

Title: The path of microplastics through the rare biodiversity estuary region of the northern Bay of Bengal

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Abstract: Due to its harmful effects on ecosystems and human health, [microplastic](#) (MP) pollution has become a significant environmental problem on a global scale. Although MPs' pollution path and toxic effects on [marine habitats](#) have been examined worldwide, the studies are limited to the rare biodiversity [estuary](#) region of Hatiya Island from the northern Bay of Bengal. This study aimed to investigate the MP pollution path and its influencing factors in [estuarine sediments](#) and water in rare biodiversity Hatiya Island in the northern Bay of Bengal. Sixty water and sediment samples were collected from 10 sampling sites on the Island and analyzed for MPs. The abundance of MPs in sediment ranged from 67 to 143 pieces/kg, while the abundance in water ranged from 24.34 to 59 pieces/m³. The average concentrations of MPs in sediment and water were 110.90 ± 20.62 pieces/kg and 38.77 ± 10.09 pieces/m³, respectively. Most identified MPs from sediment samples were transparent (51%), while about 54.1% of the identified MPs from water samples were colored. The fragment was the most common form of MP in both compartments, with a value of 64.6% in sediment samples and 60.6% in water samples. In sediment and water samples, almost 74% and 80% of MP were <0.5 mm, respectively. [Polypropylene](#) (PP) was the most abundant polymer type, accounting for 51% of all identified polymers. The contamination factor, pollution load index, polymer risk score, and pollution risk score values indicated that the study area was moderately polluted with MPs. The spatial distribution patterns and hotspots of MPs echoed profound human pathways. Based on the results, sustainable management strategies and intervention measures were proposed to reduce the pollution level in the ecologically diverse area. This study provides important insights into evaluating [estuary](#) ecosystem susceptibility and mitigation policies against persistent MP issues.

Keywords: Microplastics (MPs) Estuarine ecosystem Hatiya Island Bay of Bengal Sediment pollution Water pollution

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