

Response of the diatom flora in the Gdańsk Basin (southern Baltic Sea) to eutrophication in the last century

Małgorzata Witak

Institute of Oceanography, University of Gdańsk, Gdynia, Poland (malgorzata.witak@ug.edu.pl)

The diatom flora in six short cores (length of 10-20 cm) taken from Gdańsk Basin, southern Baltic Sea, was analyzed in order to response of diatoms to environmental changes over the past 100 years. This study is a part of CLISED project (Climate Change Impact on Ecosystem Health – Marine Sediments Indicators) funded from Norway Grants in the Polish-Norwegian Research Programme. Three cores P116, M1 and P1 were retrieved from the Gdańsk Deep region, whereas P104, BMPK10 and P110 were drilled from the shallower part – Gulf of Gdańsk. The sediment cores were dated by ^{210}Pb and represented time interval of AD 1895-2015. In this period an artificial mouth of the Vistula River near Świbno was excavated and riverine waters flowed directly to the Gulf of Gdańsk. Urbanization, progressive industrialization and an increase in the inflow of waste water had a strong influence on ecosystem in the last 120 years. The transport of large amounts of nutrients, organic matter and pollutants by the rivers resulted in environmental degradation of the Gdańsk Basin and its progressive eutrophication in particular.

Diatoms, being the major component of algal assemblages, are excellent bioindicators for assessing the state of basin ecosystems. They are usually abundant in marine sediments, diverse and sensitive to numerous environmental variables, including physical (e.g. light, temperature, water transparency) and chemical (e.g. pH, alkalinity, nutrient availability) factors. Changes in nutrients concentrations may lead to substantial transformations in the structure of diatom assemblages.

Samples for diatom analyses (ca. 0.3–2.0 g dry sediment) were prepared following the standard procedure for diatom observation under light microscope (Battarbee, 1986). To estimate the concentration of siliceous microfossils per unit weight of dry sediment (absolute abundance), a random settling technique was used (Bodén, 1991). Permanent diatom preparations were mounted in Naphrax[®] (refractive index $n_D=1.73$). The analysis was performed with a NIKON microscope under a $100\times$ oil immersion objective. The raw counts were transformed to relative abundance of the total frustules counted. The diatoms were divided into groups according to their biotype, salinity, trophic and saprobic requirements. The content (in percentage) of all ecological groups were counted in the core.

A total of 145 diatom species including varieties and forms representing 53 genera were identified in all samples. The diatom community was strong dominance by small-size planktic euhalobous (*Thalassiosira levanderi*, *Pauliella taeniata*) and mesohalobous (*Cyclotella choctawhatcheeana*) species. They were accompanied by freshwater eutraphentic and pollution-tolerant forms *Actinocyclus normanii*, *Cyclostephanos dubius*, *Cyclotella atomus*, *C. caspia*, *C. meneghiniana*, *Stephanodiscus hantzschii*, *S. medius*, *S. neoastraea* and *S. parvus*. The assemblage structure is a visible evidence of the progressive anthropopressure recorded in the near-bottom sediments of the Gdańsk Basin. Moreover, changes in spatial distribution of diatom anthropogenic assemblage show the close relationship to the distance from mouth of the Vistula River.