

i-Plastic: Surface and Water Column Microplastics From the Coastal North Eastern Atlantic (Portugal)

Authors : Beatriz Rebocho, Elisabete Valente, Carla Palma, Andreia Guilherme, Filipa Bessa, Paula Sobral

Abstract : The global accumulation of plastic in the oceans is a growing problem. Plastic is transported from its source to the oceans via rivers, which are considered the main route for plastic particles from land-based sources to the ocean. These plastics undergo physical and chemical degradation resulting in microplastics. The i-Plastic project aims to understand and predict the dispersion, accumulation and impacts of microplastics (5 mm to 1 μm) and nano plastics (below 1 μm) in marine environments from the tropical and temperate land-ocean interface to the open ocean under distinct flow and climate regimes. Seasonal monitoring of the fluxes of microplastics was carried out in (three) coastal areas in Brazil, Portugal and Spain. The present work shows the first results of in-situ seasonal monitoring and mapping of microplastics in ocean waters between Ovar and Vieira de Leiria (Portugal), in which 43 surface water samples and 43 water column samples were collected in contrasting seasons (spring and autumn). The spring and autumn surface water samples were collected with a 300 μm and 150 μm pore neuston net, respectively. In both campaigns, water column samples were collected using a conical mesh with a 150 μm pore. The experimental procedure comprises the following steps: i) sieving by a metal sieve; ii) digestion with potassium hydroxide to remove the organic matter original from the sample matrix. After a filtration step, the content is retained on a membrane and observed under a stereomicroscope, and physical and chemical characterization (type, color, size, and polymer composition) of the microparticles is performed. Results showed that 84% and 88% of the surface water and water column samples were contaminated with microplastics, respectively. Surface water samples collected during the spring campaign averaged 0.35 MP.m⁻³, while surface water samples collected during autumn recorded 0.39 MP.m⁻³. Water column samples from the spring campaign had an average of 1.46 MP.m⁻³, while those from the autumn recorded 2.54 MP.m⁻³. In the spring, all microplastics found were fibers, predominantly black and blue. In autumn, the dominant particles found in the surface waters were fibers, while in the water column, fragments were dominant. In spring, the average size of surface water particles was 888 μm , while in the water column was 1063 μm . In autumn, the average size of surface and water column microplastics was 1333 μm and 1393 μm , respectively. The main polymers identified by Attenuated Total Reflectance (ATR) and micro-ATR Fourier Transform Infrared (FTIR) spectroscopy from all samples were low-density polyethylene (LDPE), polypropylene (PP), polyethylene terephthalate (PET), and polyvinyl chloride (PVC). The significant difference between the microplastic concentration in the water column between the two campaigns could be due to the remixing of the water masses that occurred that week due to the occurrence of a storm. This work presents preliminary results since the i-Plastic project is still in progress. These results will contribute to the understanding of the spatial and temporal dispersion and accumulation of microplastics in this marine environment.

Keywords : microplastics, Portugal, Atlantic Ocean, water column, surface water

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