



Microplastics

Biology - Module 2

Biology Module 2

Microplastics

Abstract

This module expands on the previous module on macroplastic pollution. Microplastics are found everywhere, from the deepest spots in our Oceans to the highest mountains. From our polar regions to our drinking water. This also means that organisms, from bacteria to plants to animals are continuously exposed to these microplastics. In this module we will explain in more detail what a microplastic is and what different types there are, discuss where they come from, and what risks they pose to organisms. We will introduce the way in which the impacts of microplastics are investigated, and critically look at the pros and cons of these methods.

Key Concepts

- i. Macro-, micro- and nanoplastics
- ii. Primary and secondary microplastics
- iii. Microplastic ingestion
- iv. Trophic Transfer
- v. Bioaccumulation
- vi. Environmental Risk Assessment

Learning Outcomes

At the end of the module, students are able to:

- i. Understand what a microplastic is, and where it can come from;
- ii. Discuss the issues of microplastic estimation in nature, with a basic understanding of the research methods and their limitations;
- iii. Describe how microplastics are distributed via natural and anthropogenic means;
- iv. Understand how a microplastic can affect organisms once it's in the environment.

Glossary

Term	Definition
Macroplastic	Plastic particle with a length of above 5 mm
Microplastic	Plastic particle with a length of less than 5 mm but bigger than 1000 nanometer (or 1 micrometer)
Nanoplastic	Plastic particle with a length of up to 1000nm
Primary microplastic	Microplastic intentionally created in that size for a product
Secondary microplastic	Microplastic created through degradation and fragmentation of larger plastic pieces
Hazard	Something dangerous that has the potential to inflict damage (electricity, chemicals, stress, etc.)
Risk	The probability of a hazard actually causing harm
Environmental Risk Assessment	Assessment of the likelihood that a factor or substance will cause an adverse ecological impact

Resources/Further Reading

- Besley et al. 2017 'A standardized method for sampling and extraction methods for quantifying microplastics in beach sand'
<https://doi.org/10.1016/j.marpolbul.2016.08.055>
- de Sa et al. 2018 'Studies of the effects of microplastics on aquatic organisms: What do we know and where should we focus our efforts in the future?'
<https://doi.org/10.1016/j.scitotenv.2018.07.207>
- Diaz-Basantes et al., 2020. Microplastics in Honey, Beer, Milk and Refreshments in Ecuador as Emerging Contaminants.
- Egbeocha et al. 2018 'Feasting on microplastics: ingestion by and effects on marine organisms' <https://www.int-res.com/articles/ab2018/27/b027p093.pdf>
- Epstein and Timmermans 2018 'Standardization'
<https://doi.org/10.1002/9781405165518.wbeoss247.pub2>
- Gasperi et al., 2018. Microplastics in air: Are we breathing it in?
- Germanov, E. S., Marshall, A. D., Hendrawan, I. G., Admiraal, R., Rohner, C. A., Argeswara, J., ... & Loneragan, N. R. (2019). Microplastics on the menu: Plastics pollute

Indonesian Manta Ray and Whale Shark feeding grounds. *Frontiers in Marine Science*, 6, 679.

- Hamid et al. 2018 'Worldwide distribution and abundance of microplastic: How dire is the situation?' <https://journals.sagepub.com/doi/pdf/10.1177/0734242X18785730>
 - o <https://hal-enpc.archives-ouvertes.fr/hal-01665768/document>
 - o <https://www.mdpi.com/2071-1050/12/14/5514/pdf>
- https://www.who.int/water_sanitation_health/water-quality/guidelines/microplastics-in-dw-information-sheet/en/
- Lots et al. 2017 'A large-scale investigation of microplastic contamination: Abundance and characteristics of microplastics in European beach sediment' <https://doi.org/10.1016/j.marpolbul.2017.08.057>
- Obbard, 2018. Microplastics in Polar Regions: The role of long range transport. <https://doi.org/10.1016/j.coesh.2017.10.004>
<https://www.sciencedirect.com/science/article/pii/S2468584417300132>

Images

- Fig 1
<https://doi.org/10.1016/j.marpolbul.2017.08.057>
- Fig 2
<https://www.sciencedirect.com/science/article/pii/S0048969718326998>