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# PRESENT AND PAST-MILLENNIA PHYTOPLANKTON BLOOMS IN TWO DIFFERENT EUROPEAN COASTAL AREAS

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### Abstract

Eutrophication, leading to the oxygen depletion in near-bottom water, is one of the important contemporary problems of many coastal areas. However, previous studies suggest, that high primary production and intensive cyanobacteria bloom phenomena might also have occurred in the past. In order to estimate the intensity of the phytoplankton blooms during last millennia, short (up to 50 cm) and long (up to 400 cm) sediment cores were collected in two different European coastal areas – the Gulf of Gdańsk (Poland) and the Oslofjord (Norway). The sediment samples were analyzed for phytoplankton pigments (i.e. chlorophylls-a, -b, -c and selected carotenoids specific for different phytoplankton species), diatoms, biotoxins and toxin-producing phytoplankton organisms. Moreover organic carbon, total nitrogen, stable carbon and nitrogen isotopes, grain-size and selected trace chemical elements were analyzed in the sediment cores. Sediments were dated using <sup>210</sup>Pb and <sup>14</sup>C. To identify biological processes (primary production, phytoplankton taxonomy changes) in the water column which occurred during formation of the sediments, the data were analyzed with application of multivariate statistical methods. Comparison of the results obtained for the long cores and recent sediments indicated that in the historical/past times there were periods of very high primary production, most probably caused by climate variability. Analyzes of carotenoids specific for cyanobacteria as well as cyanobacterial toxins in deep sediment layers confirmed that cyanobacteria blooms occurred also in the past.





#### Analyses

phytoplankton pigments chlorophylls-a, -b, -c; chlorophyll-a derivatives;







## Conclusions

- Pigments in sediments are sensitive markers of primary production and hydrodynamic conditions in adjacent water, e.g. plankton taxonomy and biomass changes, sedimentation/accumulation rate, hypoxia/anoxia and others.
- Cyanobacteria blooms occurred in the Baltic and in the Oslofjord also in the past few thousand years.
- Eutrophication in the Gulf of Gdańsk during Roman Climatic Optimum was comparable or even higher than that observed nowadays.
- During early post-Littorina period there were better oxic conditions than during Roman Climatic Optimum and Littorina Sea.
- Climate has great influence on eutrophication, maybe even greater than anthropogenic factors.







