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Seagrass Beds May Act as a Trap of Microplastics: A Case Study at Puttalam Lagoon, Sri Lanka

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Abstract

Microplastics (MP) have become a ubiquitous presence in various ecosystems, including seagrass, posing significant environmental concerns. However, a comprehensive understanding of their full implications remains inadequate. The extent of MP accumulation in seagrass meadows in Sri Lanka is not well-documented, prompting our efforts to investigate MP contamination in Puttalam Lagoon. Sampling was conducted across ten specific sites throughout the entire lagoon during the North-East monsoon period of 2021, aiming to fill the knowledge gap on this matter. In total, vegetated (n=30) and non-vegetated sediment samples (n=30, 30 cm cores), and seagrass samples (n=30, 0.25 m<sup>2</sup> quadrat) were randomly collected to determine MP. The length of the seagrass blades, the percentage of the canopy cover, and the water depth were also measured. Additionally, three transects (each 50 m) were deployed perpendicular to the shore to assess the correlation between MP accumulation potential against the seagrass species and the water depth. Under a dissecting microscope, details such as colour, morphotype, and MP counts were recorded, while the polymer type was identified using Fourier Transform InfraRed (FT-IR) Spectroscopy. All surveyed sites showed contamination with MP. Among the seagrass samples, 86.7% contained MP, ranging from 7.7 to 13.7 MP blade blade<sup>-1</sup>. The mean MP abundance was higher in seagrass sediment (62.8±30.7 MP kg<sup>-1</sup>) compared to non-vegetated sediment (29.87±12.10 MP kg<sup>-1</sup>). Out of the five identified seagrass species, the highest MP abundance was found in *Enhalus acoroides* (13.7±3.5 MP blade<sup>-1</sup>). The exclusive morphotypes identified in both seagrass and sediment samples were fibres and fragments. Notably, fragments were the prevailing morphotype in both seagrass blades (6.7±1.4 MP blade<sup>-1</sup>) and vegetated sediments (32.3±10.1 MP kg<sup>-1</sup>), while fibres dominated in unvegetated sediments (15.8±4.5 MP kg<sup>-1</sup>). A total of six different colours of MP were noted, with blue emerging as the most abundant colour in both seagrass and sediment. The findings of this study reveal the significant capacity of seagrass meadows to trap MP with their root systems. Considering the potential transfer of MP from seagrasses and sediment through various levels of the food chain, there is a critical need to advocate for sustainable consumption practices and implement effective waste management strategies. These measures are essential to safeguard the coastal environment from persistent pollution and mitigate the MP contamination in seagrass habitats.

**Keywords:** Microplastics, Puttalam lagoon, Morphotype, Polymer, Fourier Transform InfraRed (FT-IR) Spectroscopy