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

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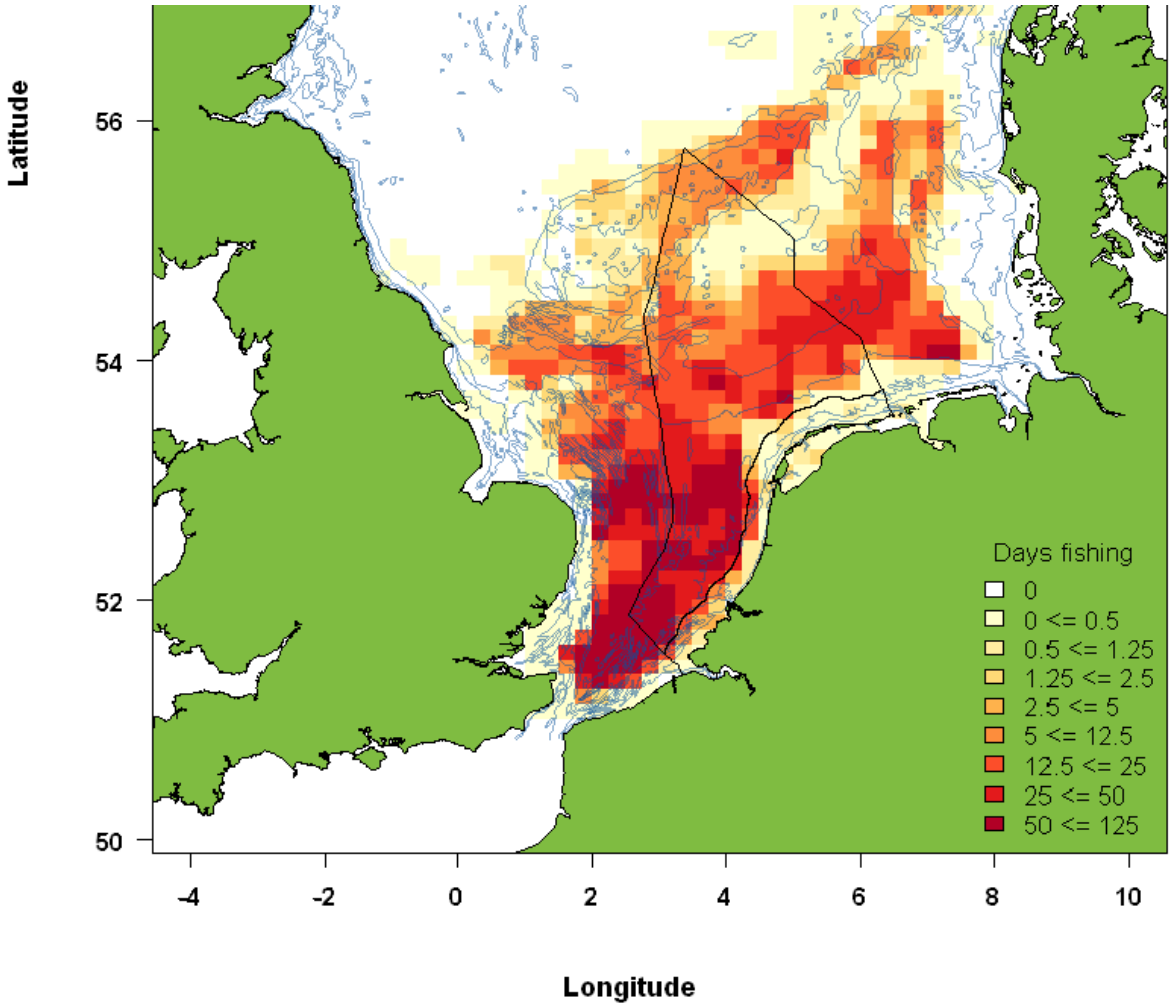
BENTHIS

Bottom trawl fishery

- Negative effects of trawling on benthic species richness

  (field studies on small spatial scale)

Impacts at the scale of the fishery



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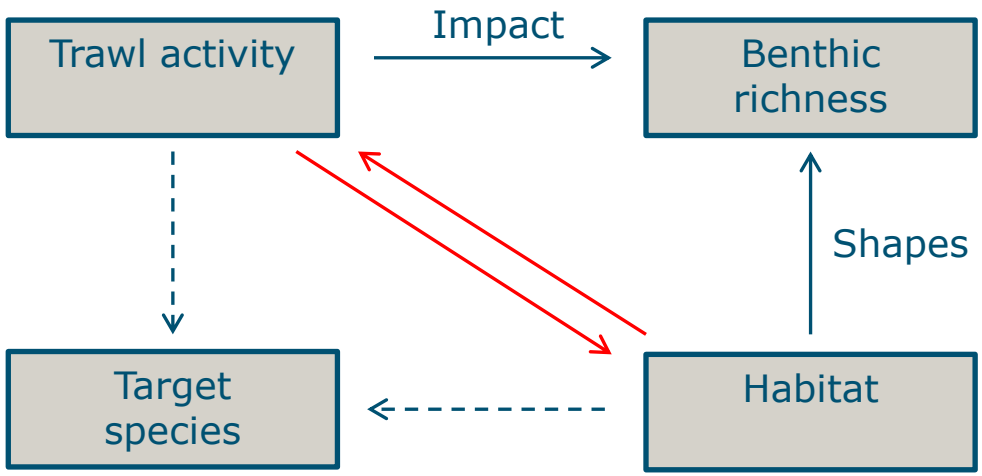
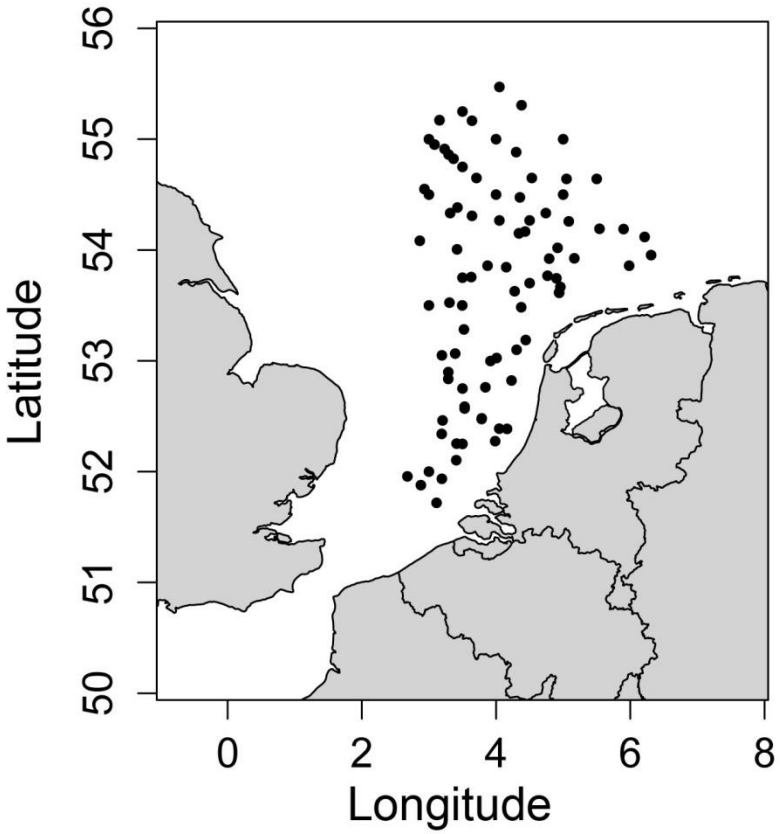
Trawl impact on benthic richness

