
Specifics of microplastics pollution assesment in the Arctic coastal waters

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Abstract

Coastal areas act as transition zones between freshwater and marine compartments and are important for understanding the fate of microplastics (MPs) in the marine environment. Microplastic pollution in estuaries emphasized that a uniform framework that dictates sampling and detection methodologies is urgently needed to better understand the extent of MPs pollution among estuaries and other ecosystems.

As part of the project HAMPSTER (harmonization of methods of marine microplastic assessment in the Arctic), fieldwork in Svalbard fjords was conducted in July 2021 and 2022. MPs pollution was studied in the central part of Isfjorden and its branches – Grønfjorden, Adventfjorden, Sassenfjorden and Templefjorden. Sampling locations were chosen in order to study MP concentrations in environments with different hydrophysical and hydrochemical conditions. The collection of MPs floating on the sea surface was carried out by net trawling with three-time sampling at each location. Additionally, continuous measurements of temperature, salinity, oxygen and pH were conducted during MPs sampling.

High variability was found within one fjord indicating importance of local hydrophysics in MPs distribution reinforces that real estuarine MPs can hardly be described by a single sample, even for one small fjord. As a bare minimum, triple repetition of any sampling approach is advised in areas with relatively stable hydrophysical condition and at several sampling sites in case of contrasting hydrophysical conditions in an estuary. It was found that under favourable conditions, i.e. wind blowing into the fjord in the absence of intensive river runoff (in 2021), inner parts of fjords can reveal potential MPs accumulation sites. High riverine input (in 2022) resulted in effective MPs removal from the fjords. Importantly, we highlight that hydrophysical conditions in the area of interest (wind/current direction and speed, intensity of river outflow) must be considered when identifying relevant sample sites and predict potential accumulation zones.

Keywords: microplastics, fjords, Svalbard, hydrophysics, Arctic, harmonization

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