



Long-term phytoplankton[nutrient interactions in a shallow coastal sea: Algal community structure, nutrient budgets, and denitrification potential

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ABSTRACT: In the eutrophic Marsdiep, the westernmost tidal inlet of the Wadden Sea, phytoplankton biomass, and production almost doubled at the end of the 1970s and remained high ever since. Principal component analysis of 21-yr (1974- 1994) high-resolution time series of the 32 most numerous marine algal species revealed that the phytoplankton community changed drastically both between 1976 and 1978 and again between 1987 and 1988, and that it was relatively stable in-between (1974-1976, 1978-1987) and thereafter (1988-1994). These major changes in phytoplankton biomass and species composition coincided with changes in absolute and relative (TN : TP) nutrient concentrations. During the summer of 1977, the Marsdiep shifted from a rich, but phosphorus-controlled system to an even more eutrophic but nitrogen-controlled environment. The system reshifted towards P-control between 1987 and 1988. The coincidence of the shifts in relative nutrient concentrations and phytoplankton species composition implies a strong causal relationship between TN: TP ratios and phytoplankton community structure. Among diatoms, the observed increase in phytoplankton biomass under eutrophic N-controlled conditions was particularly due to an increase of the abundance of larger algae. Our results indicate that the N budget of the area is correlated with the community structure, suggesting enhanced loss of nitrogen to the sediment through increased deposition of larger algal cells.

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