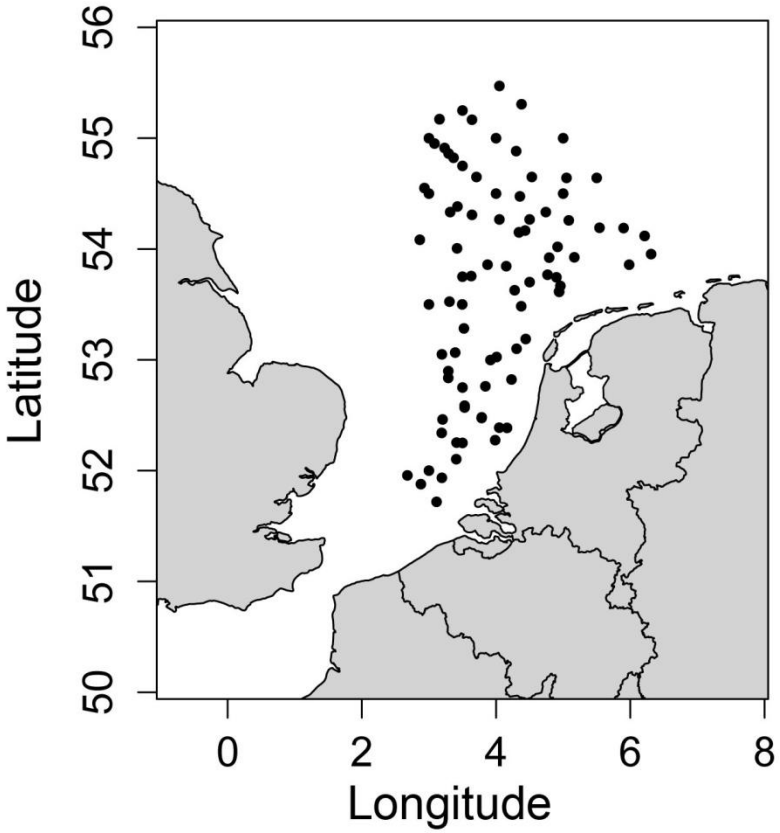


- How does trawl activity interact with habitat?
- How do these together determine benthic richness?

