An overview of the source, characteristics and fate of microplastics in a transitional environment from the i-plastic project: the Ebro delta System (NW Mediterranean)

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Abstract

The ongoing JPI-Ocean i-plastic project aims to comprehensively ascertain the dynamics of microplastics in coastal systems. We focus on transitional environments under distinct flow and climate regimes. Here we present the results obtained from one of the three targeted estuary systems by the project: the Ebro Delta (NW Mediterranean Sea). This estuary is affected by a micro-tidal regime and characterized by the development of a salt-wedge. The wedge shape is a result of the denser seawater diving below the river freshwater and intruding the Ebro River up to 25 km upstream from the mouth. The different sampling campaigns carried out over the last two years include sampling of different environmental matrices both inside and outside the estuary. Within the estuary, surface freshwater outflow and deeper seawater inflow were regularly sampled along with the riverbed sediments and the effluent of a wastewater treatment plant discharging directly into the river. While outside of the estuary, the beaches surrounding the delta, the marine surface waters and the seabed sediments, within and outside the river plume, were regularly sampled. Commercially valuable species were collected to assess the health status in relation to microplastics ingestion. A pristine estuarine marine sedimentary record was also analysed to assess the accumulation rate and mass of microplastics in the sediment over the last ±60 years. The results show that the freshwaters of the river represent a source of microplastic to the Mediterranean Sea while

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the estuarine sediment represents a sink for this pollution. The accumulation of microplastic in the coastal marine sediments increased exponentially over the last ±60 years, while no significant pathological conditions were observed in the targeted biota. Finally, the results obtained were used to feed a regional dispersion model to assess the residence time and fate of the microplastics once they reach the marine system.

Keywords: "i, plastic", transitional environments, freshwater, marine water, biota, estuary