

Habitat-specific effects of fishing disturbance on benthic species richness in marine soft sediments

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Bottom trawl fishery

- Negative effects of trawling on benthic species richness
(field studies on small spatial scale)



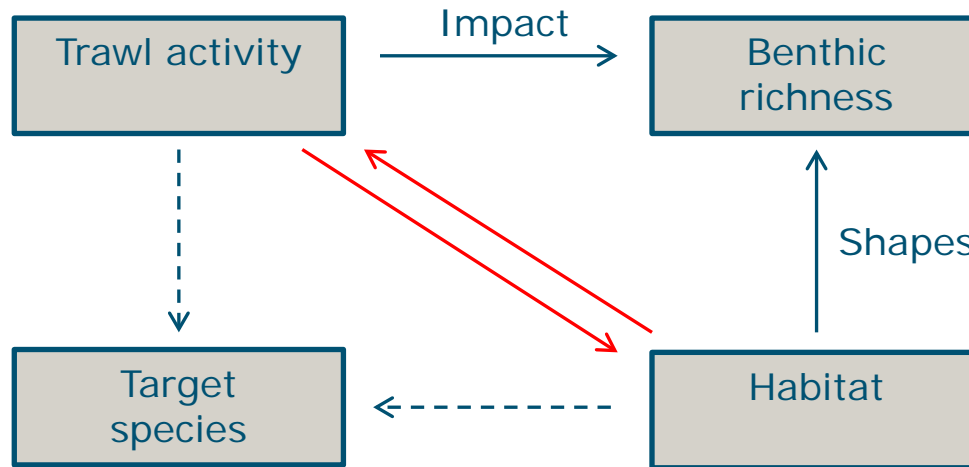
Floor Quirijns



Impacts at the scale of the fishery

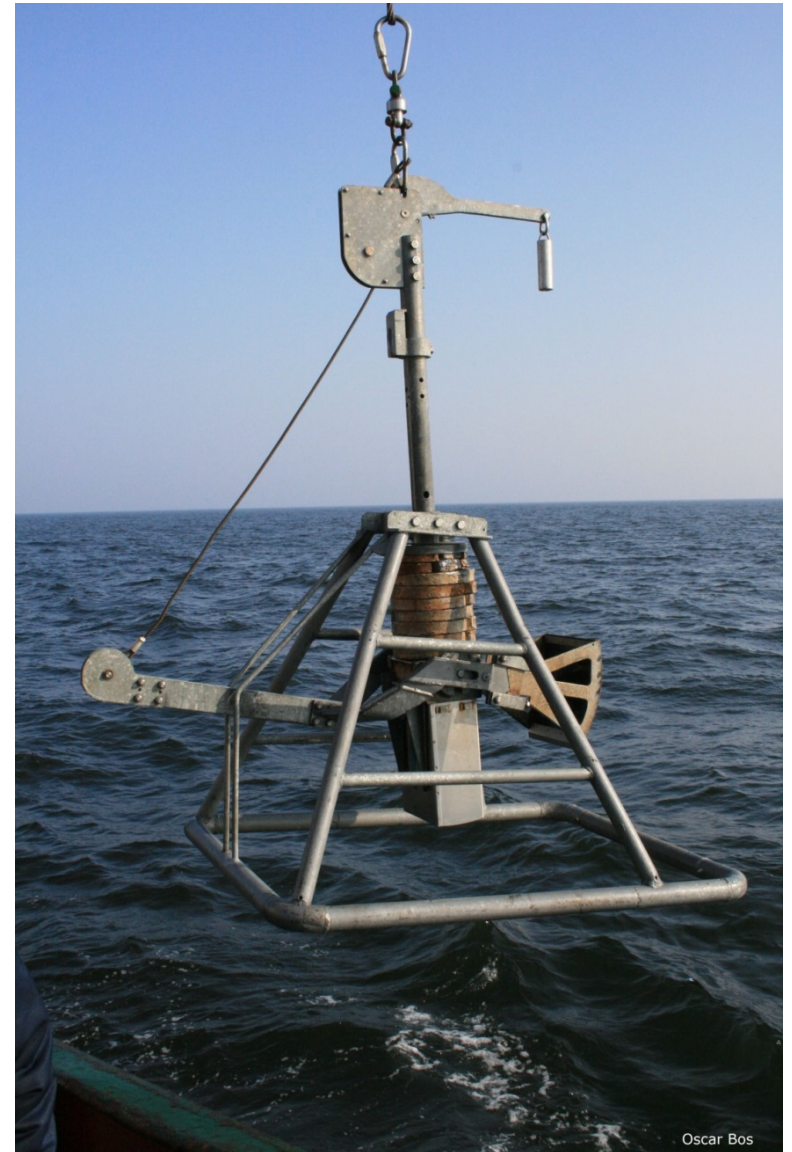
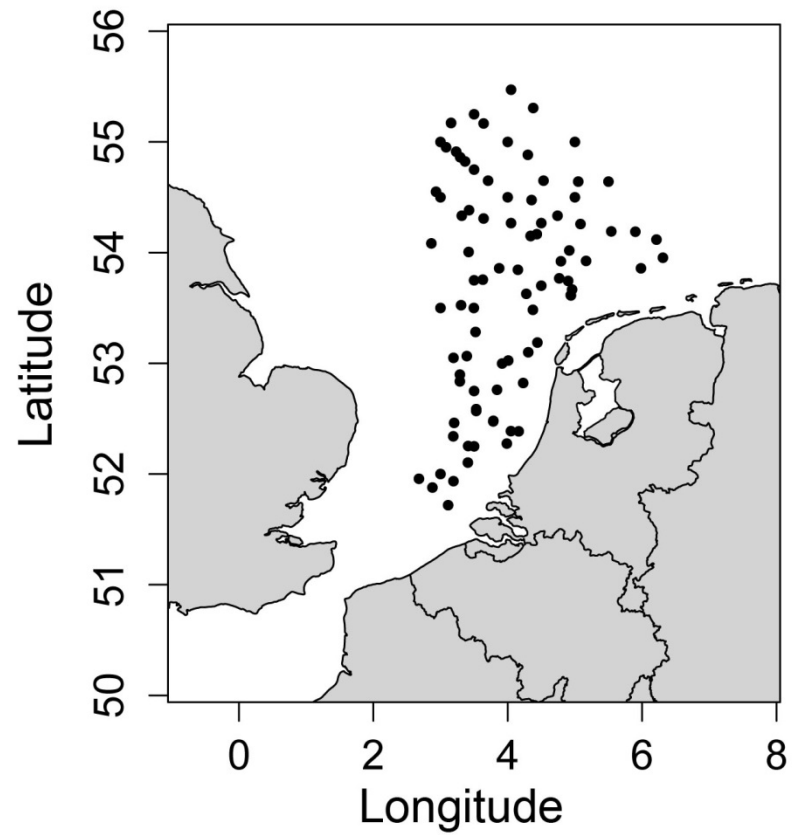
Map of the North SEA

