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PLANKTON AS BIOLOGICAL PUMP FOR CONTAMINANTS IN MARINE ECOSYSTEMS: A TRANS-MEDITERRANEAN APPROACH (MERITE HIPPOCAMPE CRUISE, APRIL-MAI 2019)

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Abstract

Recent research on the bioaccumulation of organic and trace element contaminants along trophic food webs suggests that plankton plays a central role as a 'biological pump' for pollutants. The MERITE-HIPPOCAMPE project (oceanographic cruise in April-May 2019) aims at studying the interactions between plankton and contaminants (metallic, organic plastics) at atmosphere/water/biota interfaces via a North-South trans-Mediterranean approach in contrasted areas (primary production, fishing zones, ecoregions, polluted bays). The target contaminants are on the lists of priority pollutants and substances of Regional Conventions (OSPAR) and EU directives (WFD, MSF). The expected results are to provide a better understanding of the transfer processes of contaminants from water to the first pelagic trophic levels

Keywords: Trace elements, Pcb, Pah, Plankton, Mediterranean Sea

Recent research on the bioaccumulation of organic and trace element contaminants along trophic food webs suggests that plankton plays a central role as a 'biological pump' for pollutants. The MERITE-HIPPOCAMPE project (oceanographic cruise in April-May 2019) aims at studying the interactions between plankton and contaminants (metallic, organic plastics) at atmosphere/water/biota interfaces via a North-South trans-Mediterranean approach in contrasted areas (primary production, fishing zones, ecoregions, polluted bays).

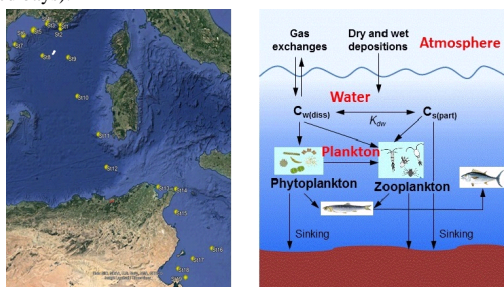


Fig. 1. Left: Position of the 19 sampling stations for the campaign. Coverage includes fishery areas (Gulf of Gabès and of Gulf of Lions), urban bays (Toulon, Marseille, Sfax) and offshore reference stations for West and South basins. Right: Diagram of the role of plankton as "biological pump" for contaminants ($C_{w(diss)}$: concentration of contaminants in seawater dissolved phase; $C_{s(part)}$: concentration of contaminants in seawater particulate phase; K_{dw} : partitioning between dissolved and particulate phases).

The target contaminants are on the lists of priority pollutants and substances of Regional Conventions (OSPAR) and EU directives (WFD, MSF). The expected results will provide a better understanding of the transfer processes of contaminants from water to the first pelagic trophic levels. The methodology used at each station allows conducting intensive and maximized surveys including: 1) deployment of a cluster of sensors for physical, biological and chemical measurements and water column sampling: CTD and range of optical sensors casts with ultraclean Niskin/Go-Flow rosette bottles for depth profiles of chemical contaminants concentrations, nutrients and main physico-chemical parameters, and plankton sampling for biomass, abundance and community structure determinations and 2) intensive plankton sampling in the deep chlorophyll maximum (DCM) and size class fractionations, using *in situ* submersible pumps for bacterioplankton fraction (0.7-60 μm), and deployments of multinet-Hydrobios type for sampling a large amounts plankton by horizontal repeated net tows and cascade on line size class fractionation (60-2000 μm). In addition sampling of contaminants atmospheric wet deposition is carried as well as survey of surface and water column of microplastics. The expected results of this study will provide a better understanding of the transferring processes of metallic and organic contaminants from water to

the first pelagic trophic levels (phyto-, zoo-, and bacterio-plankton) in the Mediterranean Sea. The new knowledge will bring elements to assessment of exploited biological resources chemical contamination, and improve our ability for modeling the fate and impact of contaminants across the Western Mediterranean Basin. Sound scientific understanding of the factors influencing the chemical contaminants uptake by first planktonic trophic level in both southern and northern western Mediterranean will benefit environmental evaluations at basin to coastal scales. The coastal vs more off-shore contaminants bioaccumulation in plankton will also provide new data for ecological status indicators. The MERITE-HIPPOCAMPE project is supported by CNRS/INSU MISTRALS program and its new transverse action Pollution and Contaminants (AT P&C). The project relies on a multidisciplinary and inter-institutional consortium combining French institutes (Ifremer, IRD, CNRS, IRSN, Ecoles des Mines) and Tunisian institutes (INSTM, FSB, CBS). This action is also identified as a major force of the phase 2 of the Joint International Laboratory LMI-COSYSMED (2019-24), enabling the integration of competences and implementation means. This partnership context constitutes a real strength in the perspective of the BLUEMED (H2020) initiative and provides a general framework and an opportunity for collaborative work to be developed in other pilot urbanized and fishing areas of middle/eastern Mediterranean and Black Sea.

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