

PHYTOPLANKTON ASSEMBLAGES IN THE NORTHEASTERN SHELF OF MEDITERRANEAN SEA DETERMINED BY CHEMTAX ANALYSIS OF PIGMENT DATA

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Abstract

Relative contributions of the major phytoplankton groups to the total chlorophyll a were estimated by the CHEMTAX analyses. Chemo-taxonomic results for phytoplankton characterization showed mixed phytoplankton community and reflecting major contributions of cyanobacteria at the surface of the deep station. However, diatoms and dinoflagellates were the most abundant algal classes in shallow zone water.

Keywords : Eastern Mediterranean, Phytoplankton, Pigments.

Introduction

The eastern Mediterranean is known as one of the oligotrophic seas over the world, due to limited nutrient input to its surface waters from external and internal sources. Chlorophyll concentrations previously recorded in the Levantine basin were low, not exceeding $1 \mu\text{g/l}$ even in coastal waters [1]. However, phytoplankton composition is quite diverse (minimum 70 spp.). Microscopic analysis of phytoplankton composition is a tedious and necessitates well-trained taxonomist. Unfortunately, there are almost no studies on the pigment characterization of phytoplankton in the NE Levantine basin. The main aim of this research was to use the chemotaxonomy for great improvement in our understanding of the distribution and composition of oceanic phytoplankton populations.

Material and Method

In this study, the distributions of phytoplanktonic community composition in the NE Mediterranean coastal waters were described by using chemotaxonomy of photosynthetic pigments. In the field, sampling was carried out from a deep (total depth is 200 m) (36.26 N 34.22 E) and a shallow (total depth is 20 m) (36.33 N 34.15E) stations. Measurements were conducted in these stations in monthly intervals during December 2001 - December 2003 period. Pigments were analyzed by improved HPLC method [2].

Results and Discussion

Average chl-a concentrations were $0.13 \mu\text{g/l}$ (range $0.01-1.19 \mu\text{g/l}$) at the deep and $0.71 \mu\text{g/l}$ (range $0.03-8.0 \mu\text{g/l}$) at the shallow station during the entire studied period. Chlorophyll-a concentrations at the deep station was within the range of oligotrophic waters. Maximum surface CHL *a* values in shallow and deep station (8.0 and $1.2 \mu\text{g/L}$) were recorded during January 2002 sampling period probably due to transport of nutrients by river water in shallow station and winter mixing processes in deep station (Figure 1). Higher nutrient concentrations in shallow station (average (μM) \pm StDev; PO_4 : 0.08 ± 0.08 , NO_3 : 3.67 ± 4.75 , Si: 6.07 ± 5.98) relative to deep station (PO_4 : 0.03 ± 0.02 , NO_3 : 0.25 ± 0.23 , Si: 1.39 ± 0.56) resulted in higher algal biomass.

The output marker pigment: CHL *a* ratios calculated by CHEMTAX [3] were used in the calculation of the relative abundance of each phytoplankton group and hence their contributions to the total CHL *a* (Fig. 1). In surface waters of the deep station, the composition of the phytoplankton population was generally dominated by cyanobacteria, contributing 8-96% CHL *a* (mean=52%, SD=24%). Recent studies in the area showed that cyanobacteria abundance were generally high [4]. Marty *et al.* [5] reported that high contribution of cyanobacteria was observed at DYFAMED time-series station in the western Mediterranean Sea. The specific occurrence of cyanobacteria is related to possible N_2 fixation of some of the species composing this group. Algal classes, constituted the bulk of the remaining CHL *a*, showed mixed phytoplankton assemblages in deep station. However, in January 2002 where the highest concentrations of CHL *a* were recorded, surface waters of deep station were dominated by diatoms (56%), prymnesiophytes (15%) and dinoflagellates (13%). In shallow station, different composition of algal class was observed, with a general shift from surface waters dominated by prokaryotic cyanobacteria to populated predominantly by the eukaryotic diatoms (mean=41%, SD=16%) and dinoflagellates (mean=20%, SD=12%) (Figure 1). Similar to deep station, diatoms (62%) and dinoflagellates (22%) were the dominant algal groups in January 2002 (Figure 1).

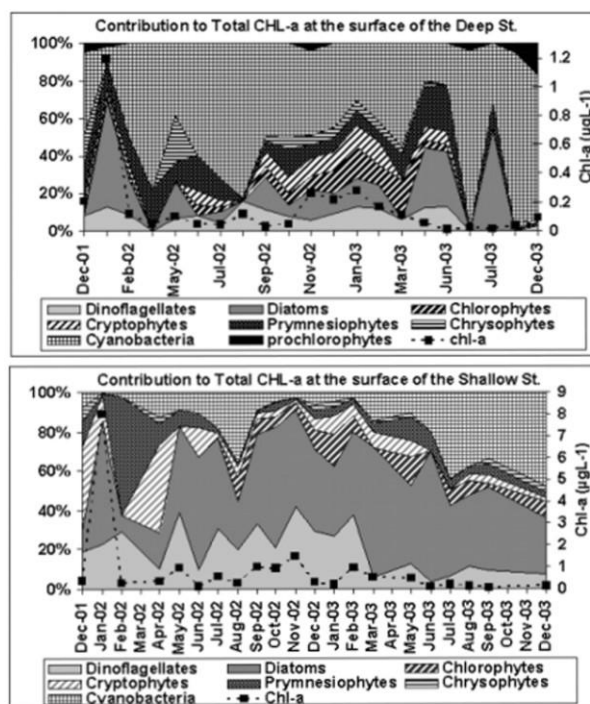


Fig. 1. Contribution of various algal classes to total CHL *a* biomass in surface waters of deep and shallow waters determined using CHEMTAX analysis.

References

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