

Holistic assessment of microplastics in various coastal environmental matrices, southwest coast of India

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Plastics in the marine environment are introduced through multiple pathways, and pose serious threats to aquatic biota. Recently microplastic pollution and its possible consequences in India have been recognized by the scientific community, however the extent of the crisis has not yet been quantified. The present study attempted to ascertain the abundance, distribution and characteristics of microplastics in coastal waters (14 locations), beach sediments (22 locations) and marine fishes (11 locations) from the state of Kerala, southwest coast of India. The results showed that the mean microplastic abundance was 1.25 ± 0.88 particles/m³ in coastal waters and 40.7 ± 33.2 particles/m² in beach sediments with higher concentrations in the southern coast of the state. The abundance of microplastics, mostly contributed by fragments, fibre/line and foam, in both coastal waters and beach sediments, were highly influenced by river runoff and proximity to urban agglomeration. Fourier Transform Infrared Spectroscopy-Attenuated Total Reflection (FTIR-ATR) revealed that polyethylene (PE) and polypropylene (PP) were the dominant polymers in the marine environment. The digestive tracts of 15 out of 70 commercially important fishes studied, contained 22 microplastic particles. Polyethylene (PE; 38.46%) followed by cellulose (CE; 23.08%), rayon (RY; 15.38%), polyester (PL; 15.38%) and polypropylene (PP; 7.69%) were the major contributors in the fish ingested microplastic composition. A broad range of heavy metals, metalloids and other elements that are potentially indicative of hazardous chemicals were present in microplastics collected from the beaches of Kerala. These results enhance our understanding on the sources, transport pathways and the associated environmental risks of microplastics to marine ecosystems.

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