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Spatio–temporal effects of environmental drivers and fishing in a Baltic Sea ecosystem

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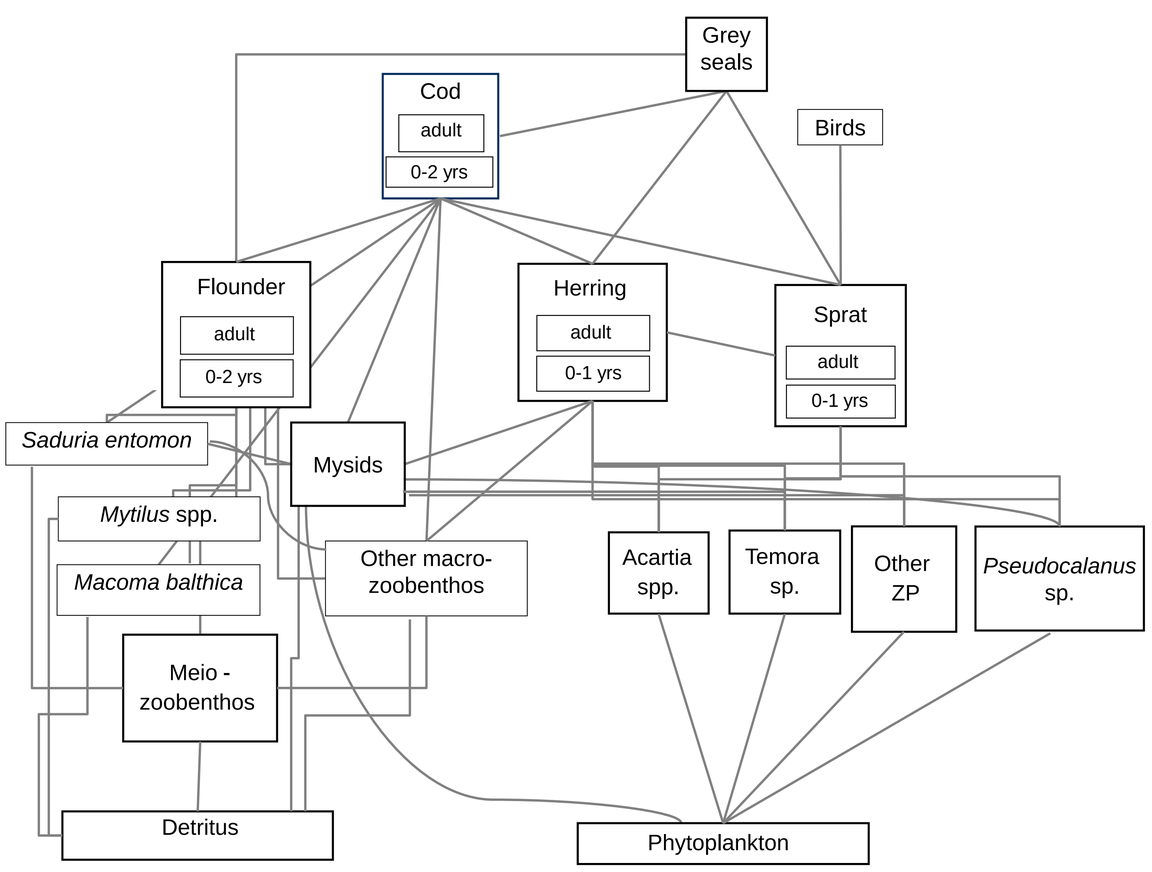
Structure of the food-web model.



Question

How do density and spatial distribution of Baltic sea species, e.g. cod, change as a result of the combined effects of eutrophication and fishing?

Method

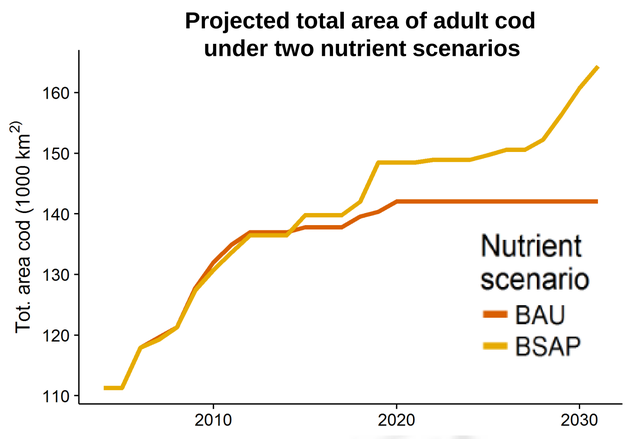
Spatio-temporal scenario simulations (2014-2030) were performed using an Ecopath with Ecosim and Ecospace food-web model (21 functional groups, 4 multistanza fish groups). States of the abiotic environment (e.g. in terms of hypoxic area, cod reproductive volume, temperature and salinity) and of the lower trophic levels (e.g. production rate of phytoplankton) were generated by a coupled physical-biogeochemical model. These influenced the spatial distribution of species via their respective tolerances to abiotic factors. Species distributions were additionally influenced by their trophic interactions and fisheries.

