A plastic trap? Factors influencing microplastics retention in coastal vegetated habitats

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Abstract

There is growing concern from governments and the public regarding the threat plastic pollution poses to coastal ecosystems. Many plastics, both macro- and micro-, accumulate in coastal areas due to their proximity to land based sources. Coastal vegetated habitats (e.g., seagrasses, saltmarshes, mangroves) provide a myriad of ecosystem functions, such as erosion protection, habitat refuge, and carbon storage. However, the biological and physical factors that underlie these functions may provide an additional benefit: retention of marine microplastics. For instance, vegetated canopies can affect flow velocity, sediment accumulation and resuspension, and may also directly affect microplastics transport in coastal systems. While microplastics occurrence in coastal vegetated sediments is well documented, there is conflicting evidence on whether the presence of vegetation enhances microplastics retention relative to bare sites. Moreover, the factors that influence the likelihood of microplastic capture and resuspension remain understudied. We aimed to investigate how vegetation type influences microplastic retention in a simulated coastal wetland. Through a flume experiment, we measured the efficiency of microplastic trapping in the presence of two types of vegetation – branched and grassy. We also tested how diverse types of microplastics that differ in shape, size, and density interact in these systems and whether they follow a similar pathway to natural sediments. The outcomes of this study will enrich our understanding of coastal vegetation as a microplastics sink, inform where plastics are most likely to accumulate, and provide a basis for harnessing these characteristics to create a nature-based solution for microplastic clean-up.

Keywords: coastal vegetation, flume, transport, fate, marine canopies

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