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## RESPONSES TO OLIGOTROPHICATION IN DANISH COASTAL ECOSYSTEMS

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### ABSTRACT

Danish coastal waters suffer from eutrophication. In the 1980s the situation was so bad with fish kill etc. that a public pressure for political response was established. Since the mid-1980s several mitigation measures have been adopted to reduce the nutrient input from land – a process stimulated by the objective of good environmental status as describe in the Water Framework Directive and Marine Strategy Framework Directive. Based on data from 25 years of monitoring this presentation will describe indicator responses to oligotrophication.

Nutrient inputs from land were reduced by almost 50% for nitrogen and just over 50% for phosphorus since 1990. These reductions resulted in significant declines in nutrient concentrations, and initiated a shift in the dominance of primary producers towards less phytoplankton and more macroalgae. In the last five years eelgrass has also expanded in response to increased water clarity. The reduction in phytoplankton caused a decrease in the biomass benthic macrofauna composed of a drastic decline of filter feeders paralleled by an increase of deposit feeders. This shift was most likely induced by increased stratification reducing the access of filter feeders to plankton in surface water. Reduced benthic filtration probably kept more particles in suspension, which together with increased resuspension due to reduced sediment stability can explain why improvements in water clarity were modest. Further, bottom water oxygen conditions have not improved, presumably because more frequent stratification and higher water temperatures have counteracted the expected positive effects of reduced nutrient inputs. Overall, several ecosystem components demonstrated clear signs of improvement, suggesting that at least partial recovery is attainable with different time lag of the indicators. On this basis we propose a conceptual scheme for recovery of shallow coastal ecosystems following oligotrophication.



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