Trawl impact on benthic richness

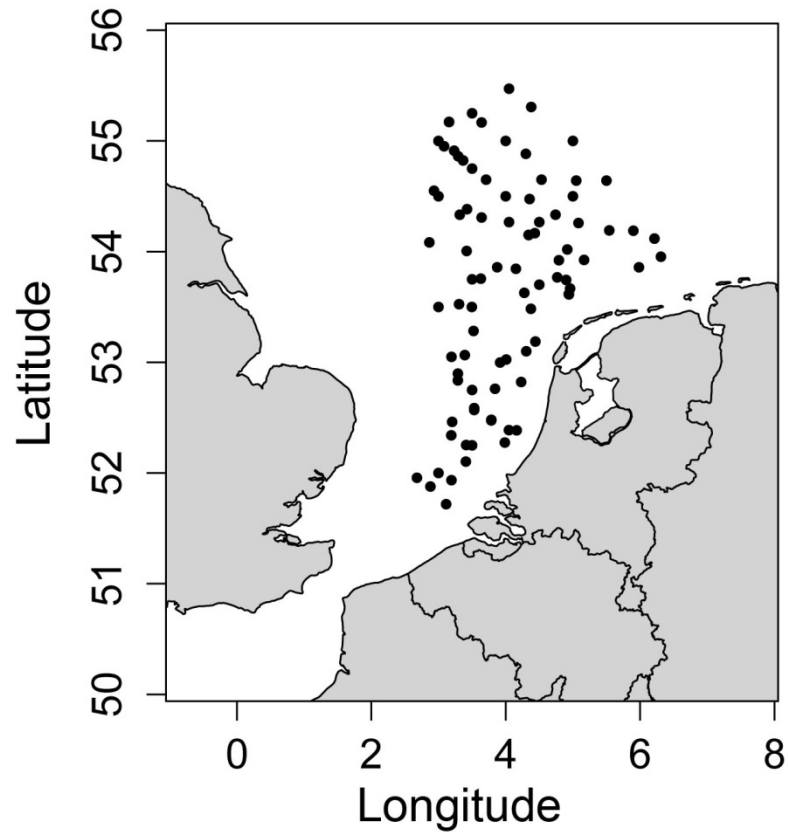


- How does trawl activity interact with habitat?
- How do these together determine benthic richness?

Macrobenthic sampling program



Macrobenthic sampling program (80 stations – 6 years)

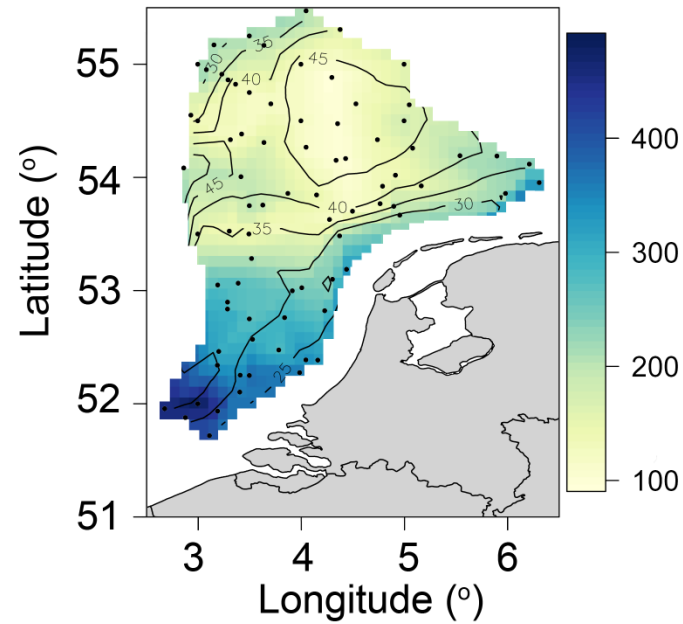


■ Sampling

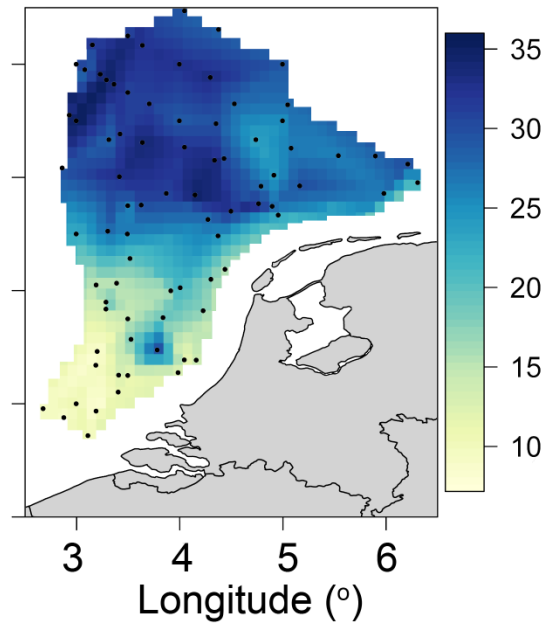
- Species biomass
- Species richness
- Depth
- Sediment grain size

