

PLASTIC IN THE NORTHERN ADRIATIC: ITS EVERYWHERE, BUT ITS NOT A "SOUP". NOW WHAT DOES IT DO?

M. Smolaka Tankovic ¹, V. Stinga Perusco ¹, D. Maric Pfannkuchen ¹, A. Baricevic ¹ and M. Pfannkuchen ^{1*}
¹ Center for Marine Research, Ruder Boškovic Institute - mp@cim.irb.hr

Abstract

Plastic litter is a very common and very persistent pollutant. And as most pollutants it ultimately ends up in marine ecosystems. Its dynamics and effects on the ecosystem are underinvestigated. We performed a first assessment of different size classes of plastic litter in the north-eastern Adriatic. Our results indicate a strong penetration of plastic litter throughout the marine ecosystem as well as throughout the food web.

Keywords: *Plastics, Pollution, Plankton, North-Eastern Mediterranean*

Plastics are the most commonly used materials nowadays. As heavily persistent materials, plastics tend to accumulate in the environment and ultimately end up in marine ecosystems. A particular concern is the increasing number of plastic microparticles in the environment. Microplastics comes from degradation of larger plastic pieces in the environment or stems directly from household wastewater and the use of microplastics in personal care products, paints, textile and plastic pellets from the plastic industry. Plastics can be found in every sea and ocean investigated so far, from the surface layer to the bottom. The impact of microplastics on ecosystem functions or e.g. biodiversity is so far not yet clear. However, microplastics was found throughout the trophic web raising the question of the plastics impact to marine organisms and ultimately to human health. Plastic litters was identified as transport vector and substrate for marine organisms as well as vector for a variety of toxic substance. It is furthermore supposed to change nutrient cycles in marine ecosystems by affecting feeding efficiency, buoyancy and by adsorption of nutrients. While it is generally accepted, that the concentration of a persistent pollutant can be expected to continuously rise in marine ecosystems. It is so far unclear how intense the interaction between microplastics and the marine environment is and what the respective effects are.

We performed an initial assessment of plastic litter in the north-eastern Adriatic. Our data on beachlitter (performed according to the European Commission "Guidance on Monitoring of Marine Litter in European Seas") demonstrates a high percentage of plastic litter as well as a relatively large fraction of presumed local origin. Ocean current models for the area support this notion. A quantitative analysis of microplastics in the watercolumn on a transect between Rovinj (Croatia) and the Po river mouth (Italy) showed alarmingly high concentrations of microplastics throughout the watercolumn.

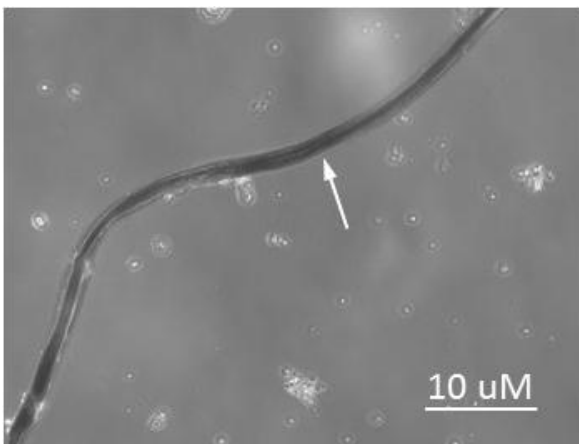


Fig. 1. A plastic fibre (arrow) as found in the watercolumn.

However, natural microfibrils, including also e.g. cotton fibres, are even more abundant. This microlitter was not equally distributed, but showed higher abundances towards the Po river mouth and even more so towards coastal

settlements. While we observed a frequent association of bacteria with organic fibres, we did not observe any significant association of bacteria and plastic microfibrils. The same holds true for unicellular eucaryotes.

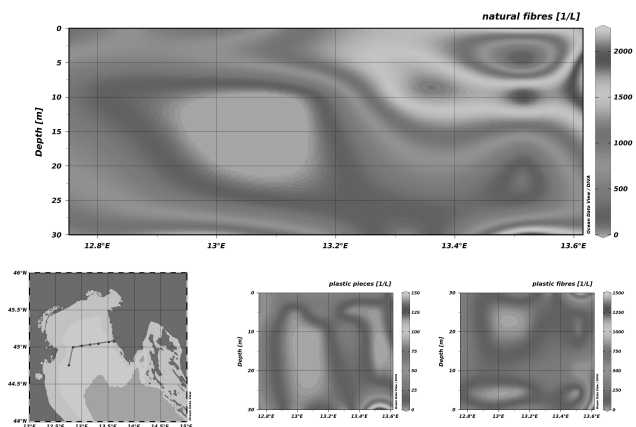


Fig. 2. Microlitter abundance and distribution across the northern Adriatic

To further search for possible effects of such microlitter on the ecosystem, we quantified plastics in the stomach content of fish (*Pagellus erythrinus* (Linnaeus 1758)) and found a relatively low percentage of individuals with ingested plastics. Finally we experimentally exposed blue mussels (*Mytilus galloprovincialis* (Lamarck, 1819)) to plastic microfibrils. We found those fibres afterward on and in the filtering apparatus.

Overall our results seem to give reason for growing concern about plastic litter in the sea and especially about the dynamics of its effects on the ecosystem.

References

- 1 - Zettler Erik R., Mincer Tracy J. and Amaral-Zettler Linda A., 2013, Life in the "Plastisphere": Microbial Communities on Plastic Marine Debris, *Environmental Science & Technology* 47 (13), 7137-7146
- 2 - Senga Green D., Boots B., Blockley D.J., Rocha C. and Thompson Richard, 2015, Impacts of Discarded Plastic Bags on Marine Assemblages and Ecosystem Functioning, *Environmental Science & Technology* 49 (9), 5380-5389
- 3 - Cole M., Lindeque P. K., Fileman E., Clark J., Halsband C. and Galloway T.S., 2016, Microplastics Alter the Properties and Sinking Rates of Zooplankton Faecal Pellets, *Environ Sci Technol* 50
- 4 - Pruter A.T., 2016, Sources, quantities and distribution of persistent plastics in the marine environment, *Marine Pollution Bulletin* 18,6