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The Role of Microplastics in Fisheries: A Growing Concern Beneath the Surface

*Harshitha U
College of Fishery Science, Narasapuram
*Corresponding Author's email: uttiuttiharshitha@gmail.com

Fisheries support millions of people around the world by providing food, income, trade, and livelihoods. Fish and seafood are also important sources of protein, omega-3 fatty acids, vitamins, and minerals. However, one silent threat is now becoming increasingly visible in aquatic environments: microplastics. These tiny plastic particles, usually less than 5 millimeters in size, are now found in oceans, rivers, lakes, sediments, plankton, fish, shellfish, and even seafood consumed by humans. Microplastics may look like a small pollution problem, but their role in fisheries is much bigger than their size. They affect fish health, aquatic ecosystems, seafood safety, and the long-term sustainability of fisheries.

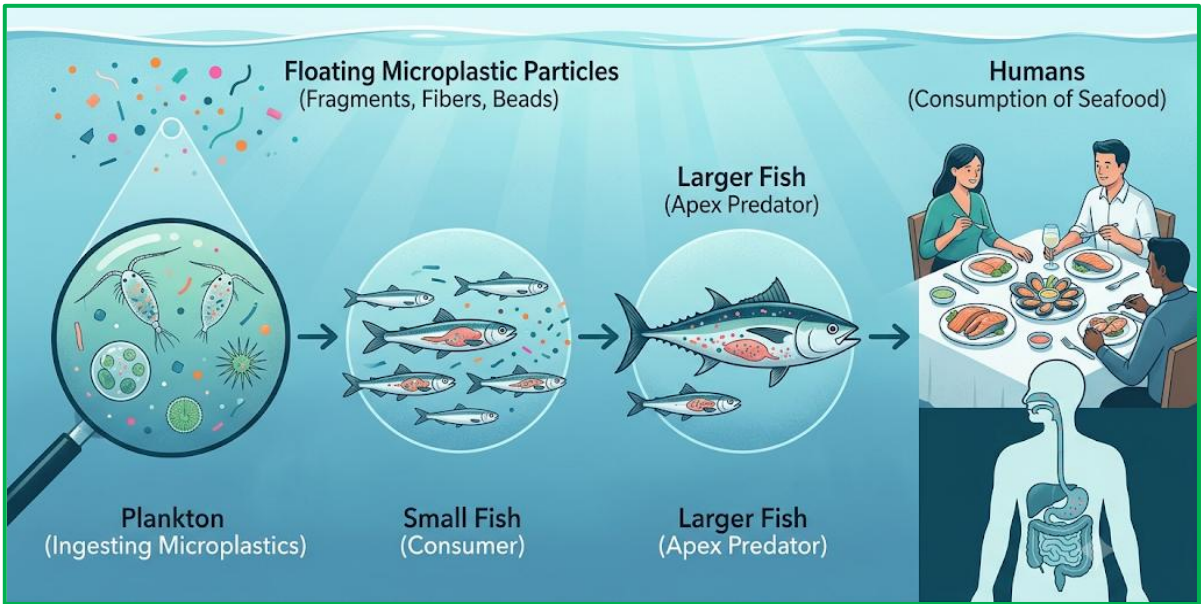
What Are Microplastics?

Microplastics are small plastic fragments that come from two main sources. Primary microplastics are manufactured in tiny sizes, such as microbeads, industrial pellets, and synthetic fibers. Secondary microplastics form when larger plastic items such as bags, bottles, fishing nets, ropes, packaging materials, and containers break down due to sunlight, waves, heat, and mechanical force. In fisheries, plastics can enter the aquatic environment from both land-based and fishing-related activities. Poor waste management, urban runoff, wastewater discharge, plastic packaging, abandoned fishing gear, aquaculture materials, and boat activities all contribute to the problem. Once plastics enter water bodies, they slowly fragment into smaller particles and remain in the environment for long periods (GESAMP, 2015).

How Microplastics Enter Fisheries

Microplastics enter fisheries through the food chain and surrounding environment. Small aquatic organisms such as plankton may mistake microplastics for food. These organisms are then eaten by small fish, which are later consumed by larger fish. In this way, microplastics can move through different levels of the aquatic food web. Fish may ingest microplastics directly from water, sediments, or contaminated prey. Shellfish such as mussels, oysters, and clams are especially vulnerable because they filter large volumes of water and can trap tiny particles inside their bodies. This is important because shellfish are often eaten whole, which may increase the chance of human exposure to microplastics. The Food and Agriculture Organization has reported that microplastics have been found in many aquatic organisms, including species important for fisheries and aquaculture. Although the level of risk may vary

depending on species, habitat, particle size, and exposure level, the presence of microplastics in seafood-producing systems is now a recognized global concern (Lusher et al., 2017).



