Assessment of Microplastic Contamination in *Halodule uninervis* and *Halophila ovalis* Seagrass Habitats of Negombo Estuary, Sri Lanka

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Microplastics (MPs) are an increasing concern in coastal environments, where seagrass meadows may act as sinks for MPs due to their structural complexity. However, their role in tropical ecosystems remains poorly examined. This study aimed to assess MP contamination in above-ground (leaf blades) and below-ground (rhizome and roots) biomass of two seagrass species; *Halodule uninervis* and *Halophila ovalis*, and its surrounded water and sediment (seagrass-associated and non-seagrass associated) across the Negombo estuary. Nine sampling sites within the Negombo estuary were selected using stratified random sampling based on seagrass distribution and anthropogenic influence. Triplicate samples of seagrass, surface water (30 L), and sediments (0–5 cm depth) were collected and appropriate controls were maintained. Samples were subjected to organic matter digestion (30% H_2O_2, 30% or 10% KOH, and $FeSO_4$), followed by density separation using NaCl solution (1.2 g cm^{-3}) and membrane filtration (0.45 µm). Microplastics were then identified and quantified based on shape and color using a stereomicroscope, while polymer types were identified through µ-FTIR (Attenuated total reflectance-ATR). Water quality parameters (salinity, pH, and total solids) were measured using standard methods. No significant difference in MPs abundance was observed between *H. uninervis* (3.36 ± 1.80 items g^{-1}) and *H. ovalis* (4.46 ± 2.55 items g^{-1}) ($p > 0.05$). However, above-ground seagrass tissues exhibited higher MP accumulation (2.89 ± 2.07 items g^{-1}), than below-ground tissues(1.71 ± 1.16 items g^{-1}), seagrass-associated sediments (0.018 ± 0.016 items g^{-1}), non-seagrass-associated sediment (0.009 ± 0.008 items g^{-1}), and water (0.08 ± 0.06 items/L), indicating a strong capacity to trap MPs within the estuarine environment. Furthermore, seagrass-associated sediments contained elevated MP concentrations compared to non-seagrass associated sediments, reflecting the enhanced particle retention capacity in vegetated habitats. Fibers was the dominant MP morphotype (82.87 %) primarily composed of low and high-density polyethylene polymers, followed by films (9.89 %) and foams (3.00 %). Blue particles represented the most prevalent color category across all sample types (41.57 %) whereas black particles predominated surface water samples (50% black and 16 % blue). These findings emphasize the role of seagrass as an effective sink for MPs and highlight the need for improved microplastic management strategies in coastal environments.

Keywords: *Microplastics pollution, Seagrass leaves and rhizome, Stereo microscope, Tropical estuary*