Data overview

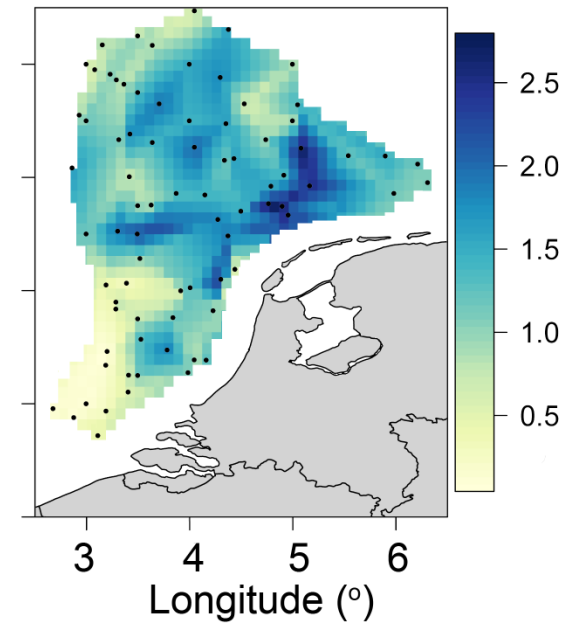
Sediment grain size & depth



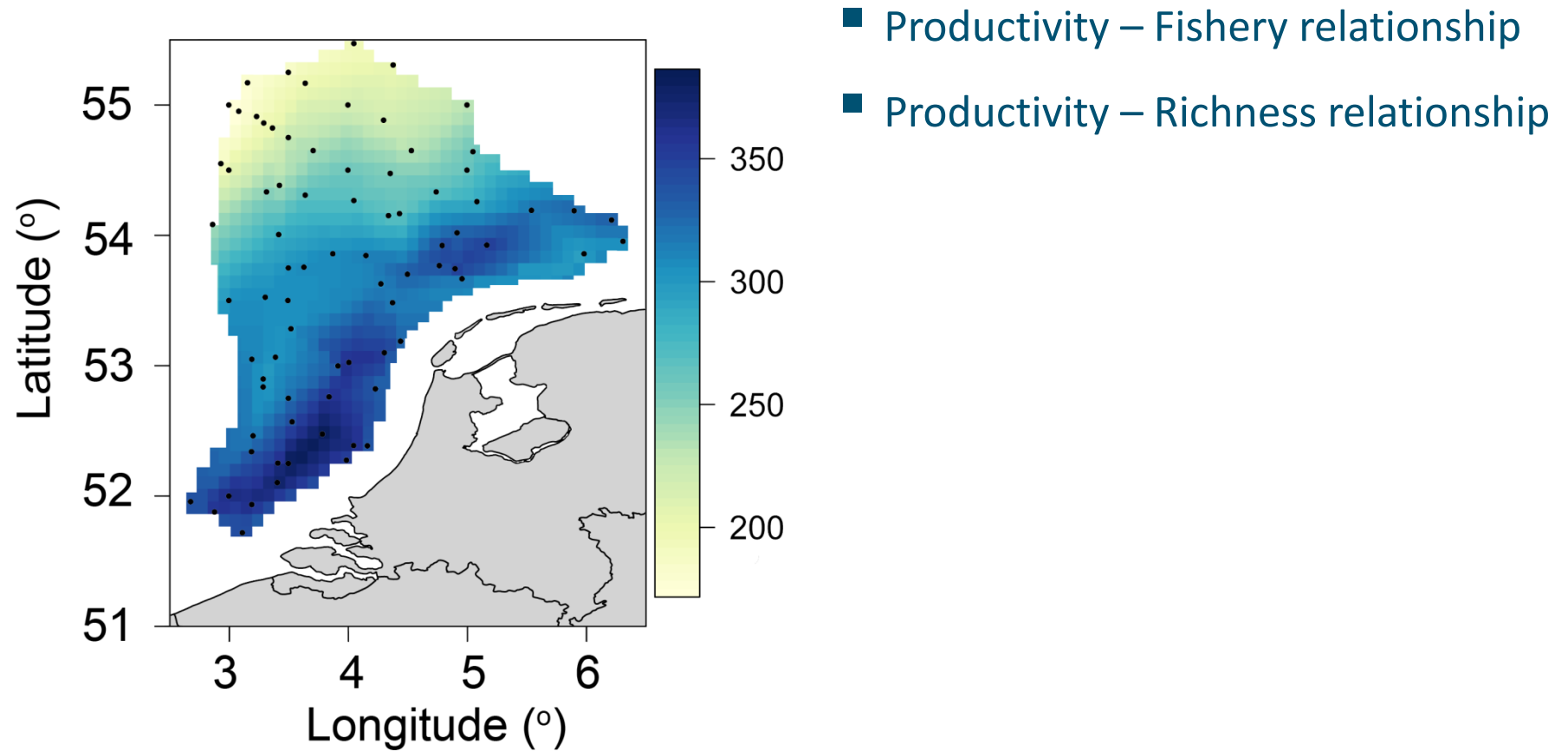
Species richness



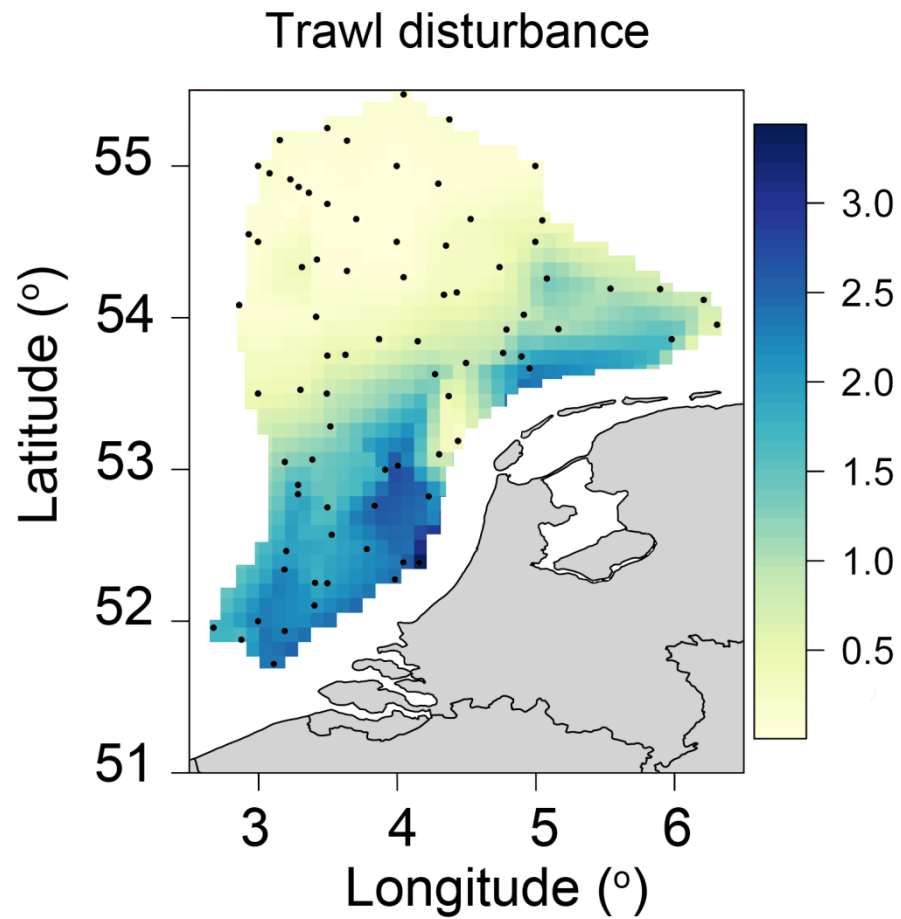
Species biomass



Primary productivity (ecosystem model GETM-ERSEM)