Results & Conclusion

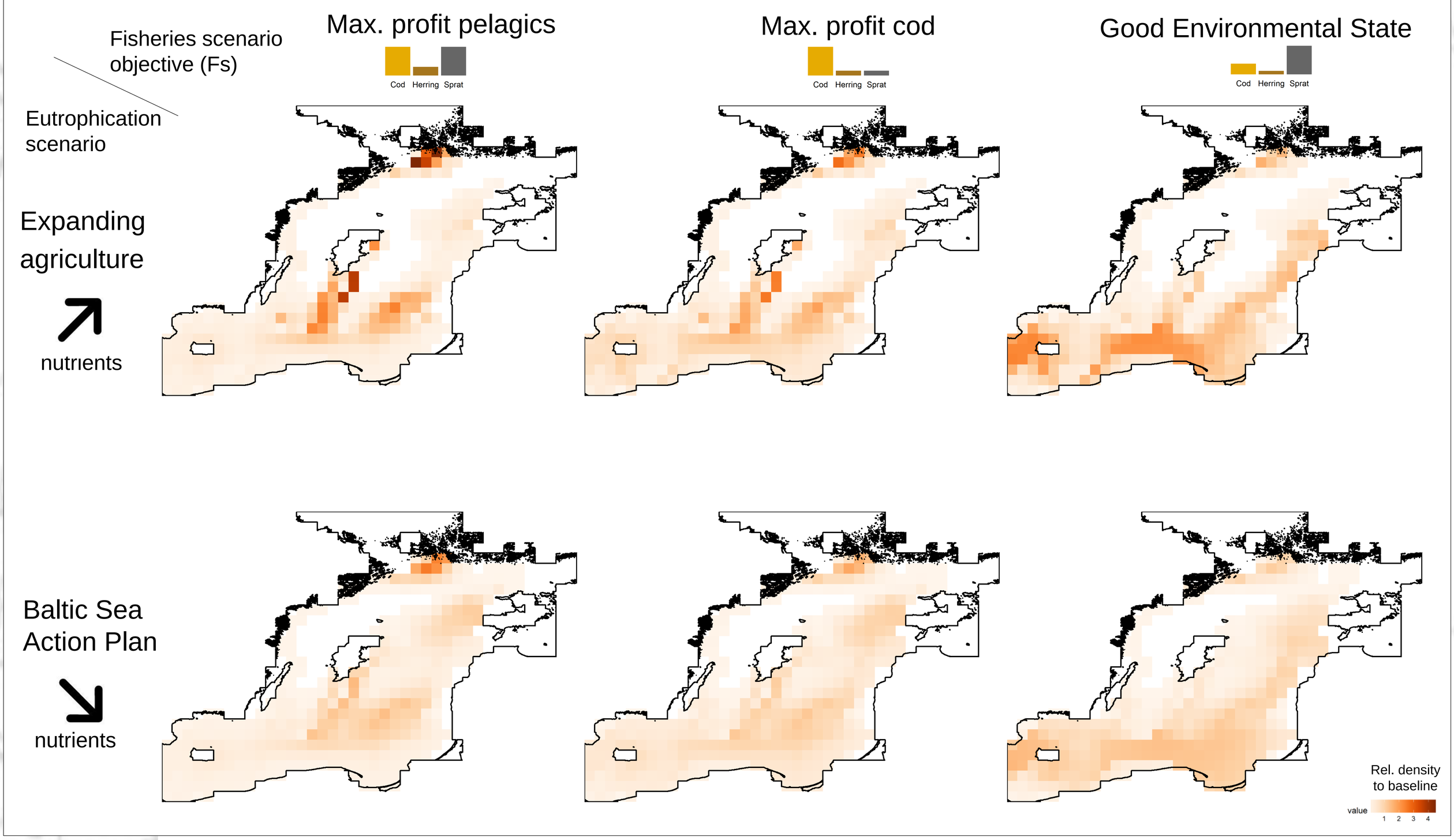
Maximum spatial area of cod depended on nutrient management, its total biomass on fisheries management.

Managing fisheries without effectively managing eutrophication can lead to concentrating the cod stock in small areas, with potential negative consequences for stock productivity and viability in the long run.

Projected total area of adult cod under two nutrient scenarios



Projected relative biomass distribution of adult cod in 2030 under combinations of fisheries and eutrophication management regimes.



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