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Fish habitat modelling to evaluate effects of eutrophication mitigation on recreational fisheries

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Abstract
Habitat models and spatially explicit scenarios can be used for quantitative evaluation of environmental policy objectives. Here we apply habitat models to explore how improvements in water clarity, reflecting different levels of achievement of the eutrophication targets of the Baltic Sea Action Plan, may influence the biomass of predatory fish and thereby the recreational fisheries sector in a Baltic Sea coastal area. We develop an ensemble of predictive species distribution models, which encompass the relationship between water clarity and recruitment habitats for European perch (*Perca fluviatilis*) and pikeperch (*Sander lucioperca*). Then we use habitat productivity functions to estimate potential changes in the biomass of large individuals of these two species following eutrophication-driven changes in habitat distributions. An increased water clarity compared to the current situation was predicted to lead to an increase in perch biomass, but a simultaneous decrease in pikeperch, as this species gains from eutrophication. To estimate the resulting economic effects for the recreational fisheries sector, information from a study on the willingness to pay for increases in catches was combined with information on the extent of recreational fishing targeting the two species. Due to a considerably larger fishing effort on perch, the net effect of eutrophication mitigation with respect to the two species was a benefit for recreational fisheries, despite a loss for pikeperch. Our multistep approach exemplifies how habitat modelling can be connected to socioeconomic analysis to map and evaluate the outcomes of different management alternatives.

Keywords:
Essential fish habitats, species distribution modelling, scenario analysis, eutrophication, recreational fishing, *Perca fluviatilis*, *Sander lucioperca*, willingness to pay

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