European Project Semester

PROJECT OUTLINE

Project dates: March – June 2023

Title: Development of a multi-level sampling process for the characterization of microplastics vertical distribution in Mediterranean Sea

Project activity areas:	**Keywords:**
Process engineering	**marine pollution; marine litter; microplastics; water column; vertical distribution; sampling methodology; lowtech**
Tutor's name and coordinates	**Project origin**
Client – End-user: Expédition MED ENIT Technical Supervisor + contact:	*Environment protection, Research*

Project technical background:

The ubiquitous presence of microplastics (MPs) in the oceans is now well established, as well as their many damaging effects on the marine ecosystem[1]. In order to better understand the origin and consequences of plastic pollution in the oceans and provide effective guidelines for its reduction and prevention, long-term monitoring programs are crucial.

For 13 years now, the NGO Expedition MED have been conducting scientific campaigns to characterize MPs distribution in the Mediterranean Sea, among the most polluted sea in the world[2]. The MPs characterization has focused so far on the top few centimetres of the water column, collected with a filtering method widely used by scientific community for sea-plastics evaluation (i.e. Manta trawl). To date, the vertical distribution of MPs and related sinking mechanisms remains largely unknown. However, the oceanic water column is the largest ecosystem on earth and deeper water layers could potentially be huge reservoirs of plastics[3].

In the light of the above, this project aims to develop a sampling method in order to assess MPs repartition in deeper water layers (< 1m). With the willingness to respect the technical restrictions related to on-board research, the new method has to be adapted from the existing Manta trawl process used for surface MPs characterization. Various technical and scientific locks must be overcome to fulfill the process specifications:

[1] Cincinelli et al., « A potpourri of microplastics in the sea surface and water column of the Mediterranean Sea ».
[2] Cappelletto et al., « The Mediterranean Sea We Want ».
[3] Liu et al., « Elucidating the vertical transport of microplastics in the water column: A review of sampling methodologies and distributions ».

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- The sampling process should allow the characterization of various depths of water layer (multi-level sampling)
- The sampling process should provide an accurate evaluation of MPs concentrations down to 0,1 MP particle per m^3 of water (large amounts of water need to be analysed)
- The technical choices should take into account the field strains related to the establishment of the sampling apparatus on the NGO vessel

Studied topics:

- Process engineering
- Fluid mechanics
- Marine engineering