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Macroplastics monitoring in the Sea Scheldt estuary

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The presence of small plastic fragments in open ocean water was first noticed in the 1970’s. Throughout the last decade, the scientific interest has been renewed and has pointed out that rivers may act as sinks for land-based plastic pollution and a potential major source of marine plastic debris, thus presenting an environmental threat. As a long-term consequence, plastic fragmentation will lead to pollution release that can impose a negative impact on river, as well as marine ecosystems, especially once they enter the food webs. As a result, this is a topic of increasing concern, but research on this issue is still in its early stages with fundamental gaps in the understanding of the sources, transformation pathways, fragmentation processes, fate of the land-based plastic pollution and estimates of the riverine plastic flux in general.

In order to identify the most polluting rivers and to prioritize mitigation efforts, accurate estimates of global riverine plastic emissions are required. The present work is aimed to give an overview of the morphology, size and composition of plastic debris found in the Sea Scheldt estuary (Belgium). For that purpose, in 2018, 3 sampling campaigns were performed by using an anchor netting technique with the mesh size of the nets progressively becoming smaller, reaching 5 mm at the tip of the nets. The samples originating from the Scheldt were separated into two categories based on their appearance (morphology) and size. The morphology consisted of 5 classes: fragments, foam, foil, filaments and pellets, whilst the size was divided into 6 categories: 0-2.5 cm (where 0 represents smallest size of the mesh being 5 mm); 2.5-5 cm; 5-10 cm; 10-20 cm; 20-30 cm; and larger than 30 cm. As a result, a grand total of 12,801 plastic items were collected. On average 1.6×10^{-3} items per m^3 were found as suspended fraction of plastic debris in the Scheldt river. Foils were the most abundant with more than 88% of the samples being characterized as such, followed by fragments for 11% of the samples and filaments constituting less than 1% of the plastic debris. By using FTIR, polypropylene and polyethylene were identified as the most common polymers found with an abundance of more than 70%. This can be expected, as polypropylene and polyethylene make up for more than 50% of the plastic production in general. Finally, analysis of plastic debris by using μ-XRF spectrometry presents a good method for the identification of the mineral elements present. Ca, P, S and Si are the most abundant elements in the plastic debris, followed by Al, Fe and Ti.

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