Macrobenthic sampling program

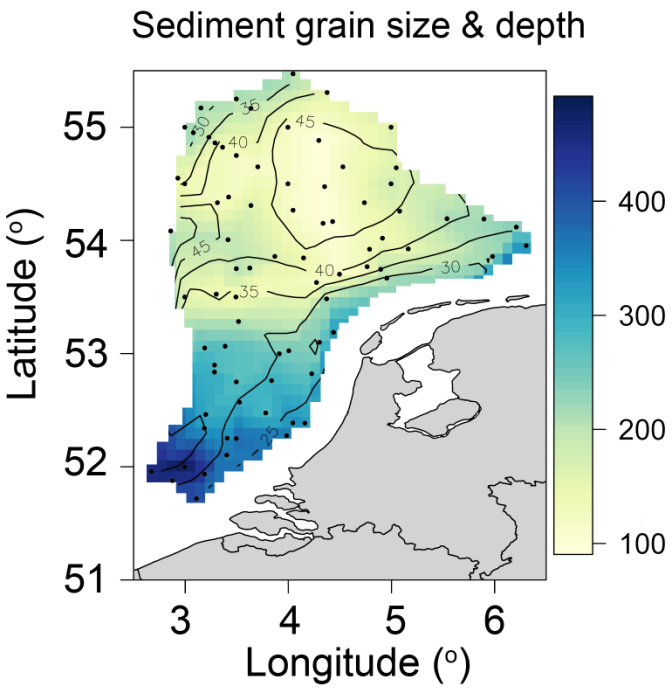


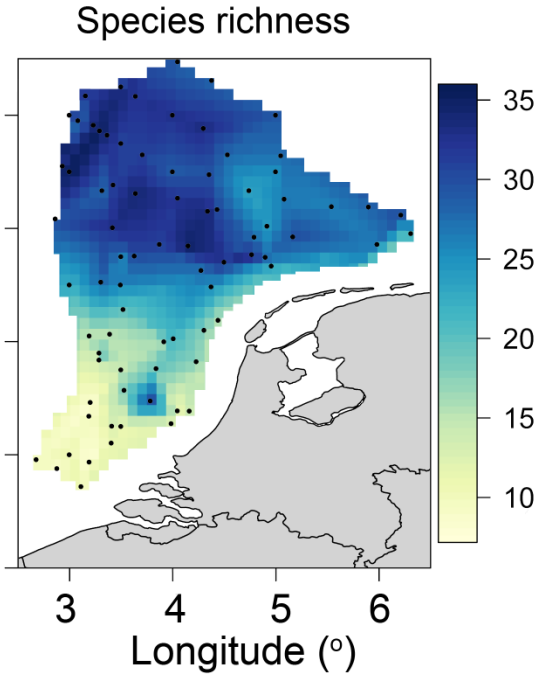
Macrobenthic sampling program (80 stations – 6 years)

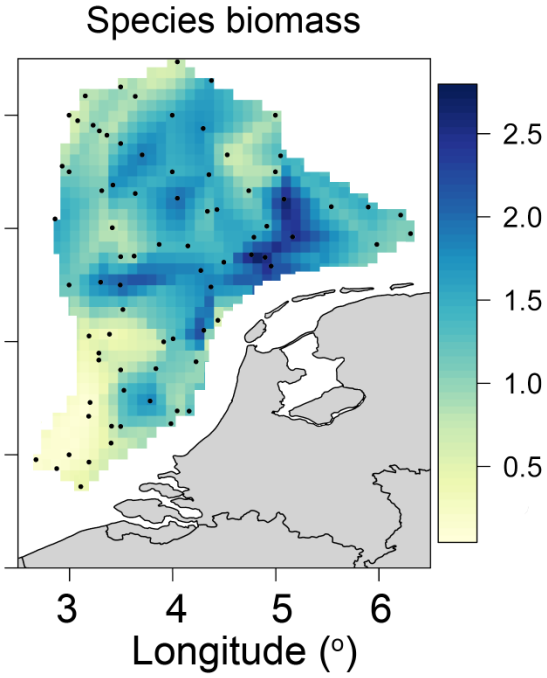


- Sampling
  - Species biomass
  - Species richness
  - Depth
  - Sediment grain size

