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Diatoms as a proxy in reconstructing Late Holocene environmental changes in SE Baltic Sea - a case study of the Gulf of Gdańsk sediments

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Diatoms, being the major component of algal assemblages of almost all aquatic habitats, are sensitive to numerous environmental variables. Their development is influenced by access to light, the thermal state of the basin, its hydrodynamics and the depth regime. Diatoms also respond to salinity fluctuations, to dissolved oxygen content and to the concentration of nutrients. Changes of environmental parameters impact the variability of the structure of diatom assemblages. Such changes influence the abundance, species composition and relationships within diatom assemblages which develop under a set of a given environmental parameters. Relationships between diatom taxa and environmental variables serve as a basis for establishing bioindicator systems which rely on such parameters as salinity, pH, trophic state and saprobity. Fossil diatoms have shown great potential for reconstruction of Baltic Sea evolution in Holocene. They are very sensitive indicators of the last three stages of the Baltic Sea development i.e. Littorina Sea (marine), Post-Littorina Sea (brackish-water), Recent Baltic Sea (brackish-water, eutrophication).

The aim of this study is to reconstruct environmental variability in the Gulf of Gdańsk, SE Baltic in Late Holocene (ca. last 5 ka) including the latest changes associated with an anthropogenic factor. 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. The material used for the diatom analyses was taken from 384 cm long core P-116, which was collected from the water depth 89 m. 125 samples (ca. 0.3–2.0 g dry sediment) were prepared following the standard procedure for diatom observation under light microscope. To estimate the concentration of siliceous microfossils per unit weight of dry sediment (absolute abundance), a random settling technique was used. Permanent diatom preparations were mounted in Naphrax® (refractive index $n_D=1.73$). The analysis was performed with a NIKON microscope under a 100× 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.

Based on species composition and relative abundance of individual taxa and ecological groups, four diatom assemblages zones (DAZ) were distinguished in the core. The occurrence of some marine planktic diatoms i.e. *Thalassionema nitzschioides*, *Cocconeis radiatus* in 116-A DAZ (384-322 cm) can be indicative of marine stage of Littorina Sea (ca. 8.5-4.5 cal. y BP). Two next zones are corresponded to brackish-water stage of Post-Littorina Sea (ca. 4.5-0,5 cal. y BP). In 116-B DAZ (322-210 cm) large-sized marine taxa i.e. *Actinocyclus octonarius*, *Coscinodiscus asteromphalus*, *C. marginatus*, *C. oculus-iridis*, *C. obscurus* are accompanied by brackish-water diatoms represented mostly by *Chaetoceros* spp. (resting spores). In 116-C DAZ (210-40 cm) marine species *Pseudosolenia calcar-avis* and *A. octonarius*

dominated. In addition, brackish-water *Thalassiosira baltica* and halophilous *A. normanii* var. *subsalsa* appear in taphocoenosis. The last environmental change associated with the progressive anthropopressure was registered in the near-bottom sediments of 116-D DAZ (40-0 cm). The higher number and abundance of eutraphentic and pollution-tolerant taxa representing small-sized planktonic forms characterized diatom anthropogenic assemblage of the Gulf of Gdańsk. This community dominated by *Thalassiosira levanderi*, *T. lacustris*, *Cyclotella caspia* and *C. choctawhatcheeana* documented the strong influence of polluted Vistulian waters on recent hydrology of the Gulf of Gdańsk in the last 120 years.

