
Influencing factors for microplastic intake in deep-sea lanternfishes

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Abstract

Plastic debris is ubiquitous in the hydrosphere. Yet, we lack an understanding of contamination amongst deep-sea species and primarily how each trait can influence microplastic intake. We investigated microplastic intake in hyper-abundant mesopelagic species (lanternfishes) in the Southwestern Tropical Atlantic. Samplings were carried out off the northeast Brazilian coast to seamounts and ocean islands (~350km from the coast) encompassing different depth strata (90 to 1000 m). The protocol implemented for MP extraction from the digestive tract of fishes applied alkaline digestion and further polymer identification (LDIR), following quality assurance and quality control procedures. Overall, microplastics were detected in most (68%) individuals analysed (364 individuals). Large microplastics, mostly of a filamentous shape were the most frequent, followed by smaller fragments and foams. Microplastics made of high-density polymers (PET, PVC, PA, SBR rubber) were more prevalent than low-density ones (PE, EVA and PBD rubber). Larger microplastics were detected in lanternfishes captured nearest to the coast compared to those from around the oceanic islands (Rocas Atoll and Fernando de Noronha Archipelago). Moreover, lanternfish that migrate from the upper mesopelagic to the epipelagic layers had simultaneously the highest intake and the smallest particles. Biological mediated transport of microplastics from the epipelagic to the mesopelagic waters was evinced, but fishes foraging in shallower layers, above the thermocline, had the lowest intake. Furthermore, the jaw length of lanternfishes was positively correlated with the number of detected MPs; thus, each one-unit increase (mm) in the size of the jaw was associated with a 10% increase in the incidence rate ratio

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of MP intake. The lanternfishes that preferably prey upon fish larvae are more prone to microplastic intake than their counterparts, which forage mostly on crustaceans and gelatinous zooplankton, registering 82% and 51% fewer risk of MP intake, respectively.

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