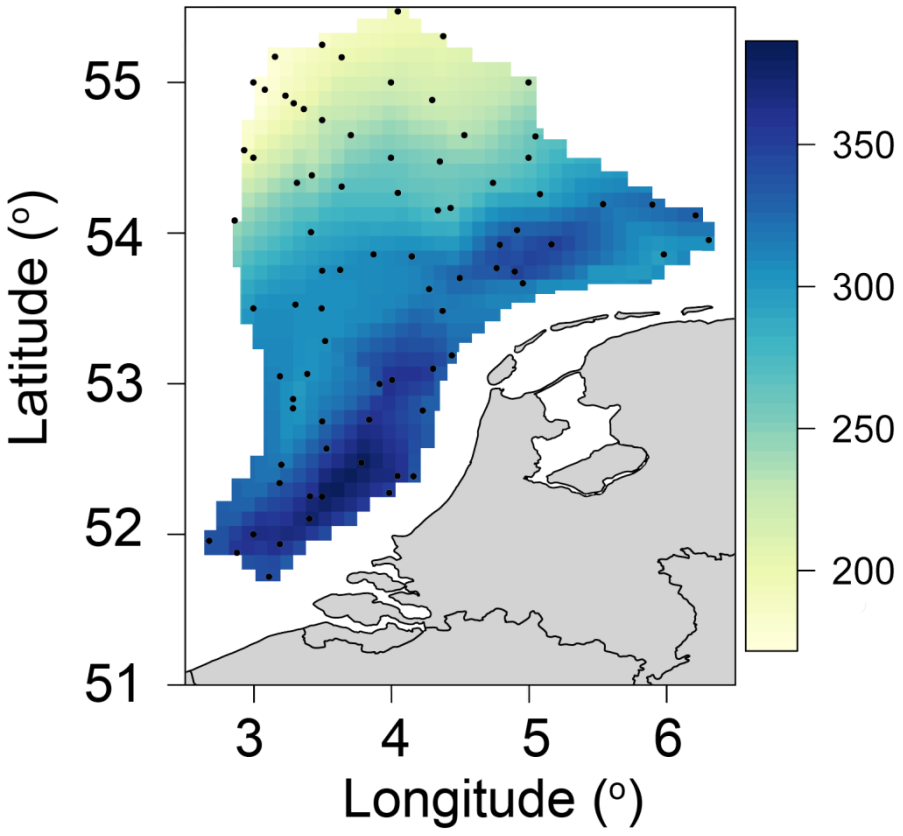
Data overview





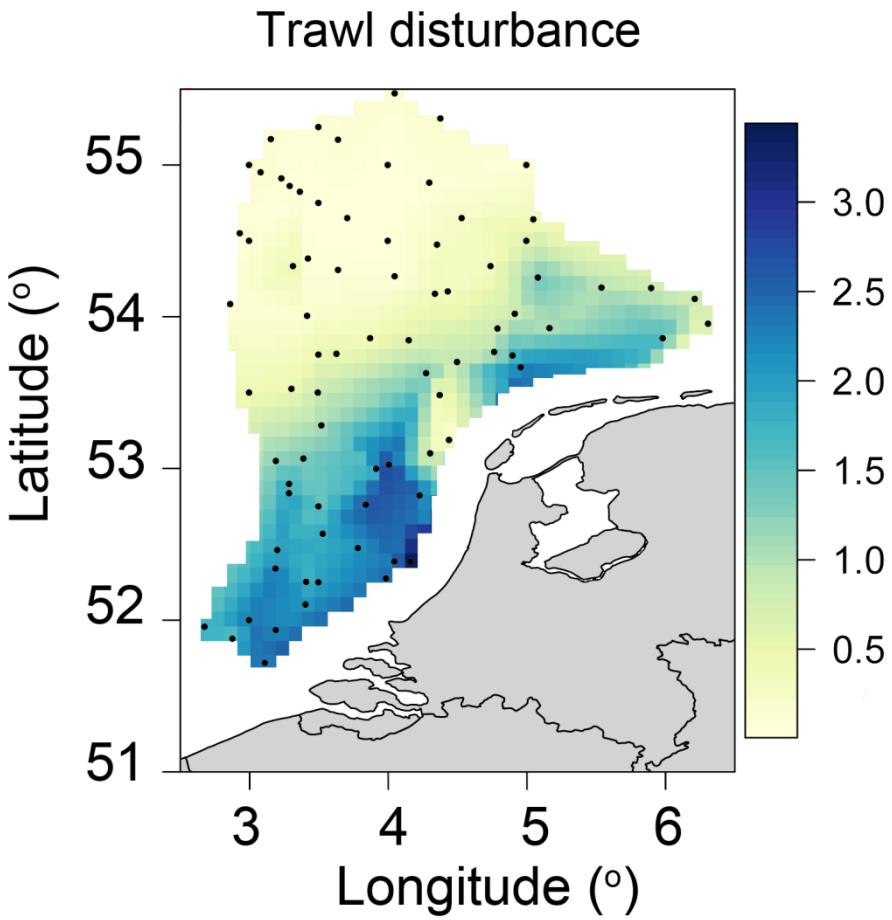


Primary productivity (ecosystem model GETM-ERSEM)



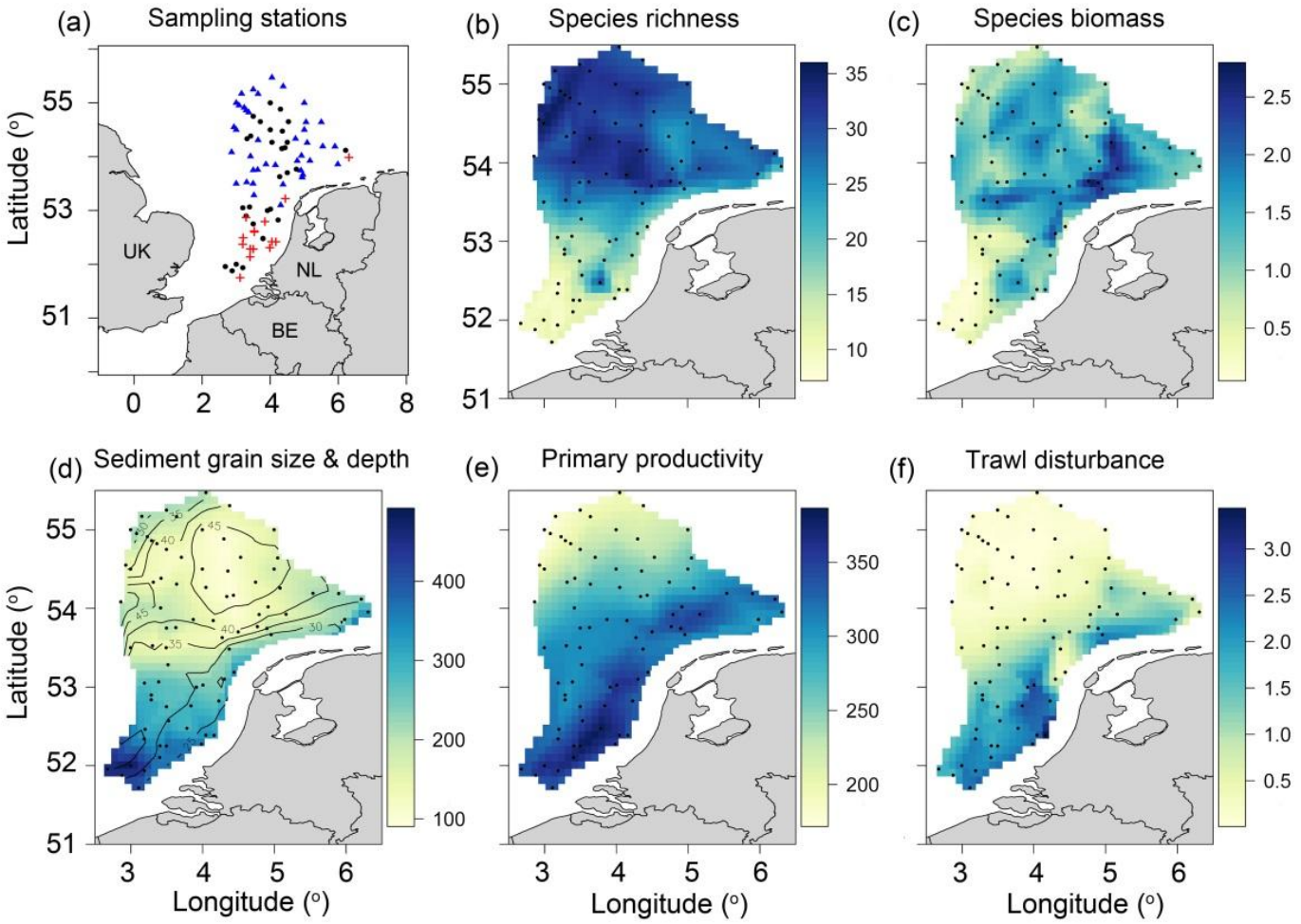
- Productivity – Fishery relationship
- Productivity – Richness relationship

