ASSESSMENT OF MICROPLASTIC FIBRE CONTAMINATION IN THE EASTERN AEGEAN SEA, WITH THE USE OF HOLOTHURIANS AS INDICATOR SPECIES

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Abstract
This study assesses the use of Holothurians as an indicator species for the presence of microplastics in the coastal zone of Samos island, NE Aegean, Greece. The aim of this investigation is to evaluate the contamination in deposit feeders in the lowest level of the trophic food chain. Individuals were sampled in the coastal zone at 5 sites on Samos Island and the total amount of egested fibres was measured. Microplastic fibres were found in all the samples with an average of 1.388 ± 0.041 (SD) fibres per individual and neither depth nor anthropogenic activities affected the concentration levels in this particular study.

Keywords: Plastics, Pollution, Bio-indicators, Aegean Sea

Microplastics are a major threat to the Mediterranean Sea, as their accumulation causes surface pollution in the water comparable to the level of pollution found in the five subtropical ocean gyres [1]. Due to their small size (<5mm), they are accessible to marine biota; in particular filter feeders and deposit feeders that feed unselectively. This research focused on identifying locations affected by microplastic fibre contamination and quantification using deposit feeding Holothuria as an indicator species. Holothuria species don't distinguish between organic and inorganic materials, are nonselective deposit scavengers [2] and have a natural defense mechanism in the form of self-evisceration of their digestive track, making them particularly suited to use as an indicator species.

27 Holothuria specimens, 18 *Holothuria poli* and 9 *Holothuria tubulosa* were sampled during March and April 2015 at 5 sites in the eastern part of Samos island, eastern Aegean Sea, Greece. The sites have different levels of anthropogenic influences and accessebility ranging from a wastewater treatment plant to urban zones. The Holothurians were stored in tanks of filtered sea water. Microplastic fibres were quantified after defecation or evisceration (if they triggered their defence mechanism). Containers were shaken for 2 minutes and left for sedimentation for 12 to 24 hours [3]. For each sampling, 500 ml of supernatant was extracted, filtered through a WhatmanTM filter and then microplastics were counted with a microscope at 100 x magnification [4].

All sites sampled were contaminated with MP fibres 1.388 ± 0.041 (SD) per 500 ml of supernatant. Depth and anthropogenic activities had no influence on the amount of egested MP fibres by Holothuria. 8 out of the 27 collected Holothuria specimens activated their defence mechanism.In addition, the amount of microplastic fibres in these samples (1.621 ± 0.035 (SD) fibres per 500 ml of supernatant) was significantly higher than the number of microplastic fibres detected in samples of the sea cucumber which did not generate their defence mechanism (1.260 ± 0.036 (SD) per 500 ml of supernatant).

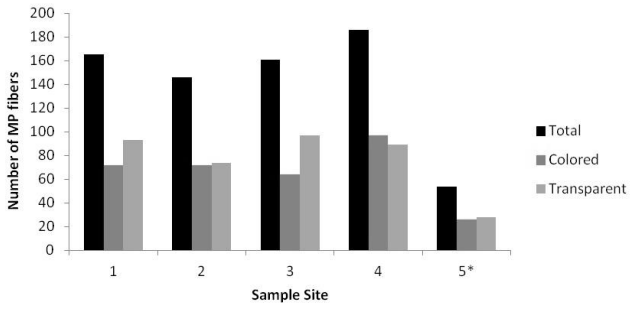

Fig. 1. Number of microplastic fibres (MP) per sampling site

This study showed that 100% of the examined Holothuria encountered microplastics in the benthic sediments while feeding and foraging the upper most layers of the sediments [2]. This observation conforms to findings made by other researches that suggest that high concentrations of microplastic fibres are available in benthic sediments in many parts of the world [5], particularly the Eastern Aegean and the Island of Samos [4].

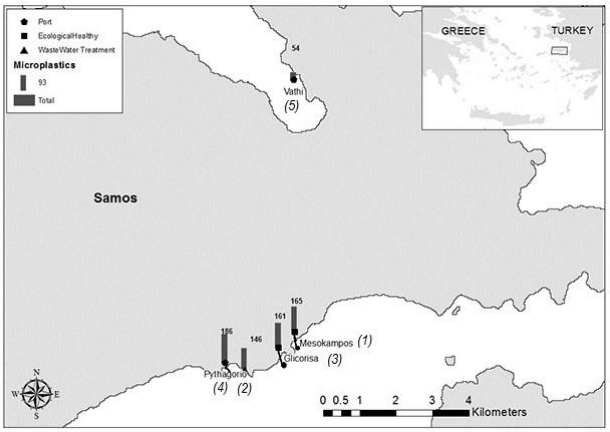

Fig. 2. Sampling sites in Samos and amount of microplastic fibres assessed in the individuals

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