

**Assessment of exposure of
organisms to persistent
organic pollutants
(POPs) in marine coastal
ecosystems**

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Post-doctoral thesis in earth sciences.

The post-doctoral thesis ‘Assessment of exposure of organisms to persistent organic pollutants (POPs) in marine coastal ecosystems’ was written by Dr Ksenia Pazdro of the Institute of Oceanology, Polish Academy of Sciences, Sopot (<http://www.iopan.gda.pl>). The thesis was published by IO PAS Publishers, Sopot, in 2007 as volume 20 in the ‘Dissertations and monographs’ series. It consists of seven parts: introduction; persistent organic pollutants (POPs) in marine organisms – a literature review; aim and scope of the study; materials and methods; results and discussion; summary and conclusions; references. In addition, there is a list of the abbreviations and acronyms used in the work, a list of figures and a list of tables, as well as an English-language summary. In total the thesis covers 195 pages.

The thesis deals with the mechanism by which polychlorinated biphenyls (PCBs) and polyaromatic hydrocarbons (PAHs) are accumulated by plankton, bivalves and fish in the Gulf of Gdańsk. The proportions of POPs absorbed from the water and from food, i.e. biomagnified in the trophic chain, were estimated quantitatively. These questions are interesting from the ecotoxicological standpoint, and they are also of practical significance in view of the large quantities of fish used in the food industry.

Despite the substantial research effort and the large number of publications, knowledge of the mechanisms of POP bioaccumulation is still incomplete. In order to satisfy the increasing demands generated by the rising standard of living and the increasing population of the world, technological progress has had to encroach into many different areas of life.

The complete text of the paper is available at <http://www.iopan.gda.pl/oceanologia/>

Industry, transport, agriculture and the household are therefore sources of many chemicals that are harmful or downright dangerous to living organisms. A considerable proportion of these pollutants reach the sea, thereby contributing to the rising contamination of the marine environment. If we are to produce reliable forecasts of the effects of POPs on this environment, then we must have knowledge of the concentrations of these substances in the sea and understand the mechanisms of their accumulation by living organisms.

The author opens her thesis with a brief historical account of how POPs came to be present in the natural environment. She also justifies the need to implement quick and simple techniques for measuring their concentrations in the marine environment.

In the next part of her work the author characterises selected POPs, including PCBs, organochlorine pesticides and PAHs; she also devotes much attention to the migration of POPs in marine ecosystems and discusses their influence on aquatic organisms. She highlights the importance of the availability of POPs for their bioaccumulation in organisms at the species level and in their further transfer along the trophic chain (biomagnification). She presents the biotic and abiotic factors determining the course of these processes and discusses in great detail the quantitative methods of estimating POP accumulation in organisms from different trophic levels; the same applies to the application of semi-permeable membranes and trioleins. She supports her position vis-à-vis the research questions with meticulously selected literature references.

The aim of the study was to assess the above-mentioned methods of defining the exposure of aquatic organisms to POPs in coastal marine ecosystems. To achieve this, it was essential to:

- analyse the concentrations of selected POPs (HCB, γ -HCH, seven indicator PCB congeners and twelve PAH isomers) in abiotic components and in organisms of the trophic chain in the Gulf of Gdańsk ecosystem;
- determine the bioconcentration factor (BCF) and biomagnification factor (BMF) for the effects taking place in the environment;
- expose under laboratory conditions bivalves and semi-permeable membrane devices (SPMDs) to POPs present in water or sediments;
- perform in situ experiments involving the simultaneous exposure of bivalves and SPMDs to POPs;
- compare the numerical values of BCF and BMF for POPs in aquatic organisms and SPMDs;
- determine concentrations of POPs on the basis of their SPMD contents.

This study required a series of laborious and time-consuming experiments to be carried out, not to mention knowledge from a wide range of disciplines, including analytical chemistry, marine chemistry, biology and aquatic toxicology.

In my judgement, the experiments and the measurements were carried out with great care, and that the analytical techniques applied were the correct ones. The means of verification ensured excellent reliability of the analyses of all the materials investigated.

The published research results are very well substantiated. I would like to lay particular emphasis not only on the extremely broad range of analyses carried out, but also on the very considerable number of samples and their representativeness. This made for a convincing statistical analysis.

The experimental evidence and the discussion fully justify the conclusions of the study. The results of field studies and the model experiments in the laboratory demonstrate irrefutably that, bioindicators apart, the technique using semi-permeable membrane devices (SPMDs) can be used to estimate the exposure of organisms to POPs. The method is accurate and can be used to monitor concentrations of POPs, i.e. PAHs, and organochlorine compounds such as HCB, γ -HCH and PCBs. Moreover, not only is it simple to apply, accurate and precise, it is also inexpensive.

Recapitulating, I would like to say that Dr Ksenia Pazdro's post-doctoral thesis 'Assessment of exposure of organisms to persistent organic pollutants (POPs) in marine coastal ecosystems' is interesting and worth reading. A title has turned up on the book market that combines practical aspects (measurements) with innovation (SPMDs) in an interesting way with the aim of acquiring a better understanding of how pollutants are transferred along the trophic chain. The results of the study are scientifically valuable and do indeed extend our knowledge of POP biomagnification.

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