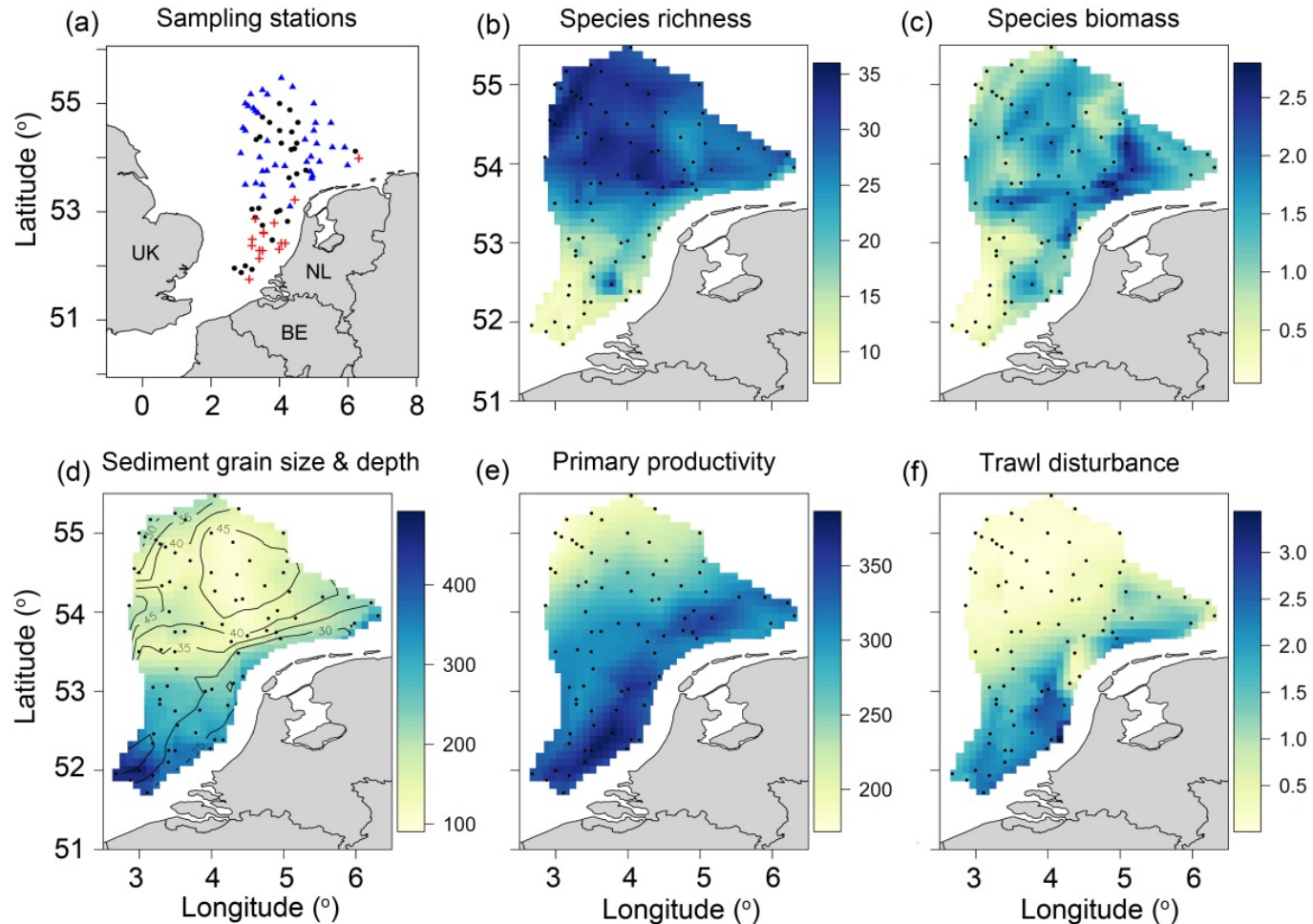


Trawl fishery disturbance

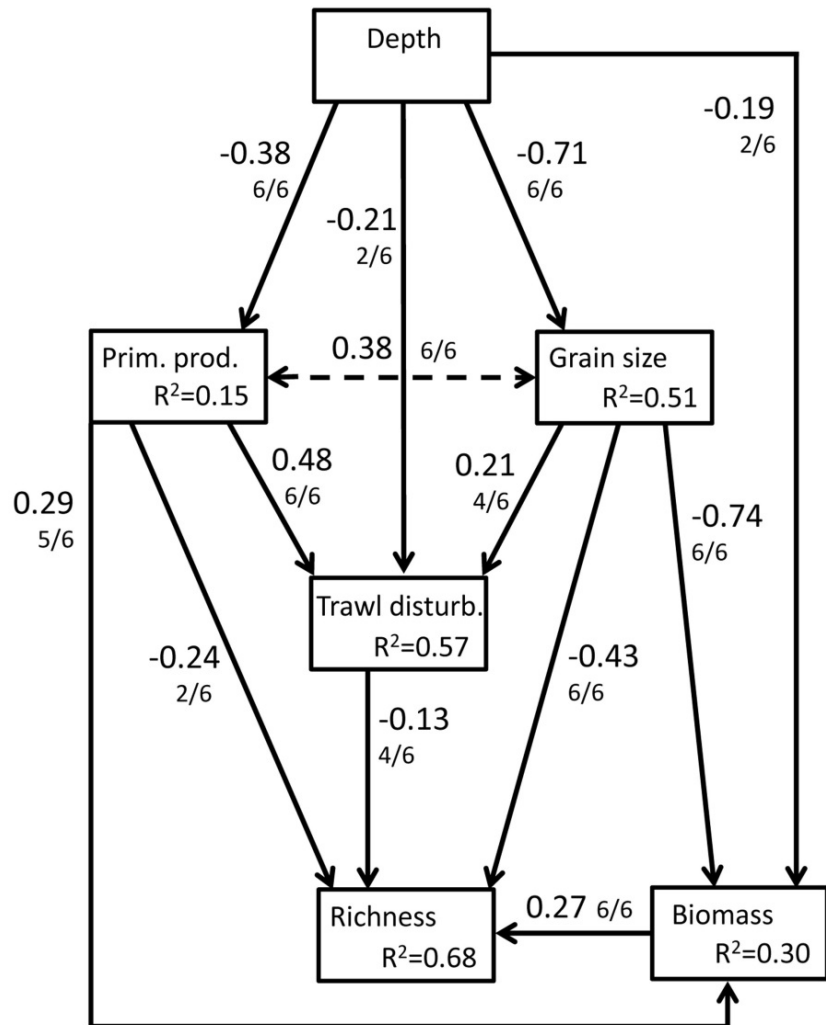


How does trawl activity interact with habitat?

How do these together determine benthic richness?

