

The effects of plastic pollution on biodiversity

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ABSTRACT

As plastic is increasingly found in natural environments, concern has grown about its biological effects beyond individual-level impacts, particularly on species health, food-web dynamics and ecosystem functioning. In this Review, we summarize current evidence on plastic exposure pathways, organismal responses and potential effects at higher levels of biological organization. Impacts on individual organisms can be acute or chronic, and include physiological stress, disrupted locomotion, feeding and reproduction, internal injury, and death. Sublethal effects might not be immediately detectable but can have profound implications for individual fitness. Although macroplastics can cause mortality, their role in population declines remains largely uncertain, and demonstrated impacts beyond the individual level are rare. Clear evidence of population-level harm from microplastics to wild organisms is lacking. Nevertheless, emerging research demonstrates a growing likelihood of broader effects, particularly for species with high plastic-encounter rates. Connecting environmental exposure to individual-level fitness and population-level consequences is a critical frontier. Future research must prioritize long-term monitoring, demographic modelling and high-throughput methods to accurately quantify risks to biodiversity. Effective solutions must be context-specific, span local to global scales, account for interactions with other stressors and integrate plastic pollution mitigation policies with broader conservation strategies to safeguard biodiversity in the Anthropocene.

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