SEASONAL DYNAMICS OF FRACTIONATED PHYTOPLANKTON PIGMENTS IN A COASTAL ENVIRONMENT (TYRRHENIAN SEA)

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Abstract
The temporal variations in pigment spectra of two phytoplankton size classes (<5μm and >5μm) were investigated at a coastal site in the Tyrrhenian Sea over an annual cycle. The <5μm fraction accounted on average for 50% of the total phytoplankton biomass and small eukaryotes were the dominant component.

Keywords : Phytoplankton, Pigments, Coastal Waters, Tyrrhenian Sea.

Introduction
The cell size influences the role of phytoplankton in biogeochemical cycles and the characteristics of community structure via size-dependent interactions [1]. Signature pigments are very useful in outlining the main algal groups including the small and fragile forms, generally underestimated with classical approaches [2]. This study is focused on the seasonal dynamics of ultraphytoplankton (<5μm) both in terms of abundance and composition, in coastal environments. The results are discussed in relation to abiotic (e.g. nutrients) factors.

Material and methods
The sampling site is located at 40°48.5'N and 14°15'E, in proximity of the 80m isobath. Sampling was carried out weekly between July 2004 and July 2005. CTD profiles (S, T, oxygen, fluorescence) were performed utilizing a SBE 911plus. Samples for nutrients determinations were collected along the water column. For the determination of pigment spectra (HPLC-[3]) water samples were collected at four depths (0, -10, -20 and -40m) and filtered sequentially on polycarbonate membrane (porosity of 5μm) and on glass-fibre filters (GF/F) for the fraction >5 and <5μm respectively.

Results
Total phytoplankton biomass (average TChl a =0.83$\pm$1.15 mg m^{-3}) indicated the generally mesotrophic conditions of the area, while the negative correlation between biomass and salinity highlighted the importance of land run-off for the phytoplankton blooms. TChl a peaks were mainly due to an increase in the >5μm fraction (slope =0.80; r = 0.98, P<0.01, n=200), while the percentage contribution of <5μm decreased. As to the vertical distribution, the contribution of ultraphytoplankton was higher in the 20-40m layer. The eukaryotes accounted, on average, for 84.1$\pm$11.0% of the ultraphytoplankton biomass and their contribution increased at higher nitrate concentrations. The ultraphytoplankton fraction showed a higher diversity than the >5μm fraction in terms of the pigment composition. Fucoxanthin and 19'hexanoiloxifucoxantin values indicated that small diatoms and prymnesiophytes were the most important groups in the <5μm fraction, especially during the blooms. However, the occurrence of alloxanthin highlighted the contribution of small cryptophytes during the autumnal peak (40% of the ultraphytoplankton biomass at surface). Prasinoxanthin concentrations indicated that Prasinophyceae accounted for 25% of the ultraphytoplankton TChl a during the early spring bloom (March). The prokaryotes, cyanobacteria (zeaxanthin$_{syn}$) and prochlorophytes (divinyl-chlorophyll a) presented an opposite distribution along the water column in summer: the prochlorophytes were almost completely absent in the surface layer, while cyanobacteria accounted for 22.2$\pm$10.3% of ultraphytoplankton biomass (Fig.1). In addition, prochlorophytes were never recorded at high TChl a concentrations (>1 mg m^{-3}).

Conclusions
Despite the conspicuous blooms of larger cells, the ultraphytoplankton (above all the small eukaryotes) plays a pivotal role in the phytoplankton community of coastal areas. We may hypothesize that these small eukaryotes are more competitive in exploiting the episodic arrivals of new nutrients as compared to prokaryotes. Further, the higher pigment diversity of the ultraphytoplankton may be related to a complex and stable community within the microbial loop.

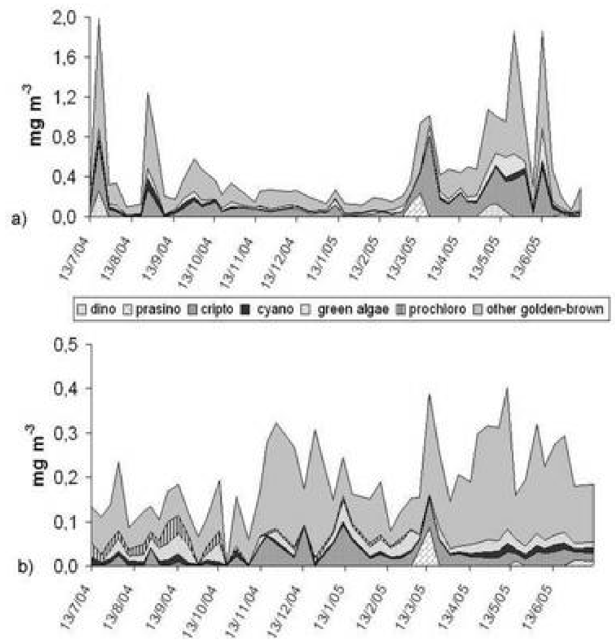

Fig. 1. Contribution of the main algal groups to the ultraphytoplankton TChl a at surface (a) and at - 40m (b), during the sampling period.

References
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