Trawl fishery disturbance

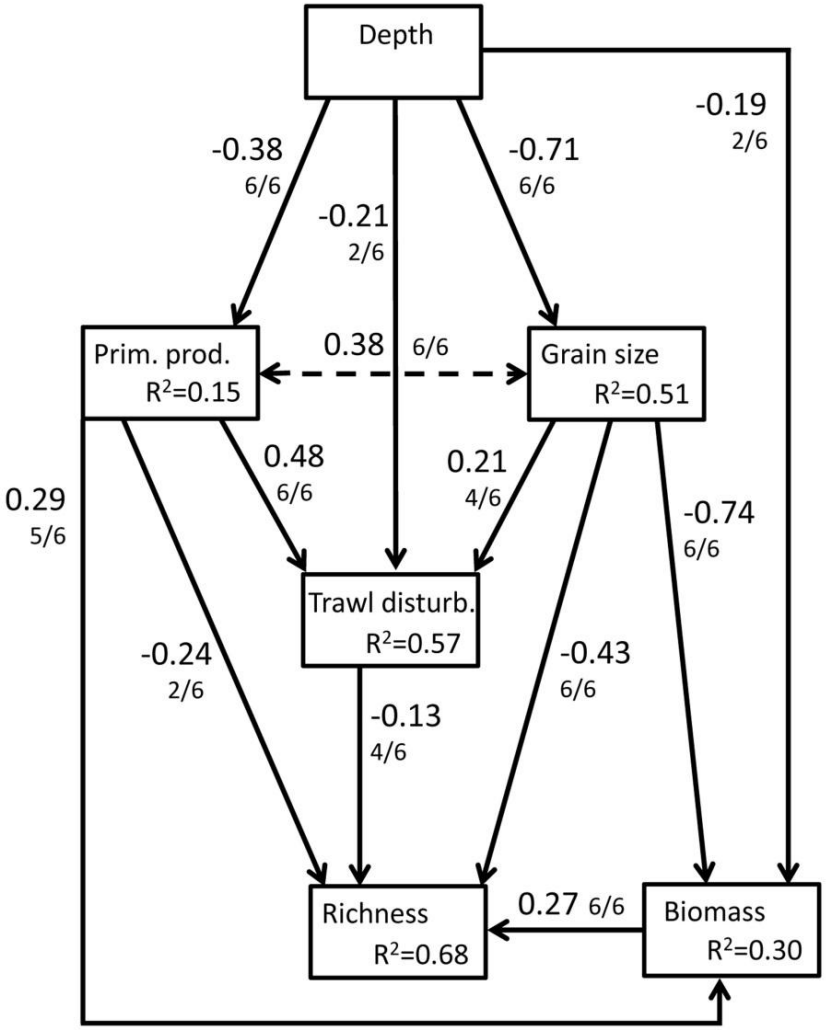


How does trawl activity interact with habitat?

How do these together determine benthic richness?

