(Micro)plastics in sediment and water samples of the rivers Elbe and Lahn, Germany

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Introduction: Plastic pollution in the aquatic environment has gained worldwide attention in the last years. Inappropriate disposal, so-called littering of plastics [1], leads to an increasing presence in the natural environment. Large parts of the plastics reach the oceans via rivers [2]. In order to study the transport and deposition of microplastic particles in water and sediment, several German rivers were investigated in the frame of the project "Microplastic in German waterways". In total, water and sediment samples from 11 sites from the river Elbe between Dessau and the shoal Vogelsand outside the Elbe estuary in the North Sea as well as four sites of the river Lahn upstream and downstream of the effluent of a waste water treatment plant were taken for studying the microplastic pollution.

Methods: The sediment samples were taken with a Van-Veen-grabber, the water samples from the Elbe with an Apstein plankton net (mesh size 150 µm) and from the Lahn with a continuous flow centrifuge, whose effluent was sieved by a plankton net (5 µm). The Elbe sediment samples were presorted by wet sieving, organic matter was digested and microplastic particles were separated from remaining matrix via density separation. For the Lahn samples, the sediment matrices were reduced by electroseparation [3]. For both the Elbe and the Lahn samples, the organic matter was digested using a reagent composed of equal volumes of 10 M KOH and 30 % H_2O_2 and neutralized with formic acid. Then, the (micro)plastic particles were isolated from remaining matrix by density floatation using 1.6 g/mL potassium formate solution and pressure filtration on aluminium oxide filters.
Analysis was done by visual inspection, selected particles measured with pyrolysis GC-MS and Fourier-transform infrared microscopy.

Results: The results of the sediments of the Elbe point to a microplastic concentration depending on the sampling site and to a decrease in the flow direction. The form of the particles
is also site specific. In two samples, more than 80% spheres were counted whereas the 6 locations downstream reveal an increase in fragments. Polystyrene and polypropylene particles are dominating. The water samples, in contrast, only show a site specific microplastic concentration.
The Lahn water samples clearly reveal a higher concentration of particles in the samples downstream the effluent of the waste water treatment plant.

Discussion: The results of the Elbe clearly show that more microplastic particles are found in the sediment compared to the water samples. Surprisingly, the amount of particles varies significantly between the sampling sites and does not increase downstream.

References: [1] Vince & Hardesty (2017) Restoration Ecology **25** [2] [2] Koelmanns et al. (2014) Environmental Toxicological Chemistry **33** [3] Felsing et al. (2018) *Environmental Pollution* **234**