Spatial modelling and development of a multi-criteria site selection tool for mussel farms as a mitigation measure in eutrophic Danish coastal waters

Eutrophication of coastal water bodies by massive anthropogenic nutrient inputs is a serious global challenge. For Denmark, a range of mitigation measures has successfully led to reduced amounts of nutrients and algal biomass within its surrounding coastal water bodies over the past decades. At the same time, however, a considerable decline in the abundance of benthic filter feeders, in particular of blue mussels (Mytilus edulis), was observed. Blue mussels play a substantial role in filtering different kinds of particles out of the water and this strongly contributes to reduced phytoplankton concentrations and improved light conditions in the aquatic environment. The implementation of blue mussel farms in Danish coastal water bodies has therefore been recently suggested as a potentially effective tool for mitigating coastal eutrophication on a national scale. The general idea in this study is to utilize the capability of these strong suspension-feeders to extract large amounts of suspended particle loads and algal biomass from the water column. Incorporated nutrient loads in harvested mussels will be recycled as organic protein source and bottom light conditions in the water will improve. Blue mussel farming itself, of course, requires to be economically feasible and cause least constrains to other important utilizations of Danish coastal waters. In a national-scale spatial context, we therefore asses (a) potential yields of blue mussel farms by numerical and spatial modelling, (b) possible risks of loss to the farms by e.g. predators and physical exposure, (c) possibly conflicting interests such as protected areas, economic utilization, tourism/recreation, and public acceptance. These evaluations will be based on a range of layered spatial datasets. Finally, we aim to develop a multi-criteria site selection tool for optimized and scientifically based decision-making for blue mussel farms as an effective mitigation tool in Danish coastal waters.

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