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Sediment microbial activity and its relation to environmental variables along the eastern Gulf of Finland coastline

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Abstract

Sediment microbial activity and its relationship with the main environmental factors and pollutants were examined in the coastal area of the eastern Gulf of Finland, Baltic Sea. The activity of two common oxidoreductase enzymes: dehydrogenase (DA) and catalase (CA) varied significantly between 13 study sites. In the Neva Bay the highest microbial activities (DA: 2.64 mg TFF (10g)⁻¹ day⁻¹, CA: 6.29 mg H₂O₂ g⁻¹) were recorded, while in the outer estuary the minimum values of dehydrogenase and catalase were measured. DA, CA, and abundances of culturable heterotrophic bacteria (CHB) were positively correlated with each other, while biomass of green opportunistic algae was independent of both microbial activities and CHB. Enzymatic activity was found to be strongly positively correlated with sediment particle size and organic matter content, but unrelated to the other studied environmental parameters (temperature, pH, and salinity). Principal components analysis (PCA), controlling for environmental variables, supported direct effects of metal and oil contamination on sediment microbial activity. Also it had shown the similar patterns for algal biomass and metals. Our results suggest that copper and hydrocarbons are the main anthropogenic variables influencing enzyme distribution along the eastern Gulf of Finland coastline.

Key words: sediments, microbial activity, metals, labile fraction, hydrocarbons, Baltic Sea

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