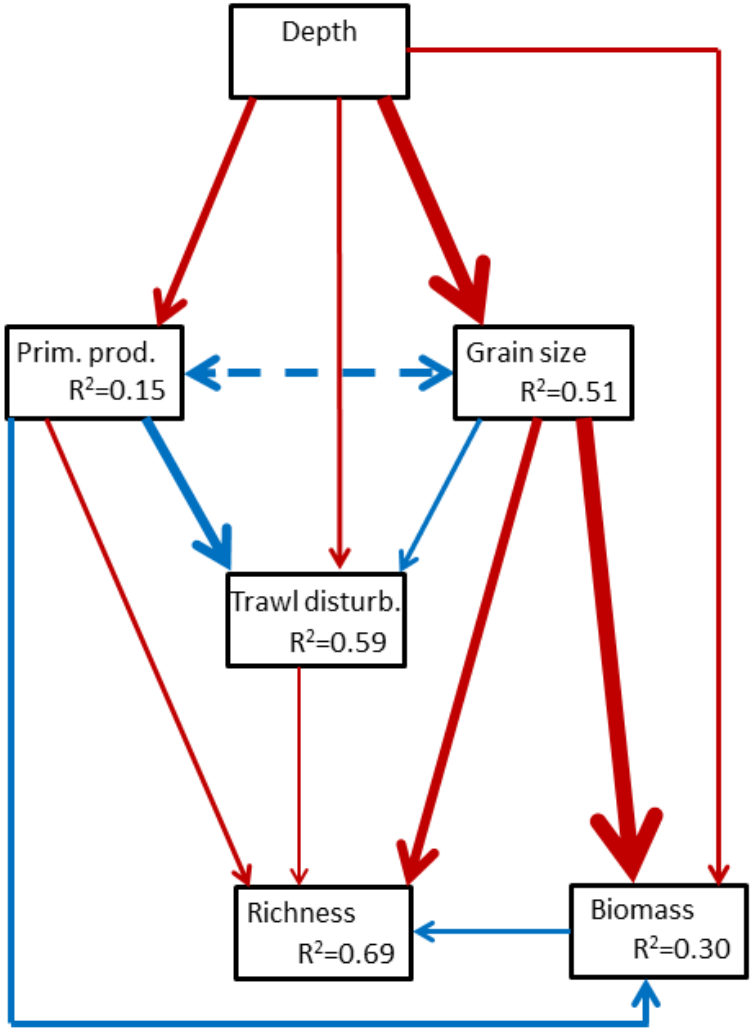


Structural equation model



- SEM: Multivariate analysis to study networks of relationships

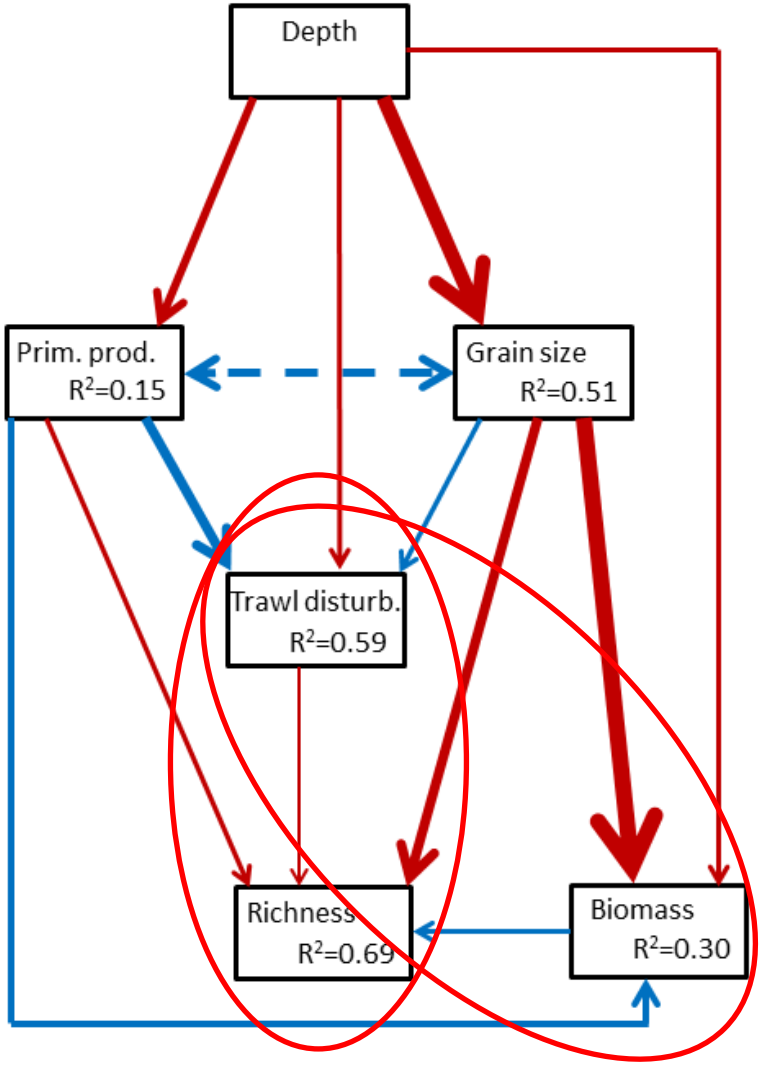
Structural equation model



blue = positive effect

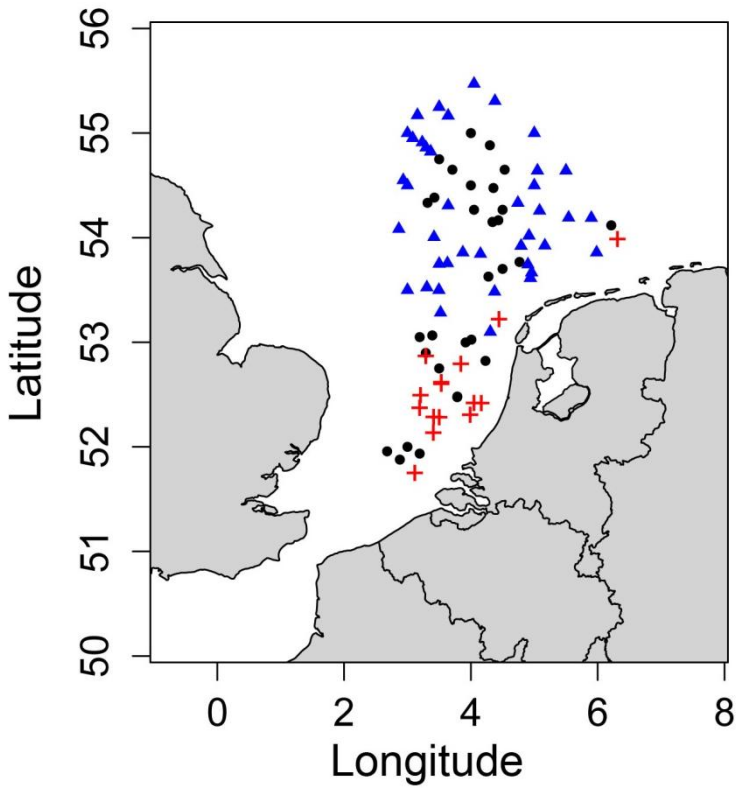
red = negative effect

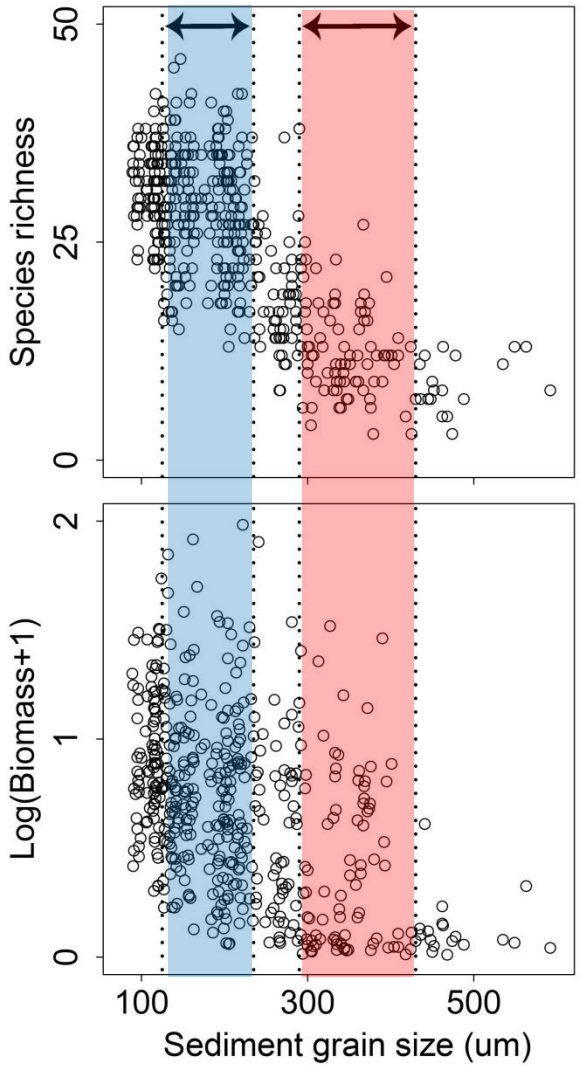
Structural equation model



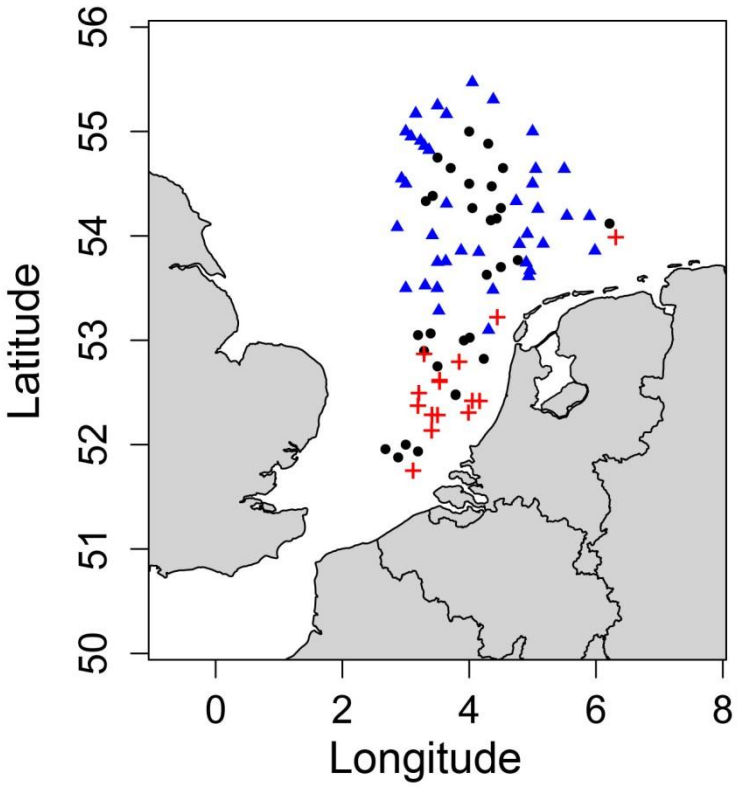
1. Richness reasonably well explained
