

Functional Ecology of the Microbial Plastisphere

Director of Studies: Raffaella Casotti (Stazione Zoologica Anton Dohrn)

Supervisor: Mario Celussi (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale)

Department of Integrated Marine Ecology

Seat: Naples, Italy

Project Summary

Plastic debris is omnipresent and it is recognized as a major threat also to marine ecosystems, with microplastics (MP, < 5 mm) accounting for >90% of total particle counts. While the collective imaginary concentrates on “Plastic Islands”, the reality is more that of a “Plastic Soup”, with small items floating and embedding seawater. Since it has been estimated that every human ingests the equivalent of a credit card per week through air, water and food, it is urgently needed a clear assessment of plastic distribution and impact in the marine realm and the factors modulating it. As soon as plastic items enter the sea, they are colonized by different organisms depending on their size and composition, collectively named “Plastisphere”. Current reports show that microorganisms such as bacteria and unicellular algae (mainly diatoms) are the first and persistent colonizers, forming specific communities different that their free-living counterparts. As these communities show signs of active division and functioning, it is evident that they are not only passively transported on the substrate, but also form a real habitat, whose characteristics are modulated by substrate, biogeography, seasonality and abiotic and biotic factors. While previous studies have concentrated on plastisphere biodiversity and community composition, much fewer studies report of metabolic activities through enzymatic assays and/or RNA transcript sequencing. This project aims at assessing metabolic potential of microbial plastisphere in two coastal areas of the Med Sea in terms of community composition and enzymatic activity, in the context of biogeochemical cycles. Initially, assays commonly used for free-living microbes will be applied and optimized to estimate functional rates of the plastisphere on in situ incubations sampled at different times using different polymers. Once the optimal condition, times and protocols will be established, measurements at sea will be conducted retrieving floating MPs by hyponeuston manta net during sampling cruises. The comparison between incubation experiments and in situ collected items is expected to provide information about permanence of items at sea and possibly their origin, based on circulation patterns of the areas. The student will profit from integration into a JPIOceans MicroPlastiX project (www.microplastix.org) at the beginning of his/her research work, and will receive also soft skill training through the SZN-OU PhD Program.