SPATIAL DISTRIBUTION OF MICROPLASTICS AND ZOOPLANKTON IN THE CANARY CURRENT UPWELLING SYSTEM

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The ubiquitous distribution of microplastics (MP) in the ocean and its potential negative impact on the marine environment cause much concern in modern society. Particularly, MP items can be easily ingested by marine organisms, which can cause adverse physiological effects, MP bioaccumulation, and its transfer along higher trophic levels. In order to understand the interaction between marine biota and MP pollution along with its potential of encounter, uptake, trophic transfer, and possible environmental implications, studies on the distribution and abundance of MP in marine environment linked with the same data on zooplankton are needed, especially in biota-rich regions of high ecological and economic importance, such as upwelling systems.

This master thesis aimed to assess the abundance and distribution of MP within the Canary Current Upwelling System (CCS) and to link this data with distributional patterns of zooplankton. To assess the MP bioavailability for predominant zooplankton groups, the size spectra of MP along with the taxonomical composition of zooplankton were conducted. The work was based on zooplankton samples taken with a plankton multinet (300 µm) along transects off the coast of Mauritania and Senegal during the RV Meteor Expedition M129 in late summer 2016. For zooplankton identification, the digital image analysis with the ZooScan system and EcoTaxa web application was used. For MP identification and counting, a method of Nile Red staining in combination with fluorescence microscopy and further image analysis with ImageJ software was applied.

The results of the work showed that the abundance of both zooplankton and MP in the CCS was higher in the neritic area closer to the coast; furthermore, higher zooplankton and MP abundances were recorded along the southern transects as compared to the northern ones. The different distributional patterns observed, however, were not statistically significant, which can be due to influence of environmental factors (e.g., ocean circulation, accumulation in the area adjacent to the coast, seasonality) and MP characteristics (e.g., polymer type). Additional methodological shortcomings (e.g., sampling technique, airborne contamination) may have contributed to the lack of statistical significance. The proportion of MP to zooplankton abundance along different areas represented the absence of any significant trends and hence indicated an equal level of MP uptake potential. However, a significant portion of detected MP classes was presumably not available for ingestion by predominant zooplankton groups due to the large size of items. In order to assess the level of MP bioavailability with a high level of confidence, additional factors (MP shape, feeding behavior of zooplankton groups, MP ingestion potential for larger planktivorous organisms) need to be considered and supported by studies on zooplankton samples collected with smaller mesh sizes of a net.

Overall, this study is one of few that assessed MP abundances and contextualized it with the zooplankton communities in upwelling regions such as the CCS, and, particularly, via using the novel method for MP identification with NR staining and image analysis tools. This could serve as a good basis for further developing, on the one hand, the methodological aspect of MP studies and, on the other hand, for conducting more detailed and extensive research on MP pollution issue within this vital ecosystem.