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Status of microplastic pollution in the Northern Indian Ocean

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Indian Ocean Scenario







- Concentration Range: MPs in surface water (0.01–372,000 particles/m³), sediment (36.8–10,600 items/kg), and biota (0.016–10.65 particles/individual).
- Dominant Polymer: Polyethylene (PE) was the most abundant polymer across all matrices, with higher prevalence in sediment.
- MP Shape: Fibers were the most common shape of MPs in all matrices within the Indian Ocean.

Plastics and Plankton



- Zooplankton are the connecting link between producers and consumers
- Filter out algae and other organic materials from water
- Provide energy to fish, whale, and other animals
- Susceptible to microplastics?



Understanding the fate of Microplastic in the northern Indian Ocean



GOALS

- To map the current plastic pollution
- To establish baseline data
- To identify the source and environmental risk

ENVIRONMENTAL MATRICES

- Water
- Sediment
- Zooplankton, finfish, shellfish



SAMPLE COLLECTION

2500

2000 1750 1500

CHARECTERIZATION

Light microscopy



DENSITY SEPERATION

IDENTIFICATION

DIGESTION

Epi-fluorescence microscopy

Plastics in the food web: a case study from Andaman Sea





Identifying microplastic pollution hotspots



- First report on MP pollution in the Arabian-Andaman Seas shelf sediments.
- MP levels were higher in the Arabian Sea sediments than the Andaman Sea.
- Fiber constituted the most common shape of microplastics in both the study areas.
- Acrylic, polyethylene, and nylon were the most common polymer types recorded.

([.] 200-M.p

100-

Arabian Sea

sediment

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Microplastics i (n/kg d



Identifying microplastic pollution hotspots





Goswami et al., Sci. Total. Env. 2023, 160876.

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Diurnal variations of MP ingestion









Adopted from Cole et al., Environ. Sci. Technol. 2016, 50, 6, 3239–324

Sources of Microplastics



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Plastic as an Anthropocene Marker





Accumulation of parent and halogenated PAHs in mMPs





\SigmaCIPAHs: 0.04 to 307 ng/g plastic

\SigmaBrPAHs: <MDL to 111 ng/g plastic

ΣCIPAHs: 0.36 to 21.8 ng/g plastic

ΣBrPAHs: <MDL to 1.59 ng/g plastic

- Out of 75 target congeners, 61
 were detected (24 parent PAH, 25 ClPAH, 12 BrPAH).
- Parent PAHs > ClPAHs > BrPAHs
- PS particle from southern Sri Lanka had highest PAH levels.
- mMPs associated PAH levels from southern Sri Lanka was relatively higher than eastern coastline.

Take Home Message





Energy transfer web

Contaminant transfer web

HPAH exposure to human through contaminated seafoods

Chlorinated and brominated pyrenes could cause additive toxicities with HMW parent PAHs

Thank you



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