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Sampling and analysis of Microplastics in the coastal area from the Estuary of Kelani River to the Estuary of Mahaoya

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Plastic particles that are less than 5 mm in dimension are referred to as microplastics (MPs). The formation of MPs can occur either by fragmentation of macroplastics (secondary MPs) or the production of micro-sized plastics (primary MPs) for intended applications. MPs have been identified as an emerging threat to the environment. MP pollution in marine environments around the globe is severe, and enough precautions have not been taken so far for its prevention. The focus of this study was to adopt suitable methods to collect and separate MPs from beach sediment and seawater samples and to identify their presence and the type by the optical microscopy and FTIR-ATR spectroscopic techniques, respectively. Therein, the distribution, types and abundance of MPs along the western coast from the Estuary of the Kelani River to the Estuary of Mahaoya in Sri Lanka were investigated while selecting nine sites along a stretch of 42 km (Hendala, Wattala, Uswetakeiyawa, Sarakkuwa, Bopitya, Dungalpitiya, Morawala, Browns beach and Estuary of Mahaoya). Random sampling was employed to collect a minimum of 8 sediment samples from each site within a 100 m area stretch in the intertidal zone of the beach during October and December 2021. Water samples were also collected parallel to the sediments from the ocean surface. A digestion method was tested and validated using KOH and Methanol. Sodium bromide was used as the density separator to extract MPs from sediment samples as an efficient method. The analysis revealed the presence of MPs in different colours (blue coloured fragments, blue and white coloured fibers, and white and yellow pellets and foams). The FTIR analysis revealed that most of the MPs found were thermoplastic polymers of polyethylene (PE), polypropylene (PP), polystyrene (PS) and polyethylene terephthalate (PET) while some are thermosetting polymers of phenol formaldehyde (PF). Amid the 81 water samples analyzed, the mean abundance varied from 161 items/L (in Hendala) to 2 items/L (in Kepungoda and Browns Beach). Among, the 166 sediments samples analyzed, the mean abundance of MPs varied from 656 items/m² (in Estuary of Mahaoya) to 3 items/m² (in Dungalpitiya). The MPs found were identified in different shapes as fragments (80.15%), pellets (14.88%), fibers (2.7%) and foams (2.48%). The FTIR analysis revealed that the beach sediments are mainly contaminated with PE (65.27%) and PP (15.28%) while surface seawater is dominated by PE (60.87%) and PP (4.34%).

Keywords: Coastal pollution, FTIR, Microplastics, Negombo, Sri Lankan beaches.

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