2. Fishers fish in certain habitats
3. Richness is higher in certain habitats
4. Biomass is higher in certain habitats
5. Grain size is an important parameter to predict richness and biomass

Sediment grain size subsets





Context-dependent effect of trawl disturbance



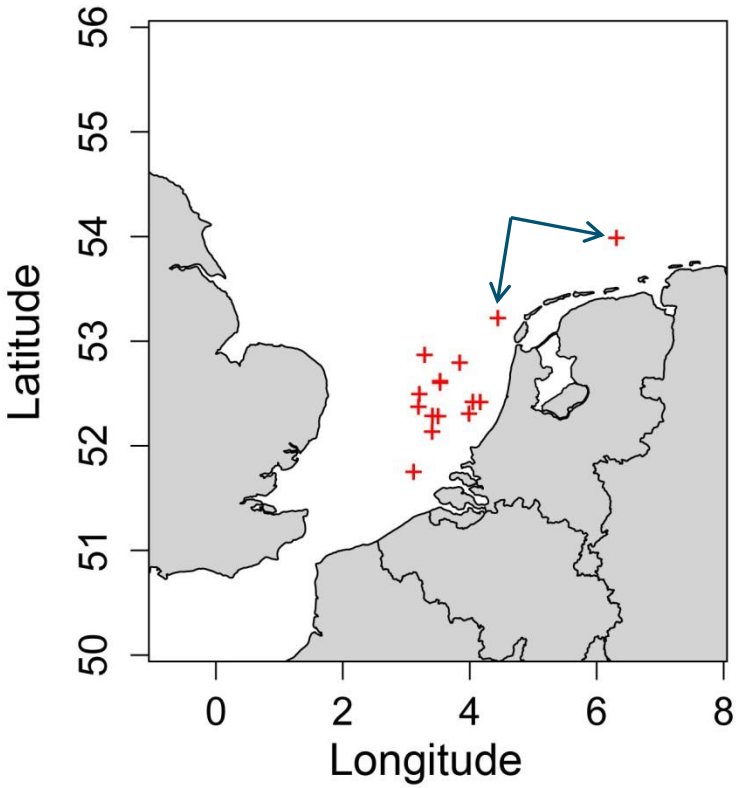
Fine sediment:

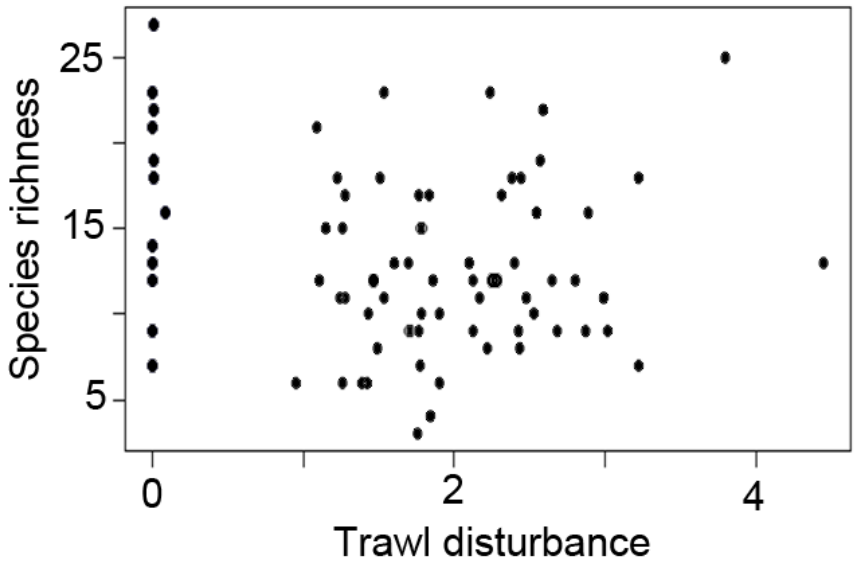
Richness ~ similar as SEM

Coarse sediment:

