

SPATIAL VARIABILITY OF PLANKTON COMMUNITIES IN A SEMI-CLOSED DISTURBED MEDITERRANEAN ECOSYSTEM (TOULON BAY, FRANCE)

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Abstract

Plankton and chemical composition of seawater have been studied along a transect of thirteen sampling stations in Toulon Bay during June 2009. Toulon Bay, located in the northwest Mediterranean coast of France, hosts major commercial and navy harbours. According to location of the sampling stations, this bay is variably affected by anthropogenic inputs, raw sewage from the Toulon area and maritime traffic. To understand spatial variability of the plankton communities in this disturbed ecosystem (little and large bay), measurements of physical and chemical parameters were carried out in the water column of Toulon Bay. According to all parameters analysed, several patterns have been obtained to explain the spatial variability of the plankton communities in this ecosystem.

Keywords: *Plankton, Coastal Waters, Metals, Organic Matter, Bacteria*

Experimental

Samplings were carried out the 11 June 2009 at thirteen stations, chosen strategically to be representative of the entire Bay and clearly separated from the open sea (Fig. 1). Samples for chemical analysis were collected in 1-L Teflon (Nalgene) bottles by scuba diving at 3-m depth, microbial and larger photosynthetic cells with a Niskin 10L-sampling bottle at 3-m depth and zooplankton samples were collected with a plankton net (0.5 m diameter, 2.5 m long, 90 µm mesh size) along the 0 to 5-m depth water column. Additionally, at 2 stations (in each part of the Toulon Bay), water sampling were performed at 1, 3 and 5-m of depth to investigate the vertical variability of the measured parameters.

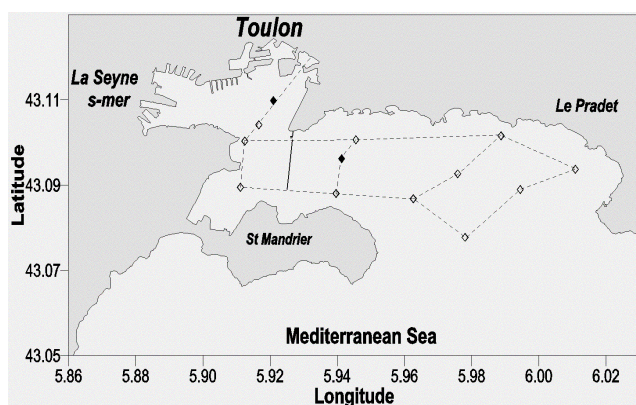


Fig. 1. Location of the sampling points (open diamond: 3-m depth sampling; black diamond: 1, 3 and 5-m depth sampling)

Physico-chemical parameters (temperature, salinity, pH, O₂, Eh, turbidity) were measured in-situ using a multiprobe (Hydrolab MiniSonde 4a). Microbial communities (heterotrophic bacteria, cyanobacteria and autotrophic pico eukaryotes) were counted by flow cytometry [1]. Larger phytoplankton cells were enumerated by inverted microscopy [2]. Zooplankton was characterized by microscopy and proteomics identification (Electrophoresis analysis). After filtration on 0.2 µm on line filters (Sartorius) chemical samples were studied to (1) characterize the dissolved organic matter (DOM) by TOC-meter (TOC-V, Shimadzu) and 3-D fluorescence spectroscopy (Hitachi F-4500) measurements, and (2) analyse the total dissolved Cu, Cd, Pb, Zn (by DPASV), total dissolved Hg (by CV-AFS) orthophosphates and nitrates (by colorimetric technique) concentrations.

Results and Discussion

According to the location of the sampling stations [3], major changes in plankton abundances and diversities have been recorded [4]. As a result, cell abundances (e.g. heterotrophic bacteria, *Prochlorococcus* sp.) have been multiplied by a factor 2 between the Large Bay and the Little Bay. However, diversity of large phytoplankton cells and of zooplankton declined from the Large to the Little Bay. By localisation, several patterns have been established to determine "explicative variables" of these spatial variations. The results provide a new evidence of the critical role played by anthropogenic inputs in the spatial distribution of the "global" plankton cells (i.e. microbial and larger cells)

and highlights the importance to consider further the chemical composition of the water column for a better understanding of the plankton ecology.

References

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