

Distribution and characterization of microplastics in the marine sediments from the Montenegrin coast

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Introduction: Microplastic pollution represents a scientific topic that has received increasing attention over the last decade, due to the constant increase in plastic production and its subsequent disposal and accumulation in the marine environment. The term microplastics (MPs) refers to ubiquitous plastic particles smaller than five millimeters (5 mm) in size [1]. The accumulation of MPs in marine sediments was documented, by the literature, for the first time in 2004 [2]. Worldwide reports of MPs in marine sediments remarking the large spatial distribution of this contaminant and therefore the possible implications which MPs might have in marine habitat and food webs [3]. The purpose of our study was visual and chemical identification MPs in sediments collected during the autumn of 2019 on the Montenegrin coast.

Methods: Samples of surface sediment were collected at ten selected locations in the Montenegrin coast using Van Veen grab, frozen at -18 °C and freeze-dried at -40 °C for 48 h (CHRIST, Alpha 2-4 LD plus, Germany).

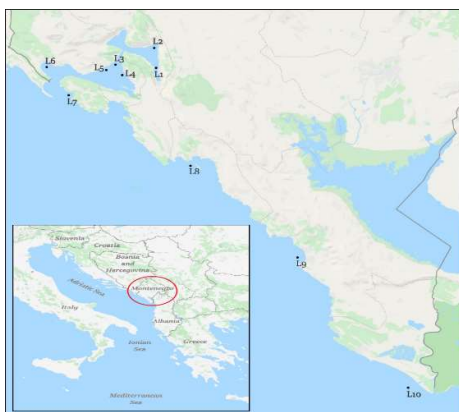


Fig. 1: Study area and sampling stations

For MPs density separation, we used a method which is currently the most widely used, relies on the density of a concentrated NaCl solution (1.2 g/dm³) to separate sediment from microplastic particles [2]. These samples were analyzed under a microscope to identify and count the number of MPs particles present in the sample. Visual analysis of particles was performed using an Olympus SZX16 imaging microscope. Particles were analyzed for their chemical structure using ATR-FTIR and micro FTIR spectroscopy. FTIR offers the possibility of precise

identification of plastic polymer particles according to their characteristic IR spectrum and provides information on microplastic samples: measurement of number, particle size and identification of polymers.

Results and discussion: MPs were found in all sampling sites on the Montenegrin coast. The first preliminary results indicate that marine sediments in the present study are moderately or very high polluted with MPs compared with literature data. Results of MPs particle in sediment samples on the Montenegrin coast are expressed as total number of MPs recovered per 100 g dry weight of sediment. The primary MPs shape types by number were: filaments > fragments > granules > films.



Fig 2. Preliminary percentage distribution (%) of dominating MPs particles in sediments in three of ten sampling sites in the Montenegrin coast

The high MPs contamination in sediments, registered in some locations of the present study, showed that higher levels were usually observed in areas with high population density and high industrial activities i.e., with magnified anthropogenic activity. This study gives a first insight into pollution and spatial distribution of MPs particles in sediments on the Montenegrin coast.

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References: [1] Claessens et al. (2011) *Mar. Pollut. Bull.* **62**: 2199–2204; [2] Thompson et al. (2004) *Science* **304**, 838; [3] Van Cauwenbergh et al. (2015) *Environ. Pollut.* **199**: 10–17.