

Chapter 7

Exploring bioaccumulation patterns and ecological risks of microplastics in aquatic ecosystems

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Abstract: Microplastics have emerged as a significant environmental concern, particularly in aquatic ecosystems. This chapter provides a comprehensive review of the bioaccumulation and ecological risk assessment of microplastics in aquatic environments. It begins with an overview of the characteristics and sources of microplastics, highlighting their prevalence in water bodies worldwide. The pathways through which microplastics enter and move through aquatic ecosystems are discussed, emphasizing the diverse sources such as plastic debris fragmentation, microbeads from personal care products, and synthetic fibers from textile materials. The chapter investigates the bioaccumulation of microplastics in various aquatic organisms, exploring how these synthetic particles are ingested, accumulated, and transported within food webs. The ecological risks associated with microplastics are analyzed, including impacts on aquatic life, ecosystem functioning, and potential effects on human health through the food chain. Methodologies for assessing ecological risks of microplastics are reviewed, encompassing both laboratory experiments and field studies that aim to quantify exposure levels and biological effects. Case studies and examples from different aquatic ecosystems are presented to provide real-world insights into the bioaccumulation patterns and ecological implications of microplastics. Lastly, the chapter discusses mitigation strategies and future directions for addressing the challenges posed by microplastics in aquatic environments, emphasizing the importance of interdisciplinary approaches and global cooperation to safeguard marine and freshwater ecosystems from this pervasive threat.

Keywords: Microplastics, Bioaccumulation, Ecological Risk Assessment, Aquatic Ecosystems

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