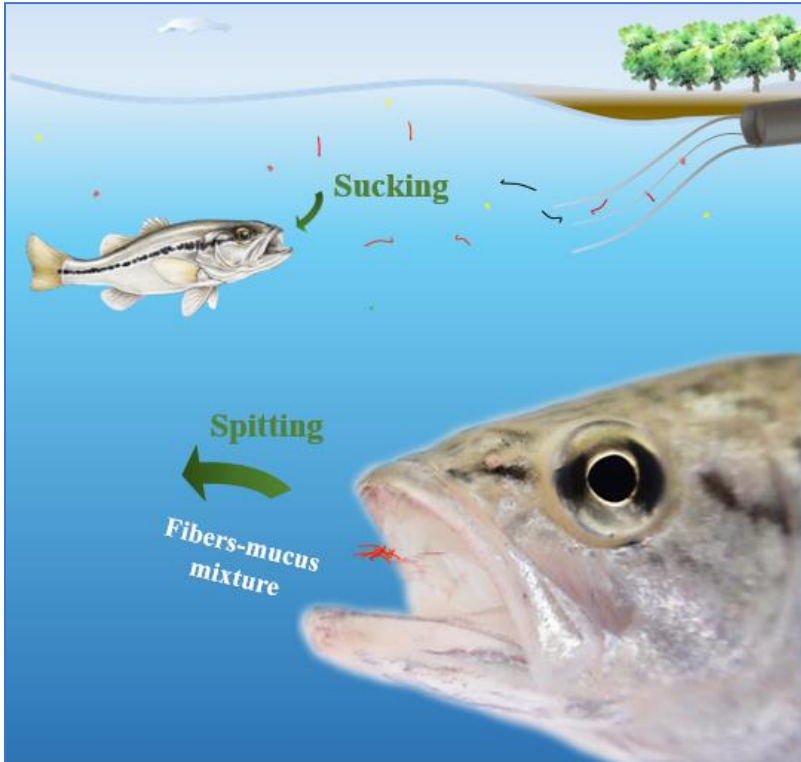


Ingestion of Microplastics in Fish

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Graphic abstract



Abstract

Microplastics (size of plastic debris < 5 mm) occur in various environments worldwide these days and cause detrimental effects on biota. Up to date, about 1000 fish species have been reported to contain microplastics in their bodies in field investigations. Fish is also



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one of the most common species used for toxicity study of microplastic in the laboratory. However, the ingestion behavioral responses of fish to microplastics in feeding processes as well as their link to the occurrence of microplastics in field are not well understood. In this presentation, we introduced our work in recent years about the ingestion of microplastics in fish. We investigated microplastic pollution in freshwater and seawater fish in the field; we also studied the accumulation of microplastics in the body of fish and the behavioral response of fish to plastic pellets and fibers in the laboratory. In the field, we found that low abundances of microplastics occurred in all collected fish species, but little fragments or pellets existed in the body of fish. No evidences suggest that microplastics larger than 20 μm were able to enter muscle or liver of fish. In the laboratory, we developed internal persistent fluorescent fibers to track microplastics and found that fish usually ingested and cleared microplastics quickly, e.g., within one hour. In feeding experiments with four fish species, swallowing-feeding fish ingested more pellets than filtering- and sucking-feeding fish. With high-definition and high-speed observational experiments, we found that all species did not actively capture microfibers; instead, they passively sucked in microfibers while breathing. Surprisingly, fish showed a rejective behavior which was spontaneously coughing up microfibers mixed with mucus. Nevertheless, some of microfibers were still found in the gastrointestinal tracts and gills of fish, while abundances of ingested microfibers were increased in the presence of food. Our findings reveal a common phenomenon that fish ingest microplastics inadvertently rather than intentionally. We provide a reasonable explanation for the low abundances of microplastics and no special types of microplastics (i.e., raw pellets) in fish in the field. We also provide insights into the pathways via which microplastics

enter fish and potential strategies to assess future ecological risk and food safety related to microplastics.

Keywords: fish, ingestion, microplastic, microfiber, feeding behavior

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Biography

Huahong Shi is a professor of Environmental Sciences at East China Normal University and an associate editor of *Marine Pollution Bulletin* (2020-). He got his Ph.D. degree of Aquatic Biology in Jinan University of China in 2003. He is interested in studying microplastic pollution in aquatic environments and endocrine disrupting chemicals in aquatic organisms. He has ever studied imposex in snails, thyroid disrupting effects of chemicals on amphibian and teratogenicity of chemicals to vertebrate embryos for 20 years. In recent 8 years, Huahong is focusing on microplastic and nanoplastic pollution including analytical methods, fate, toxicological effects and risks to human health. He has been listed as one of the “Highly Cited Researchers” by Clarivate Analytics for 2020.