



NATIONAL SCIENCE CENTRE
POLAND

Project MerABO

Mercury accumulation in benthic organisms from polar regions

Until recently, it was thought that both the Arctic and Antarctic are not affected by intense human activity on other continents. However, continuous changes in climate, resulting in glaciers melting in the Arctic, have highlighted the problem of pollution in these distant regions. One of the dangerous pollutants affecting ecosystems is mercury (Hg), which despite its well-known toxicity, is still used in many industries. Hg is mainly emitted into the atmosphere, where more than 90% of total mercury is in a non-reactive form. This implicates the time that this element can stay in the atmosphere, and in case of elemental mercury (dominant gaseous form) it might count up to a year. Combined with its properties, especially its high volatility, mercury can be transported at very long distances, becoming a cross-border pollution. Thereby, mercury emitted in e.g. Europe can reach the Arctic or Antarctic, where it can be oxidized and deposited on the surface. In this way, pollution-derived mercury adds to the pool of this metal of natural origin in polar regions. Mercury is dangerous, especially for the marine ecosystem, due to its tendency to undergo methylation processes in particular aquatic environments. As a result of changes taking place with the participation of bacteria, methylmercury (MeHg) is formed, the most toxic mercury compound, which can even pass through the blood-brain and placental barriers. Mercury is also biomagnified, that is, with each subsequent link in the food chain, its concentration increases in the body. Therefore, the top predators – including humans, marine mammals, and polar bears - that are at the top of the food chain receive the highest doses. Due to the toxicity of this element, it is widely studied in various compartments of the environment; however, in the polar regions, the number of conducted researches is smaller compared to other regions.

The main research on mercury in the Arctic and Antarctic focuses on the analysis of total mercury. However, from diversified sources, different forms of mercury can be emitted, which determines its toxicity and properties. Therefore, the project aims to estimate the bioavailability of mercury to benthic organisms in the polar regions. The results of the project will estimate the amount of mercury from melting glaciers and their impact on the benthic ecosystem in the Arctic and Antarctic regions. The conducted research will also allow the two polar regions to be compared in terms of the presence of different forms of mercury. In addition, the study of various marine organisms can help assess their suitability as indicator organisms for mercury pollution. Samples of marine sediment and organisms were collected from the Arctic and Antarctic regions. The first

research area will be the Spitsbergen fjords (Kongsfiorden, Hornsund, and Isfjord), where samples were taken from stations located directly in the vicinity of the glacier, as well as from a remote distance from the glacier and near rivers. The second research area will be the South Shetland region. Data on Antarctic samples will be obtained thanks to cooperation with the University of Gdańsk within the OPUS project "Benthic organisms as an indicator of mercury sources in the Antarctic coastal zone (Admiralty Bay)" 2019/33/B/ST10/00290.