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Occurrence and Characteristics of Microplastics in Coastal Sediments along Southeast Coast of Sri Lanka

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Microplastics (MPs), plastic particles smaller than 5 mm in size, are one of the most significant emerging environmental threats to marine environments across the globe. Despite the number of recent research on MP pollution in the western and southern coastal environments of Sri Lanka, only a few studies have been conducted to unravel MP pollution along the southeastern coast of Sri Lanka. The current study aimed to investigate the spatial distribution, sources, morphology, and composition of the MPs in the coastal sediments of the southeast coast of Sri Lanka. Sediment samples were collected from straight beaches (23) and lagoon areas (8) along the southeast coast extending from Kalmunai to Panama. At each sampling site, approximately 5 kg of surface sediments were collected from the wrack line to berm zone. The MPs in the representative fractions of sediment samples were isolated by density separation using 1.20 g/ml NaCl solution. The amount, shape, and colour of isolated MPs were analyzed using a petrographic microscope. Scanning Electron Microscope (SEM) and Fourier Transform Infrared (FTIR) Spectroscopy were employed to investigate their morphology and chemical composition respectively. The results highlighted the presence of five shape types of MPs, namely fibers (86.77%), flakes (6.61%), fragments (3.58%), foams (1.93%), and films (1.10%). Additionally, these MPs appeared in nine different colours in these beach sediments. The five shape types of MPs indicated different weathering surface morphologies such as scratches, pores, protrusions, grooves, pits, and scales, possibly due to mechanical abrasion, chemical reactions, photodegradation, and microbial degradation. The FTIR analysis revealed that the main polymer compositions of MPs are polyethylene and polystyrene. The distribution of MPs varied from 0 to 45 per 500 g. The highest number of MPs were recorded from lagoon environments (>20 MP per 500 g) indicating land-derived sources of MPs. This study lays the foundation for the investigation of MPs along the southeastern coast of Sri Lanka and to predict the possible sources of MPs based on the results.

Keywords: coastal sediments, microplastics, surface morphology