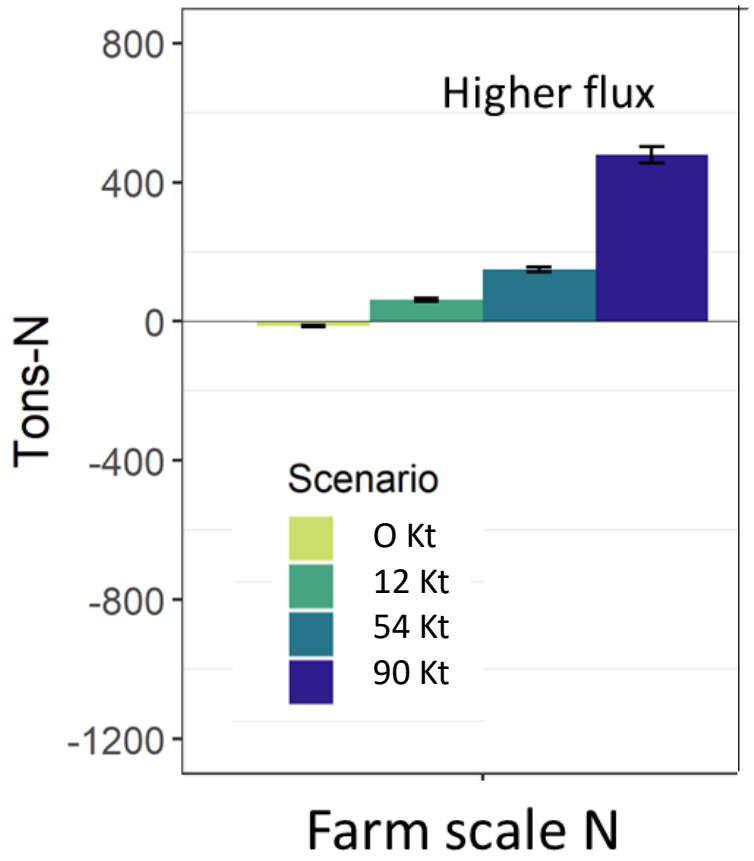
Reduction of nitrogen release on basin scale



Changes are relative to Reference scenario of 4 Kt-FW

Maar et al. 2023. IGR Biogeosci

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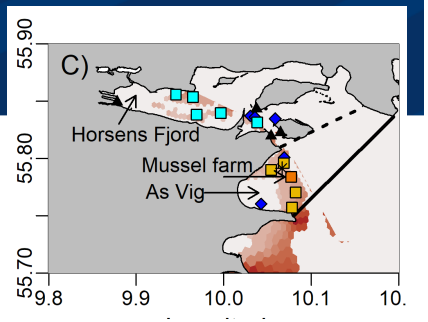
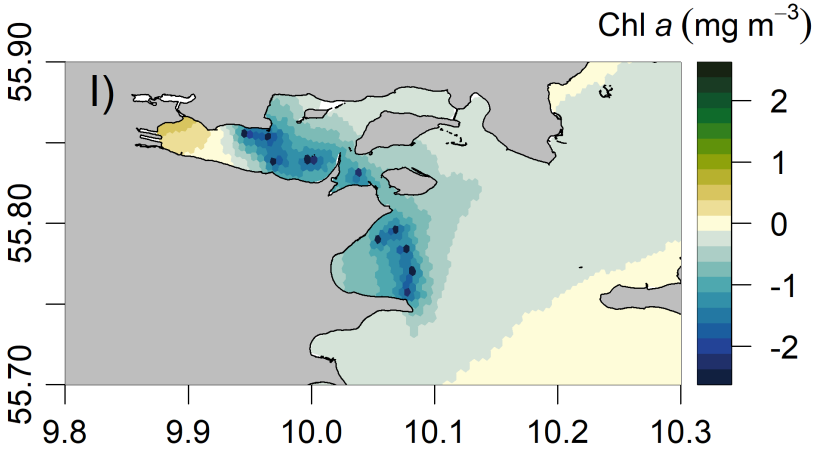
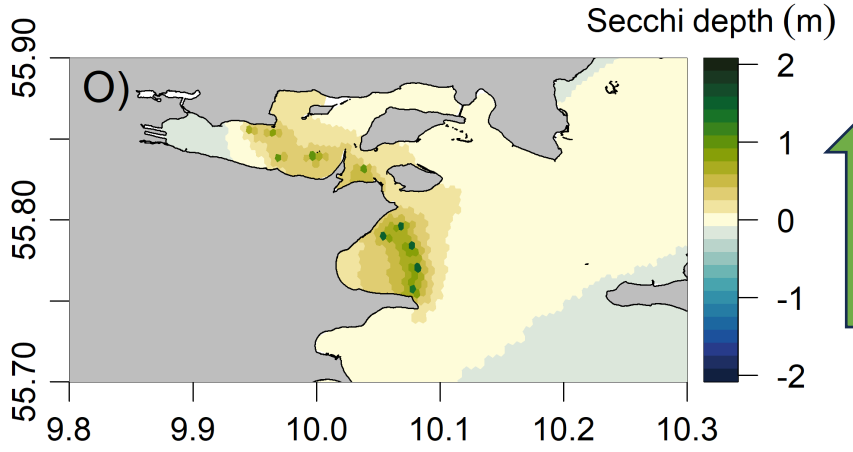
Mussel farming in Horsens Fjord



