

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 over 90% of total mercury is 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 pass even through the blood-brain and placental barriers. Mercury is also biomagnified, i.e. with each subsequent link in the food chain, its concentration increases in the body. Therefore, top predators – including humans, marine mammals, and polar bears – which 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 the conducted research is smaller compared to other regions. The main mercury research in the Arctic and Antarctic focus on the analysis of total mercury. However, from diversified sources, different forms of mercury can be emitted, what determines its toxicity and properties. Therefore, the project aims to estimate the bioavailability of mercury to benthic organisms in the polar regions. Project results 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 to compare the two polar regions in terms of the presence of different forms of mercury. In addition, the study of various marine organisms can assist in assessing 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 at the glacier vicinity, 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.