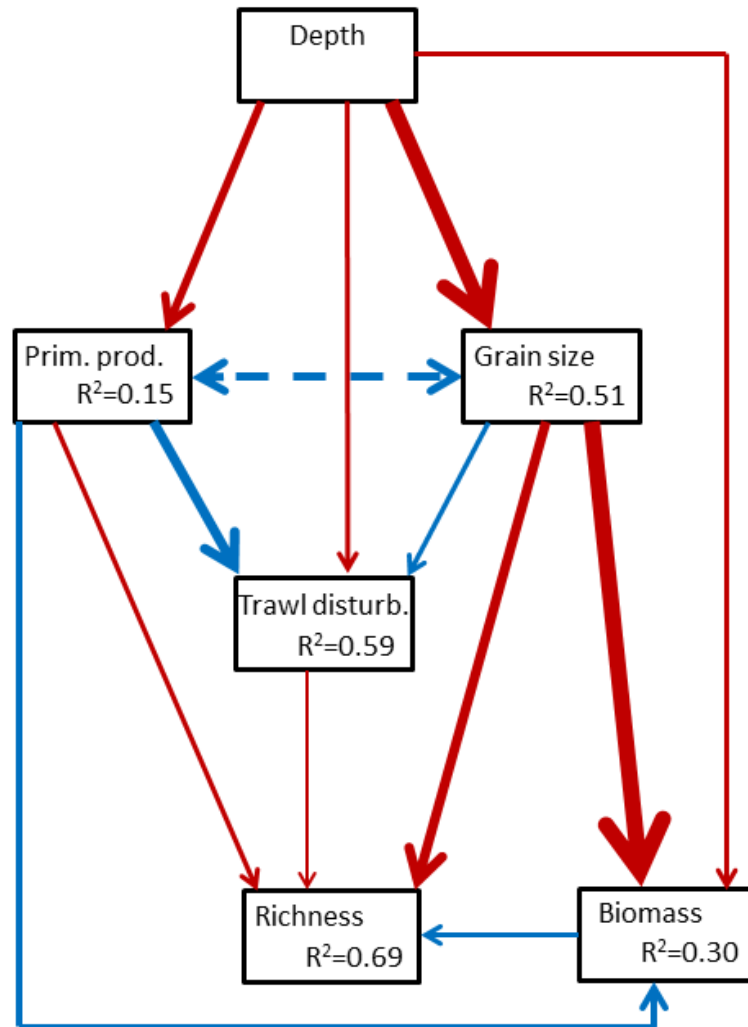


Structural equation model

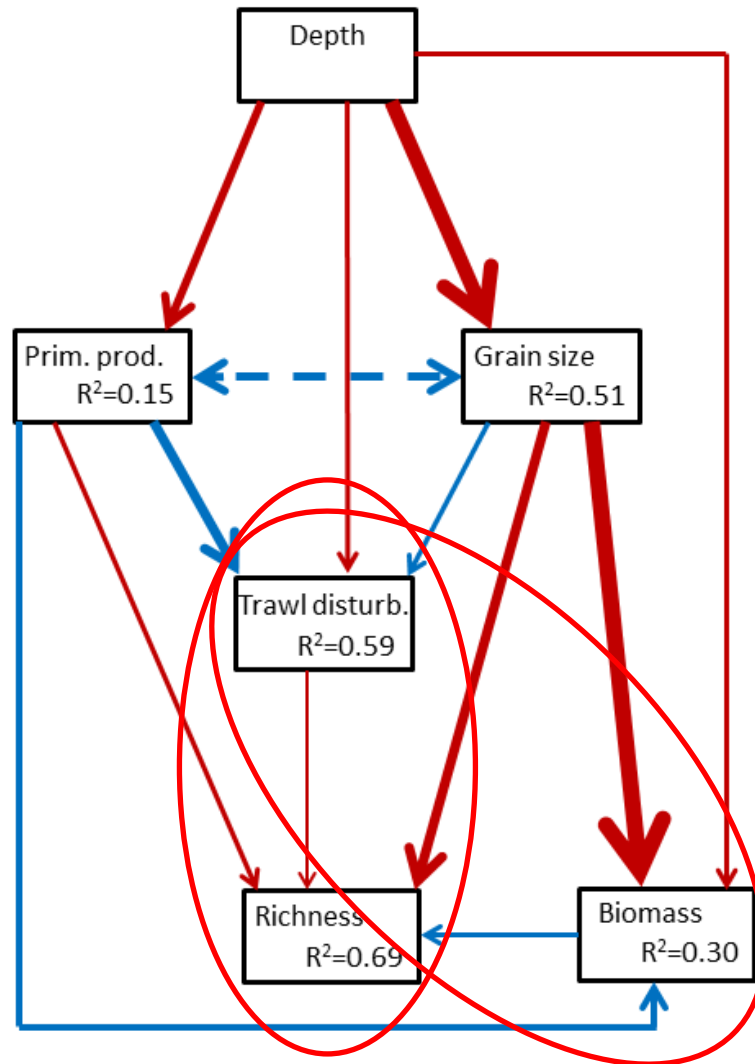


- SEM: Multivariate analysis to