

Advancing trophic ecology and microplastic ingestion analysis in crustacean species: insights from a One Health perspective.

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Over the past decades, global plastic production has increased dramatically, driven by expanding industrial demand and widespread consumer use^[1]. Human activities—across both terrestrial and marine compartments—remain the primary source to the continuous input of plastics into ocean ecosystems^[2]. Although literature indicates that humans ingest a significant amount of microplastics (MPs) through seafood^[3], the actual effects of MP ingestion in humans remain overlooked; MPs are therefore increasingly regarded as a potential threat to human health^[4], highlighting the need for a thorough understanding of MP ingestion in marine species destined for human consumption.

Within the framework of the Bioplast4safe project, this study investigates MP ingestion in six commercially relevant crustacean species, integrating trophic ecology analyses to provide a comprehensive, One Health-oriented assessment.

The study was carried out in the Central Tyrrhenian Sea, at sampling sites at varying distances from the Tiber River mouth, which represents the major source of pollutants on the western side of the Italian peninsula^[5]. Using a combined approach based on stable isotope analysis ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) and DNA metabarcoding of gut contents, we explored species-specific feeding strategies and their influence on MP uptake. Then, MPs were extracted from gastrointestinal tracts and characterized physico-chemically following a standardised protocol^[6].

MPs were detected in all analysed species with variable ingestion rates. Although isotopic niche overlaps highlighted similarities in the ecological role and trophic position of different species, differences in prey selection modalities detected through DNA metabarcoding appear to be linked to MP ingestion, suggesting that species-specific foraging patterns may affect the fate of MPs in the marine food-web.

The integrative approach proposed in this study enhances our understanding of the ecological drivers of MP ingestion, providing novel insights into the entry and transfer of MPs through marine ecosystems and ultimately to humans.

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