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Recruitment of planktonic dinoflagellates: importance of benthic resting cysts and resuspension events

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Abstract

Many factors have been put forward to account for the development of nuisance phytoplankton blooms in coastal zones. Usually hydrological factors as temperature or salinity stratification and adequate nutrient and trace metal availability are held responsible for the phenomenon. The most frequent causative organisms for nuisance blooms are dinoflagellates, many of which have a dormant stage (resting cyst) in their life cycle. The role of the complex life-strategies of these fonns in initiating bloom formation is the focus of this study. Special attention is given to 25 different dinoflagellate resting cyst types isolated from recent German North Sea and Baltic Sea sediments, and their gennination frequency under different environmental conditions. Also, the role of cyst resuspension in relationship to the timing, persistence and recurrence of dinoflagellate blooms is extensive discussed.

Summary

The present study highlights the need of pelagic cysts surveys complementary to common benthic cyst studies in order to evaluate the total seed potential for the initiation of dinoflagellate blooms. Abundance of resuspended dinoflagellate cysts in surface waters of the German Bight (North Sea) amounted up to 15 cysts l^{-1}, with highest concentrations (74 cysts l^{-1}) found in Wadden Sea water rich in detrital matter. Living cysts constituted 0-40% of total cyst abundance. The pelagic cyst flora was dominated by *Scrippsiella trochoidea*. Laboratory germination experiments with 25 different cyst types isolated from recent North Sea and Western Baltic sediments show that the germination frequency is usually much higher when cysts are incubated under simulated light and temperature conditions of surface waters in summer (frequency: 50%-100%) compared to cold (4 °C) and dark incubation (frequency: 0%), representing conditions in bottom sediments. This suggests that resuspension events directly influence the recruitment of individuals into planktonic populations. The resuspension of cysts may caused a significant reduction of bloom development time of up to 10 days compared to unique recruitment by residual motile populations.