study networks of relationships

Structural equation model

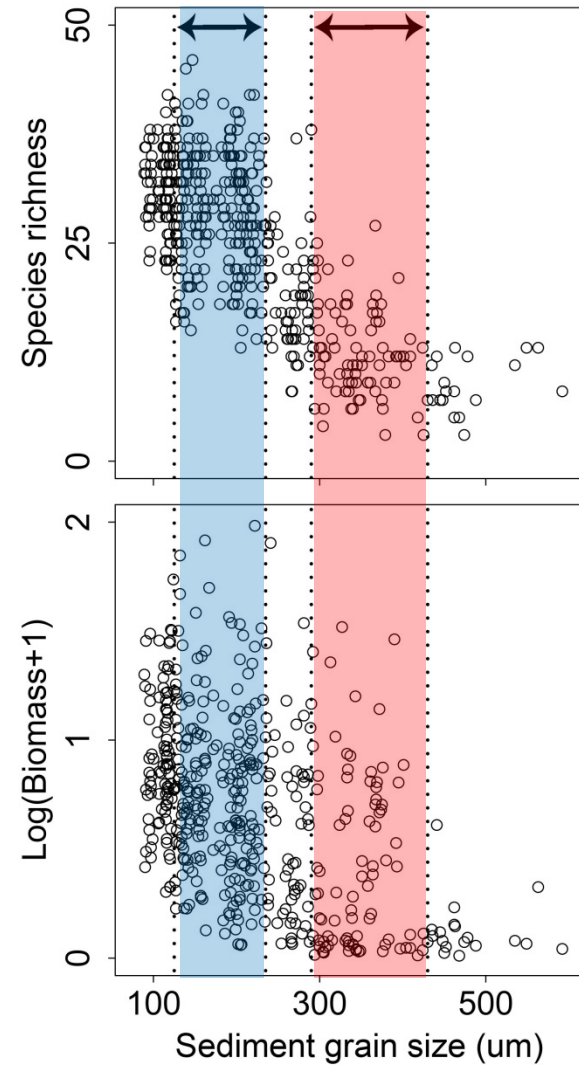
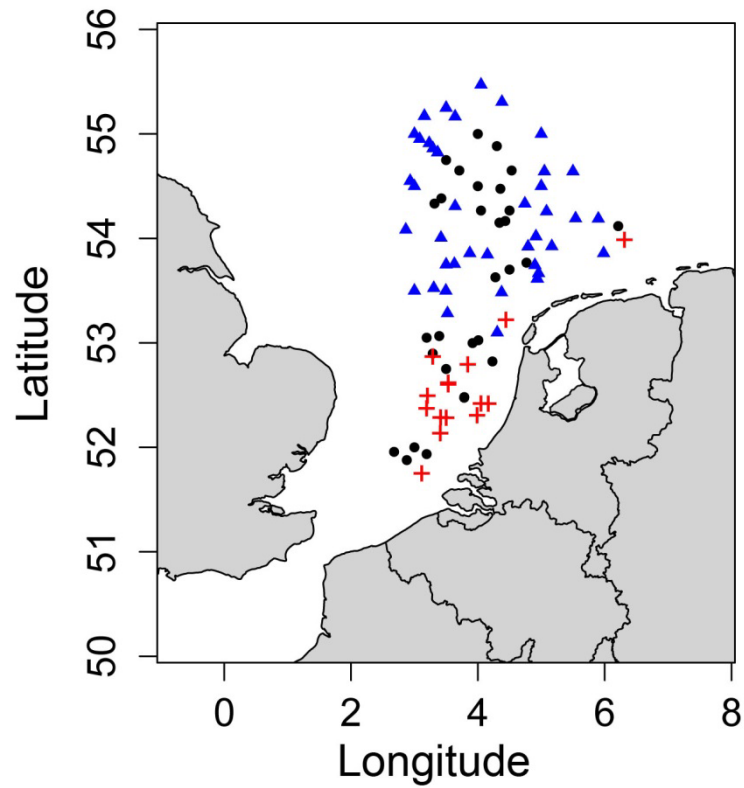


