# Microplastics in the marine environment and the characterization of their attached microbial communities

by

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**Abstract**

Microplastics (MPs) pollution is increasingly recognized as a potential threat to the marine environment (Thompson et al., 2009) and for this reason MPs are included as indicators of the Marine Strategy Framework in order to reach a Good Environmental Status (GES) (Jahnke et al., 2013). In this thesis MP distribution, occurrence at surface and its attached microbial community have been assessed and characterized using microscopy (light and electron) and High Throughput 16S rRNA gene sequencing (Illumina). Distribution and occurrence has been analysed as a function of water circulation, spatio-temporal variabilities and, most of all, distance from urban settlements and activities. Different time scales have been investigated, from the basin (Atlantic and Mediterranean sea) to sub-basin (Adriatic Sea) to coastal areas (Campania region). In coastal areas seasonality has also been investigated. The so-called microbial plastisphere has been investigated in terms of community composition and presence of individual taxa, to be used as indicators of maturity and potential toxicity to humans. Since rivers are recognized as major sources of MPs to the sea, a comparison of freshwater to marine plastisphere members has highlighted differences but also similarities. In vitro production of biofilm attached to commercial microbeads has also been assessed during an experiment aimed at assessing the effect of plastics on the sea urchin *P. lividus*. In general, results point to the existence of "core" plastisphere bacteria, which are always present, also suggesting adaptive advantages of the attachment to MPs. Apart from these, communities appear to be influenced by local environmental and biogeographical factors at all scales investigated, also confirming previous observations. Variability in time and space is a factor to be considered when assessing MP pollution, especially in coastal area, and most of all, when considering the potential harmful effects of the attached microbes to ecosystems or humans.