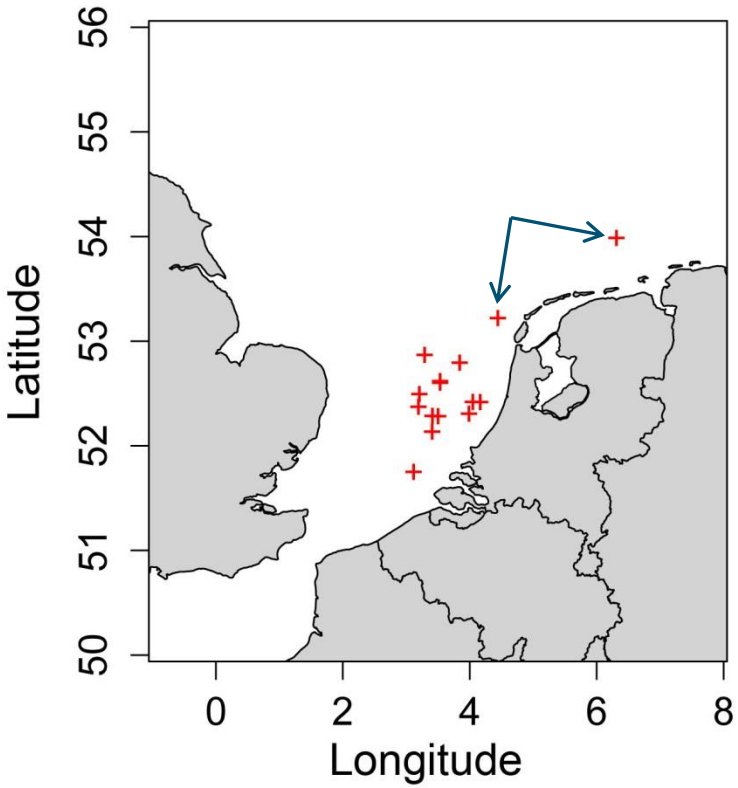
Richness ~ Biomass (↑)

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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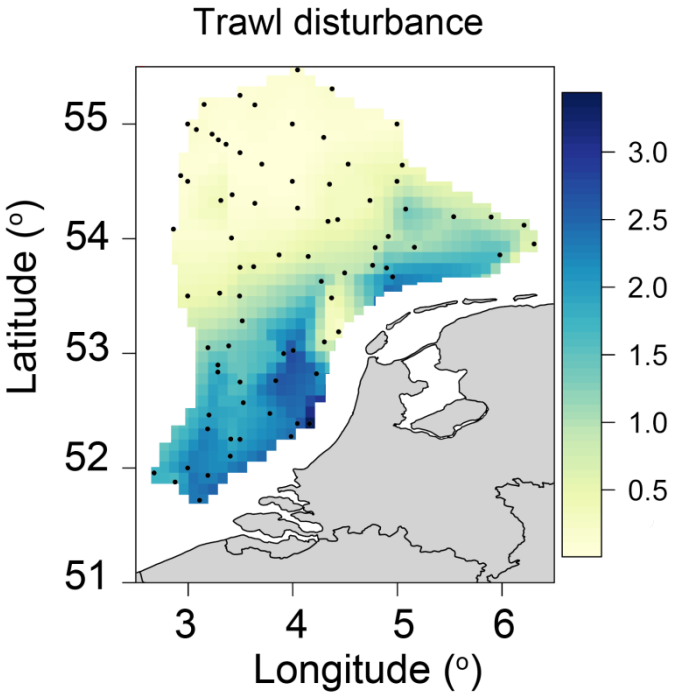
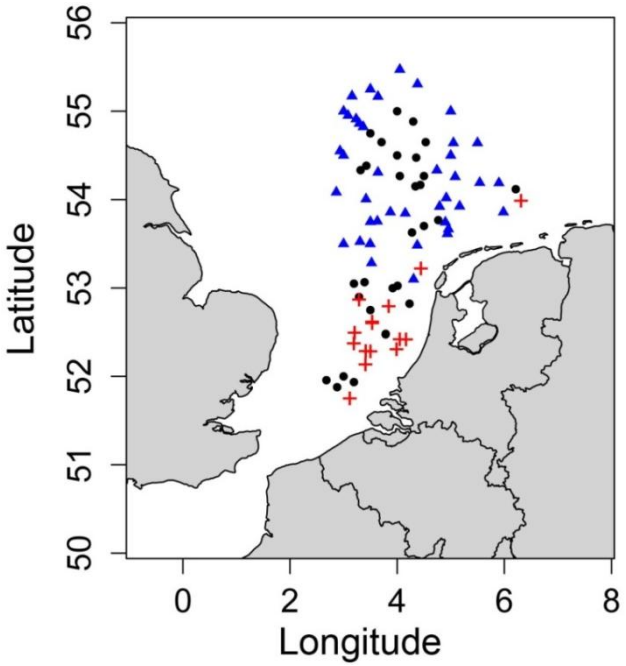
Protection of areas with the highest fishery activity





No indication of recovery / impact

Lower species richness (result of habitat)

Thank you!

Manuscript accepted in Ecosystems

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