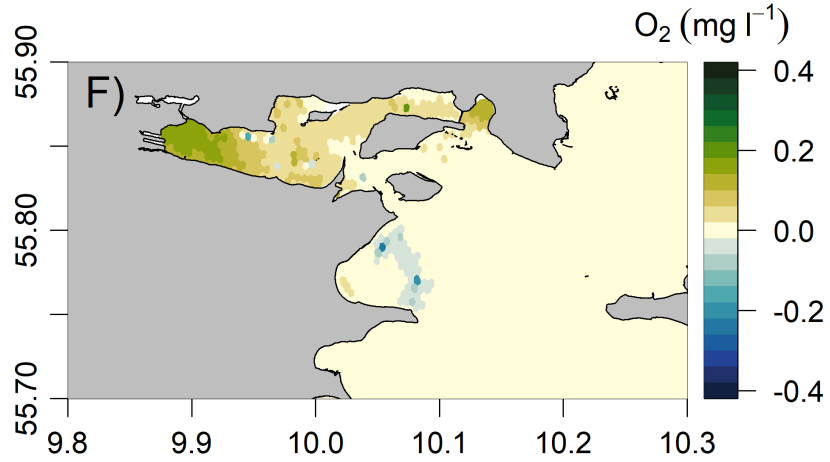
Lower Chl a

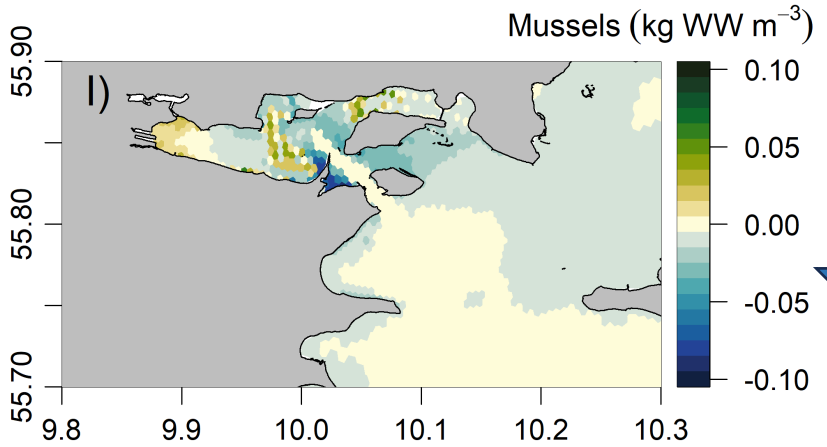




Higher water clarity

Higher oxygen





Lower benthic biomass

Maar et al. 2023. STOTEN.