Structural equation model

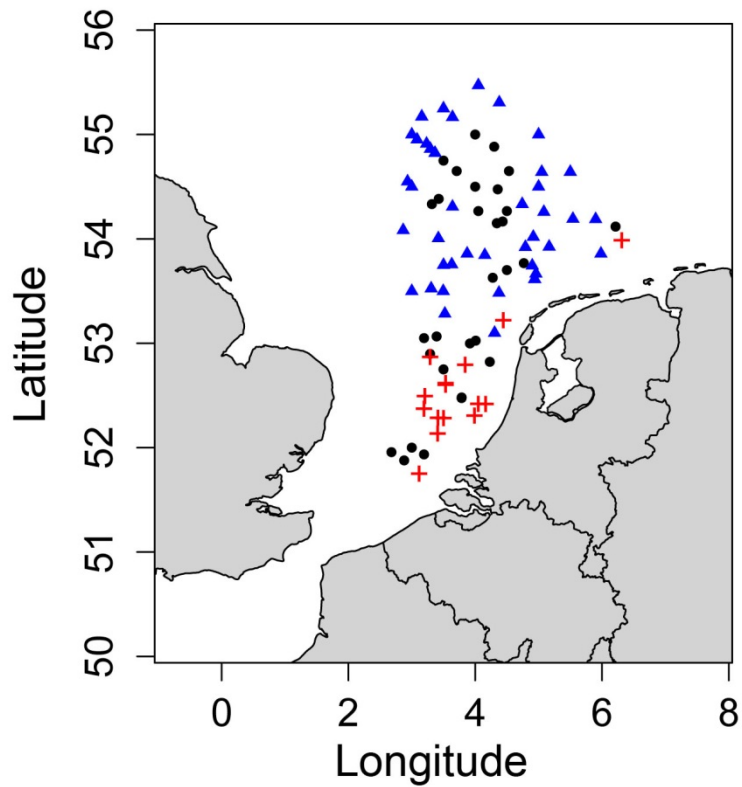


1. Richness reasonably well explained
2. Fishers fish in certain habitats
3. Richness is higher in certain habitats
4. Biomass is higher in certain habitats
5. Grain size is an important parameter to predict richness and biomass

Sediment grain size subsets



Context-dependent effect of trawl disturbance



Fine sediment:

Richness ~ similar as SEM

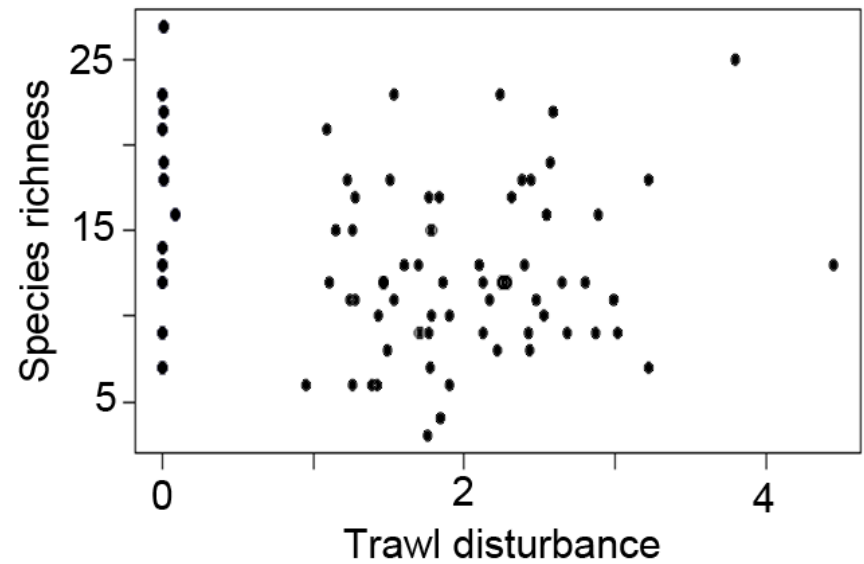
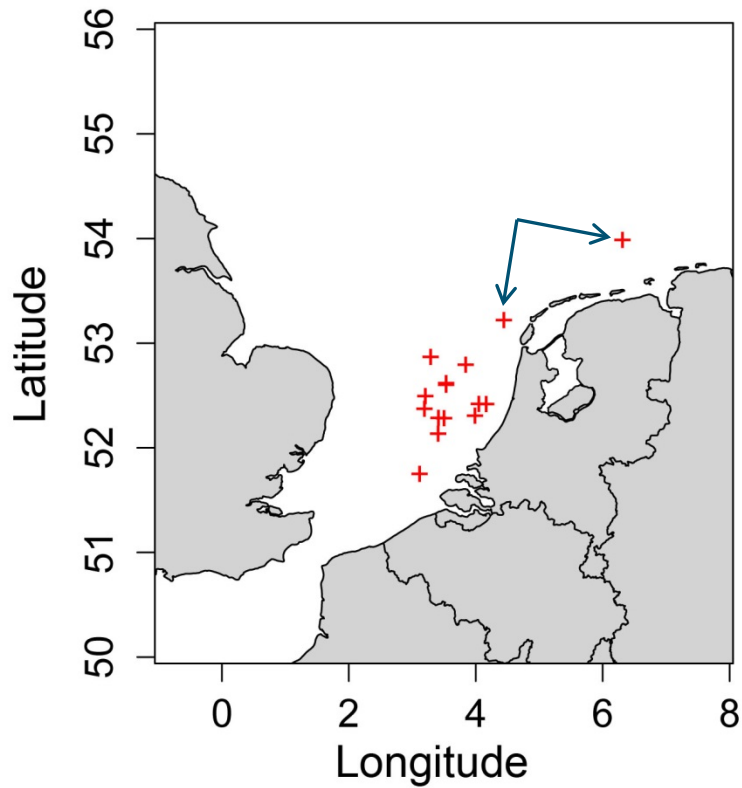


