

Institute of Oceanology Polish Academy of Sciences

Oxygen Consumption in Shallow Waters of the Bay of Gdansk

Introduction

In the Gulf of Gdansk there are many benthic habitats in populated by different macrozoobenthos species. The differences in species occurrence depending on the habitat will result in different oxygen demand in a given bottom area. Investigating oxygen consumption by placing a sensor in a particular habitat will allow for accurate identification of local oxygen demand. This is crucial knowledge in the context of increasing anaerobic areas that endanger both the Gdansk Bay and the Baltic Sea.

Methods

Measurements with the oxygen logger AquapHOx-L-O2 were carried out three times in an area at the mouth of the Plutnica River (Gulf of Gdansk). Each time the AquapHOx logger was placed in a sealed incubation chamber. The first measurement



Figure 1. The AquapHOx-L-O2 in situ

was made on a sandy substrate with no apparent presence of macro-algae (Figure 1). The second measurement was taken on a sandy substrate with a clear presence of macro-algae, but started about three hours later than the first measurement. The third measurement was also taken on a sandy substrate with macro-algae, but was started at the same time as measurement number one. Benthic macrofauna were also sampled from the study area, as well as samples for sediment chlorophyll-a analysis and sediment granulometric analysis.

Results

The initial oxygen content (approx. 9 mg/L) did not differ from the values usually obtained in the environment in the coastal zone of the Bay of Puck. In the case of a substrate consisting of clean sand, oxygen levels began to drop immediately (Figure 2). Initially slightly, but after about 3h of incubation, the rate of decrease increased significantly. The respiration rate under normal conditions (up to 4 mg oxygen/L) was -0.4 mg/L/h. Under anoxic conditions (4 - 2 mg oxygen/L), it increased to -0.5 mg/L/h. Under hypoxic conditions (<2 mg oxygen/L), decreased to -0.23 mg/L/h.

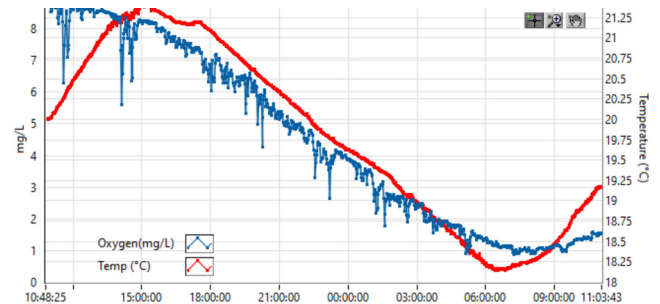


Figure 2. Oxygen concentration during incubation

Conclusions

The obtained results reflect the behaviour of the benthic community to changing oxygen conditions in the water. During the first stage of incubation up to 4 mg oxygen/L, normal functioning of the organisms is evident. In the next stage under anoxic conditions, there is increased respiration due to the desire of the benthic organisms to escape from the oxygen-reduced area. In the final stage of incubation under anoxic conditions (<2 mg oxygen/L), dormancy is evident in organisms whose activity has decreased to a minimum in order to survive the period of oxygen depletion.

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