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Microplastic Bioaccumulation in Selected Finfish Species Harvested from Northwest Coastal Waters, Sri Lanka: A Potential Risk to Human Health?

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Abstract

The widespread bioavailability of microplastics (MP) in the marine environment has upraised intense interest over the last few decades. However, MP trophic transfer via appetizing portions of marine organisms remains less recognized. Therefore, the present study looked at bioaccumulation potential of MPs investigating four common edible finfish species; *Sardinella gibbosa, Stolephorus commersonnii, Hemiramphus archipelagicus,* and *Katsuwonus pelamis* representing different trophic levels from Northwest Coastal waters. In the experimental protocol, the wild-caught finfish samples were analyzed considering their edible (muscle) vs non-edible (gastrointestinal (GI) tract and gills) tissues. The structural characteristics of MP materials were screened by stereomicroscope whereas elemental composition using Fourier-Transform Infrared spectroscopy. Amongst all the studied samples, around 96% exhibited MP contamination in the size range of 0.06 mm-0.11 mm. Fibers, fragments, and films were the prominent MP types detected while Polyethylene, Polypropylene, Polystyrene, and Nylon-6,6 were the polymeric substances extensively recorded. *K. pelamis* and *S. commersonnii* displayed the highest (1.1±0.54 MP/g) and lowest (0.1±0.02 MP/g) mean MP levels in edible portions, respectively. The MP quantities extracted from gills, GI tract, and flesh of each sample were significantly different ($p<0.05$), thereby Pearson correlation test results implied the GI tract as the major possible exposure route of higher trophic finfishes while gills act as the key direction of filter feeders. Parametric One-way ANOVA test indicated that the trophic transfer interactions in the studied finfish food chains were significant ($p<0.05$) at 95% level of confidence. Trophic Magnification Factors (TMF=2.347, 3.449) and Biomagnification Factors (1<BMF) of examined food chains signified that MPs are conceivably biomagnified in edible parts of marine food webs even though the contamination in edible tissues was significantly lower than that of non-edible shares as per the Two sample T-test and Mann-Whitney tests. Therefore, the findings advocate that trophic transfer denotes an oblique, yet possible key pathway of MP ingestion for any individual who depends on seafood diets habitually. Since the MPs magnification could possibly ensure the trophic dilution. However, considering the physical and chemical toxicities and associated contaminants of MPs, there is a necessity for further studies assessing the human susceptibility to MP-related hazards via the routine consumption of seafood. Addressing this gap which implies with food safety and pollution control is a vital primacy due to the nutritional value of seafood consumption.

Keywords: Microplastic, Trophic transfer, Biomagnification, Seafood