

# PHYTOPLANKTON VARIATIONS IN A MEDITERRANEAN CHANNEL DURING A DIURNAL TIDE.

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## Abstract

The present study discusses phytoplankton abundance and diversity diel variations in the channel, which connects the Thau lagoon (France) to the Mediterranean Sea. Abundance in surface and bottom samples, collected every three hours in May the 15<sup>th</sup> 2002 and in October the 22<sup>nd</sup> 2002, with good windless weather conditions, displayed similar trends. Peaks occurred during the ebb tide, except for the surface samples, collected in October, when the abundance remained almost constant. Pearson correlation revealed that tidal height variations affected mostly phytoplankton diversity, enriching the number of species during ebb.

*Key-words: phytoplankton, tide, lagoon*

## Introduction

Phytoplanktonic populations have a short life cycle and their presence/absence can be affected by an high number of variables (temperature, salinity, light intensity, nutrient availability...). To investigate the weak tide current effects of on phytoplankton abundance and diversity, a Mediterranean channel (Thau lagoon), with slight tidal height variations ( $\pm 15$  cm, on average), was chosen. The Thau lagoon has a wind-induced hydrodynamic pattern, negligible freshwater inputs and the sea-lagoon exchanges occur through the Sète channel [1], where sampling station is located. This area is, moreover, affected by high nutrient inputs, above all nitrogen, due to the farmed shellfish excretions and biodeposition.

## Methods

Water samples were collected by means of a bucket and a Kemmer bottle at the surface and at the bottom, respectively. Sampling campaigns were carried out in May the 15<sup>th</sup> 2002 and in October the 22<sup>nd</sup> 2002 (two windless days), every three hours from 08:00 a.m. to 08:00 p.m. to comprise a diurnal tide. Moreover, samples were collected around 10:00 p.m. to describe the dark condition. Phytoplanktonic specific composition and abundance were determined at light inverted microscope (Zeiss, Germany) according to Utermöhl's method [2]. Shannon diversity index and Pieolu evenness were calculated.

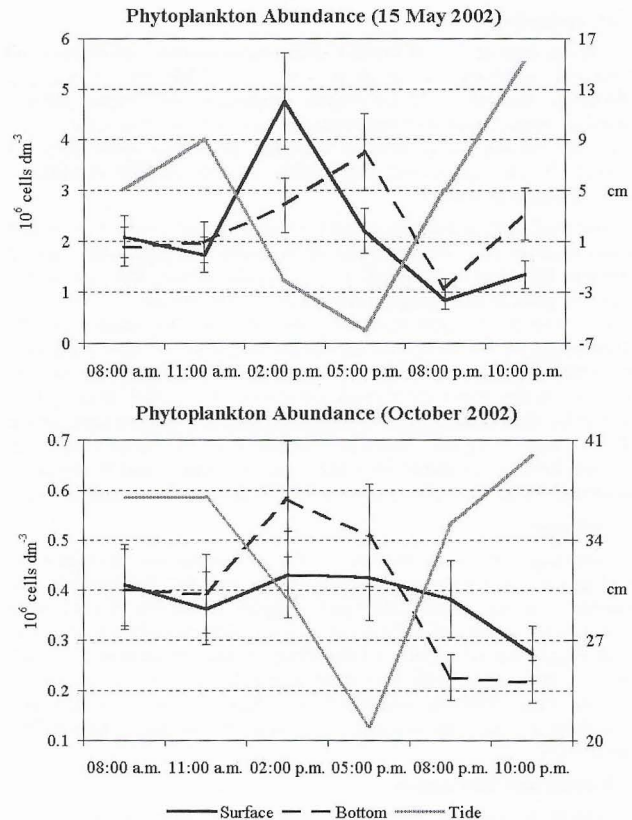
## Results

Marked abundance fluctuations were observed in May the 15<sup>th</sup> (Fig. 1). Surface and bottom samples displayed a similar mean value,  $2.16 \pm 1.37$  and  $2.32 \pm 0.91 \times 10^6$  cells  $\text{dm}^{-3}$ , respectively, but the maximum and the minimum strongly differed. Surface community was  $0.84 \times 10^6$  cells  $\text{dm}^{-3}$  at 08:00 p.m. and  $4.76 \times 10^6$  cells  $\text{dm}^{-3}$  at 02:00 p.m. (Fig. 1). Bottom community presented low abundance but, also, low variations (between 1.06, at 08:00 p.m., and  $3.76 \times 10^6$  cells  $\text{dm}^{-3}$ , at 05:00 p.m.). Some taxa were commonly widespread during all day and the most abundant was nanoflagellates (spherical flagellates, which size is less than 5  $\mu\text{m}$ ). During the ebb some species (i.e. *Nitzschia frustulum* Grunow and *Fragilaria* sp.) appeared, favouring the increase of diversity.

In October the 22<sup>nd</sup> surface abundance remained almost constant, varying between  $0.27 \times 10^6$  cells  $\text{dm}^{-3}$ , at 10:00 p.m., and  $0.43 \times 10^6$  cells  $\text{dm}^{-3}$ , at 02:00 p.m. In bottom samples abundance was higher than in surface from 08:00 a.m. to 05:00 p.m. (Fig. 1). It reached  $0.58 \times 10^6$  cells  $\text{dm}^{-3}$  in the early afternoon and, then, it dropped to  $0.22 \times 10^6$  cells  $\text{dm}^{-3}$ , in the evening. Nanoflagellates were still the most abundant taxa. During the ebb tide Dinophyceae abundance increased and *Pseudonitzschia heimii* Manguin represented till the 10% of total phytoplankton community.

Pearson correlation highlighted that, in May, diversity and evenness were significantly ( $p < 0.05$ ) affected by tidal height variations. In October, on the contrary, Shannon index was indirectly correlated with water temperature. No significant correlation was observed between abundance and the considered physical parameters.

Bacillariophyceae, both pelagic and benthic species, were, in general, more abundant during ebb than during flood tide. Pennate diatoms, often common in benthic habitat, were more frequent in bottom than in surface samples and they clearly characterised the ebb, highlighting the strong influence of lagoon waters on channel. Seawater effects on phytoplankton species were, instead, less evident.



## References

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