Effects on Fish and Aquatic Life

Microplastics can affect fish in several ways. When fish ingest plastic particles, these particles may block or irritate the digestive tract. This can reduce feeding efficiency, slow growth, and affect energy balance. In some cases, fish may feel full even when they have not received enough nutrition. Microplastics can also act as carriers for harmful chemicals. Plastic particles may contain additives such as plasticizers, flame retardants, dyes, and stabilizers. They can also attract pollutants already present in water, including pesticides, heavy metals, and persistent organic pollutants. When fish ingest contaminated microplastics, these chemicals may enter their bodies and affect biological functions. Possible effects include oxidative stress, inflammation, reduced immunity, reproductive problems, and changes in behavior. While not all studies show the same level of harm, the overall concern is clear: microplastics add another stress factor to aquatic organisms that are already facing overfishing, climate change, habitat loss, and chemical pollution.

Impact on Fisheries Productivity

Healthy fisheries depend on healthy aquatic ecosystems. If microplastics affect fish growth, reproduction, survival, or food availability, they may indirectly affect fish stocks. This is especially important for small-scale fisheries, where local communities depend directly on fish catches for food and income. Microplastics may also affect early life stages of fish. Eggs, larvae, and juvenile fish are more sensitive to environmental stress. If young fish are exposed to microplastics during development, their survival and growth may be reduced. Even small changes in early survival can influence future fish populations. Another concern is habitat contamination. Microplastics accumulate in sediments, coastal zones, estuaries, mangroves, and aquaculture areas. These are important nursery and feeding grounds for many fish species. When these habitats become polluted, the foundation of fisheries becomes weaker.

Seafood Safety and Human Health

The presence of microplastics in seafood raises an important question: is seafood still safe to eat? At present, seafood remains a valuable and recommended part of a healthy diet. However, microplastic contamination has created new food safety concerns that need more research. Humans may be exposed to microplastics through seafood, especially when eating whole organisms such as shellfish and small fish. Fish fillets may contain fewer particles than digestive organs, but contamination can still occur during processing, packaging, transportation, and cooking. The main concern is not only the plastic particle itself, but also the chemicals and microorganisms that may be attached to it. Scientists are still studying how much microplastic humans ingest, how much remains in the body, and what long-term health effects may occur. Current evidence shows that more research is needed before making final conclusions about human health risks from microplastics in seafood (Smith et al., 2018).

Economic and Social Concerns

Microplastics can also affect the reputation and market value of seafood. Consumers are becoming more aware of plastic pollution. If people believe seafood is contaminated, they may reduce consumption, which can affect fishers, processors, exporters, and local markets. For fishing communities, this issue is not only environmental but also economic and social. Many coastal families depend on fisheries for daily income. If microplastic pollution reduces fish quality, affects fish populations, or lowers consumer trust, the consequences may be serious. Small-scale fishers are often not the main producers of plastic pollution, but they may suffer from its effects. This makes microplastic pollution a justice issue as well. The people most affected are not always the people most responsible.

Role of Fisheries in the Problem

Fisheries are affected by microplastics, but they can also contribute to the problem. Lost or abandoned fishing nets, ropes, traps, lines, floats, and packaging materials can break down into microplastics over time. This is often called “ghost gear” when lost fishing equipment continues to trap marine animals. Aquaculture can also contribute through plastic cages, nets, pipes, feed bags, and other materials. This does not mean fisheries and aquaculture are the only causes of microplastic pollution. In fact, much plastic pollution comes from land-based sources. However, the fisheries sector has an important role in reducing plastic leakage into aquatic environments.

What Can Be Done?

Solving microplastic pollution requires action at many levels. Governments need stronger waste management systems, better plastic regulations, improved wastewater treatment, and monitoring programs for aquatic pollution. Industries need to design safer materials, reduce unnecessary plastic packaging, and support recycling systems. The fisheries sector can help by improving gear management, collecting damaged nets and ropes, using durable and recyclable materials, and supporting programs that remove abandoned fishing gear. Fishers can also be included in coastal clean-up programs and plastic monitoring projects. Consumers also have a role. Reducing single-use plastics, properly disposing of waste, choosing sustainable seafood, and supporting plastic-reduction policies can help reduce the flow of plastics into aquatic systems.

Conclusion

Microplastics are small particles, but their impact on fisheries is large and complex. They enter aquatic environments, move through food webs, affect fish and shellfish, raise seafood

safety concerns, and threaten the sustainability of fisheries. The issue is not only about pollution; it is about food security, livelihoods, ecosystem health, and consumer confidence. The solution is not to fear seafood, but to protect the waters that produce it. Fisheries can remain safe, productive, and sustainable only when aquatic environments are healthy. Reducing microplastic pollution is therefore not just an environmental responsibility, it is a necessary step for protecting fish, fishers, consumers, and future generations.

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