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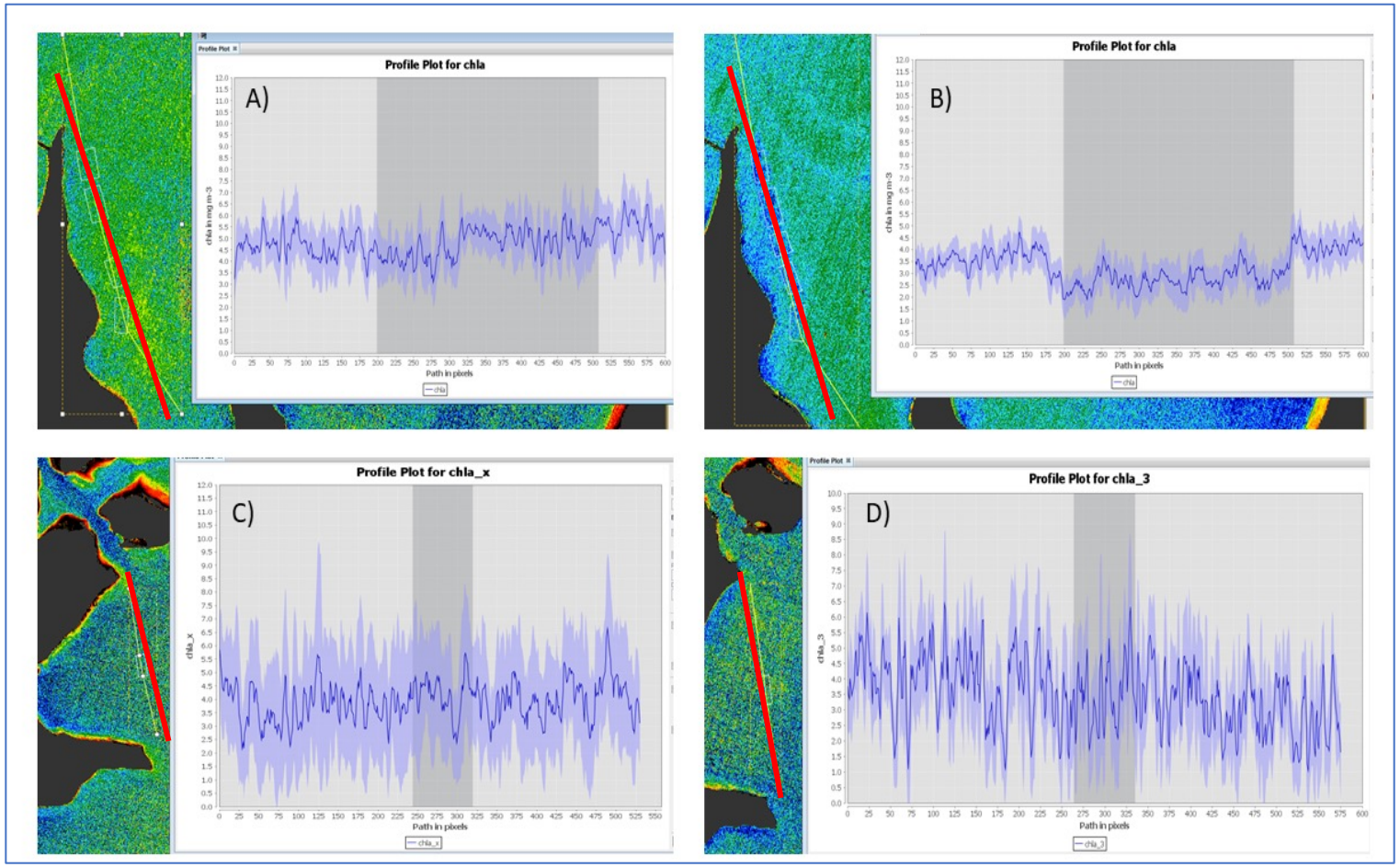
Remote sensing data confirms Chl a depletion

Before in 2017

With mussel farms

Limfjorden

Horsens Fjord



Maar et al. 2020

BONUS OPTIMUS

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Summary



- Mussel culture provides ecosystem services such as water clarity and lower Chl a concentrations
- Spatial redistribution
- The lower sedimentation on basin scale improves bottom oxygen and decrase nutrient release from sediment
- Nutrients are extracted from the systems
- Benthic mussels are decreasing <10%

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Future MARES
Nordisk ministerråd
OLAMUR
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