
HELCOM BLUES case study: Microplastic concentrations in marine bottom sediments of the German Baltic Sea

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Abstract

Within the HELCOM BLUES project Activity 3 "Marine Litter" aims to support the work of the EU's MSFD Technical Group on Marine Litter (TG Litter), as well as to promote the harmonisation of regional work on marine litter indicators and threshold values with TG Litter work. Therefore, guidelines on monitoring microlitter in seabed sediments and surface water have been drafted according to existing approaches and feasibility. These draft guidelines are currently applied within a case study to seabed sediments from the southern Baltic Sea.

In total, 29 grab sediment samples were taken in cooperation with Federal Agencies of Schleswig-Holstein and Mecklenburg Western-Pomerania in 2021 and 2022. Sampling areas were located in Flensburg fjord, Kiel fjord, Lübeck bay, Warnow estuary and Pomeranian bay. Three samples with increasing distance to the coastline were taken within each area. Additionally, three offshore stations within the Exclusive Economic Zone (EEZ) were included in the study.

Sample preparation consisted of biogenic organic matter removal by adding a digestion solution (NaClO 6-14 % and KOH 10M) with subsequent wet sieving (20 μ m) and density separation with NaI (density: 1.7 g/cm³). Sample suspensions were stained with Nile red (1 mg/ml in chloroform) and transferred to aluminium oxide filters (Anodisc 25, Whatman, 0.2 μ m retention). Potential microplastic particles were detected via fluorescence microscopy (Axioscope 5/7 KMAT, Zeiss). A subset of identified microplastic particles were investigated for their polymer composition via μ Raman spectroscopy (DXR2xi Raman Imaging Microscope, Thermo Fisher Scientific).

According to preliminary results, a total of 7,688 particles are recorded comprising predominantly fragments (89 %), followed by microbeads (9 %) and fibers (4 %). Within the areas of Flensburg fjord, Kiel fjord, Lübeck bay and Pomeranian bay decreasing microplastic particles per kg dry weight with increasing distance from the coastline are detected.

Keywords: Monitoring, Seabed sediments, Baltic Sea, HELCOM, HELCOM BLUES, Nile red, Density separation

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