Coarse sediment:

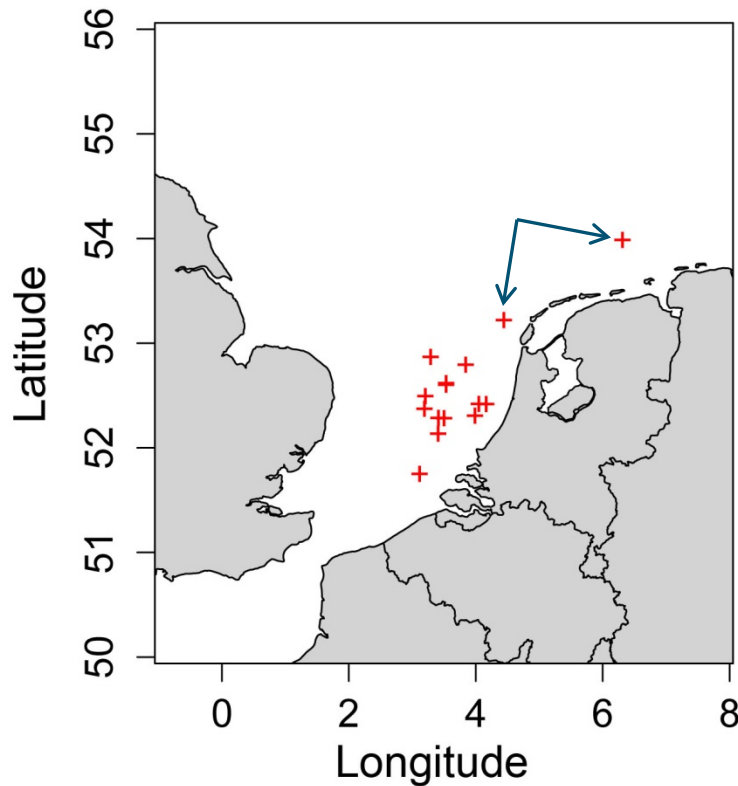
Richness ~ Biomass (↑)



Context-dependent effect of trawl disturbance



No relationship trawl disturbance-richness, why?

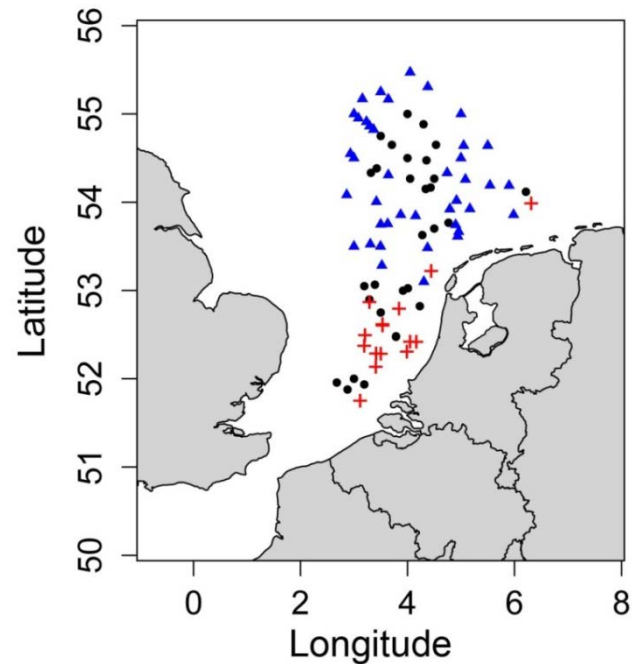
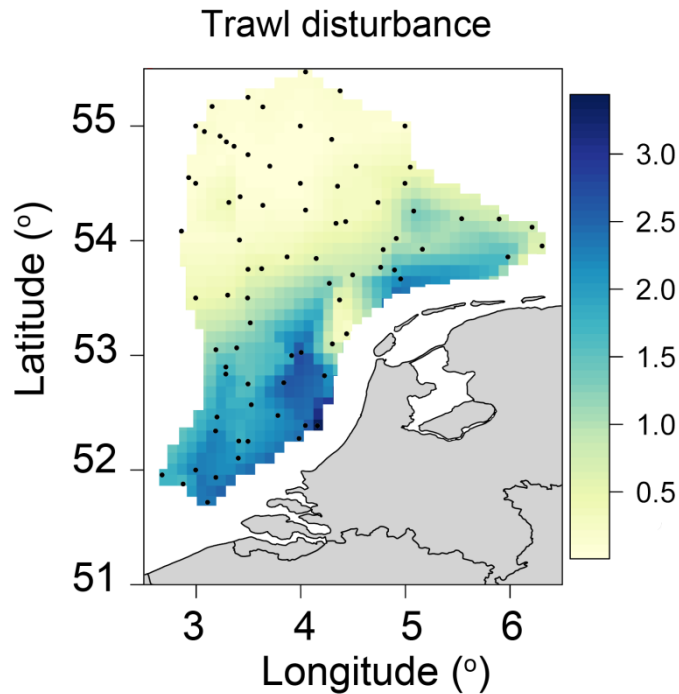


- 1) Fishing occurs where it matters least (low diversity areas)?
- 2) The benthic community has become adapted to chronic trawling (and remained in this state in the Plaice Box)?

Protection of benthic richness

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Protection of areas with the highest fishery activity



No indication of recovery / impact

Lower species richness (result of habitat)

Thank you!



Manuscript accepted in Ecosystems

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