



Międzynarodowa Środowiskowa Szkoła Doktorska
przy Centrum Studiów Polarnych
w Uniwersytecie Śląskim w Katowicach

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IEDS/2026/IO/06

The impact of pollutants on Baltic microorganisms colonizing plastic.

The leading unit: Institute of Oceanology, Polish Academy of Sciences.

Requirements:

- 1) Master's degree in the field of Chemistry, Biology, Oceanography, or similar. Knowledge of research topics related to Marine Chemistry & Marine Biology.
- 2) Good computing skills and knowledge of basic programs used in data analysis and visualization (e.g. ArcGis, Statistica, R, Matlab); knowledge (or willingness to learn) of the operation of equipment for the analysis of chemical compounds, such as a gas chromatograph or a liquid chromatograph.
- 3) Knowledge of English sufficient for communication and for reading and writing scientific papers.

Tasks description:

1. Getting to know and preparing equipment for field and laboratory measurements.
2. Planning, preparation, and conducting laboratory experiments to study the effects of contaminants on biofilm formed on plastic surfaces.
3. Participation in field work conducted in coastal waters (*in situ* experiments)
4. Interpretation of the obtained results, including statistical analyses.
5. Regular reporting of work progress.
6. Preparation of scientific publications and conference presentations.
7. Collaboration with team members and assistance in the scientific activities of the Marine Chemistry and Biochemistry Department of IO PAN, including maintenance of measuring equipment.

Abstract:

The southern part of the Baltic Sea can be considered a hotspot for microplastic accumulation. The seabed is often the final sink where plastics settle for extended periods. Once plastics enter the marine environment, they are colonized by microorganisms within a few hours,



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leading to the formation of a biofilm. Plastic covered with biofilm, referred to as the plastisphere, can sorb various pollutants from aquatic environments. Understanding the interactions among plastics, biofilms, and pollutants is crucial for assessing the potential threats posed to marine organisms across different trophic levels. Despite the urgency of this issue, there is still a significant gap in comprehensive, multi-stage investigations into the interactions among plastics, biofilms, contaminants, and organisms in this region. Furthermore, the role of aged plastics and the environmental behaviour of novel materials, such as bioplastics, requires thorough investigation.

The proposed doctoral project aims to investigate the response of Baltic Sea microorganisms colonizing plastics to contaminants. The study of multiple contaminant types on plastic surfaces and biofilms is important because their combined presence may lead to amplified toxicity and adverse effects on marine organisms. Different contaminants may interact synergistically, resulting in more severe biological effects than those caused by individual compounds alone. Biofilms constitute a superficial organic layer that may act both as a sorptive phase and as a barrier hindering the diffusion, uptake, and release of chemicals. The doctoral project includes, among other aspects, assessing the mortality of Baltic microbial populations colonizing various types of plastics following exposure to contaminants. The dissertation will also investigate the sorption and desorption of contaminants by different types of plastispheres. Understanding these processes will help assess the potential transfer of contaminants to higher trophic levels and evaluate their effects on selected aspects of marine ecosystem functioning.

Other information:

The work will be carried out under the supervision of:

prof. Ksenia Pazdro (pazdro@iopan.pl), Institute of Oceanology, Polish Academy of Sciences
and Dr Eng. Anna Pouch (apouch@iopan.pl), Institute of Oceanology, Polish Academy of Sciences

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