The role of salt marshes in the occurrence of microplastics in the Bahia Blanca Estuary (Argentina), South Atlantic

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Abstract

Microplastics (MPs) are ubiquitous particles that accumulate in natural environments, being estuaries one of the most impacted in-between marine coastal ecosystems. The objective of this study was to assess MPs abundance and distribution in the Bahía Blanca Estuary (BBE). Samples were collected in 3 salt-marshes of the BBE: Maldonado stream, Rosales Harbour, and the sewage discharge of the city where 3 sediment samples were taken both in vegetated (Spartina alterniflora) and not vegetated mudflat. Physicochemical parameters were also measured. For MPs analysis, 50 grams of sediment was digested with 30% H2O2 at 45°C. Subsequently, a flotation separation was performed with a pre-filtered saturated NaCl solution. Samples were shaken for 5 minutes and allowed to settle for at least one hour. The supernatant was then filtered through pre-burned GF/F filters (0.45 um). The extraction procedure was performed twice for each sample and then, the retained particles were visually inspected under a stereomicroscope. The highest concentration of MPs was found in the vegetated sediment at Maldonado River discharge $(165.21\pm93.34 \text{ item/kg w.w})$ followed by the vegetated sediment at the sewage discharge $(134.20 \pm 117.10 \text{ item/kg w.w})$. Rosales Harbour mudflat showed the lowest MPs concentrations $(82.22 \pm 49.80 \text{ item/kg w.w})$. Although various types and shapes of MPs were assessed in all of the samples, blue and black fibers were found in greater proportion. MPs found in the different coastal marshes are consistent with the degree of previously addressed anthropogenic impact. For instance, an open garbage dump has been characterized at the outlet of the Maldonado stream while the sewage discharge receives sewer outlet with after pre-treatment (no filtering or microparticles retention systems). Vegetated areas at these locations show a relationship between the density of vegetation and the number of MPs present, indicating a clear MPs retaining effect of the salt marshes.

Keywords: microplastics, estuary, sediment vegetated, mudflat

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