

DISTRIBUTION OF CHLOROPHYLL *a* AND PHEOPIGMENTS IN THE NORTHERN ADRIATIC

Senka Terzic, Iva Mikac*, Milos-Sasa Grubescic and Marijan Ahel

Center for Marine and Environmental Research, Rudjer Boskovic Institute, 10000 Zagreb, Croatia

Abstract

Chlorophyll *a* (chl *a*) and its breakdown products were determined in the northern Adriatic over the whole annual cycle of 2000 using reverse-phase high-performance liquid chromatography (HPLC). Distribution of chl *a* was characterised by a typical seasonal pattern with pronounced maxima in spring and autumn, coinciding with phytoplankton blooms that developed in the surface layer after the major freshwater inputs by the North Italian rivers. The composition of pheopigments as well as their percentage in the total concentration of chlorophyll *a* strongly varied, depending on the season and location. The highest levels were observed during major diatom blooms.

Key words: chlorophyll *a*, phytoplankton, pheopigments, northern Adriatic

Introduction

The northern Adriatic receives large amounts of freshwater from the North Italian rivers and represents one of the most eutrophic areas of the Mediterranean Sea. Numerous investigations have been carried out in order to assess the eutrophication and related phenomena in this basin [1]. The impact of the Po River discharges on the phytoplankton dynamics in the northern Adriatic is well documented, but, until recently, a very limited number of reports have been published on the spatial and seasonal distribution of photosynthetic pigments and their break-down products [2].

Methods

Study area and sampling

Samples were collected at several stations in the central part of the Northern Adriatic along a transect extending from the city of Rovinj to the mouth of the Po River. Sampling was performed in approximately monthly intervals, from January to December 2000.

Analysis

Chlorophyll *a* and its breakdown products, including chlorophyllide, pheophorbide, pyropheophorbide and 2 pheophytins, were determined using a HPLC-method with serially coupled UV and fluorescence detection [3].

Results and discussion

The seasonal distribution of chl *a* in the northern Adriatic during 2000 (Fig. 1A) showed some typical features, which are characteristic for this basin. The maxima observed in the surface layer (0-5 m) were strongly correlated with the freshwater pulses of the Po River, while chl *a* levels in the bottom layer were less variable and can be linked mainly to regeneration processes. The decoupling between the two layers was more pronounced in the western part of the basin (station SJ108), while in the eastern part (RV001) the surface peak of chl *a* is often missing (Fig. 1B). The ratio between chl *a* and pheopigments is highly variable. The most abundant breakdown product of chl *a* was chlorophyllide *a*, followed by pheophorbides and pheophytins. This indicated enzymatic cleavage as the key mechanism of chlorophyll *a* degradation. The concentration of those pheopigments, which were suggested to be indicators of grazing, such as pyropheophorbide *a*, was relatively low. Spatial distribution of pheopigments revealed an increase of their absolute concentrations as well as their relative contributions to the total chl *a* in the western part of the basin (Fig. 1C), especially during diatom blooms in February and October.

References

- 1 - D. Degobbi, R. Precali, I. Ivancic, N. Smodlaka, D. Fuks and S. Kveder, 2000. Long-term changes in the Northern Adriatic ecosystem related to anthropogenic eutrophication. *Int. J. Environ. Pollut.*, 13: 495-533.
- 2 - M. Ahel and S. Terzic, 1998. Pigment signatures of phytoplankton dynamics in the northern Adriatic. *Croat. Chem. Acta*, 71: 199-215.
- 3 - R.F.C. Mantoura and C.A. Llewellyn, 1983. The rapid determination of algal chlorophyll and carotenoid pigments and their breakdown products in natural waters by reverse-phase high-performance liquid chromatography. *Anal. Chim. Acta*, 151: 297-314.

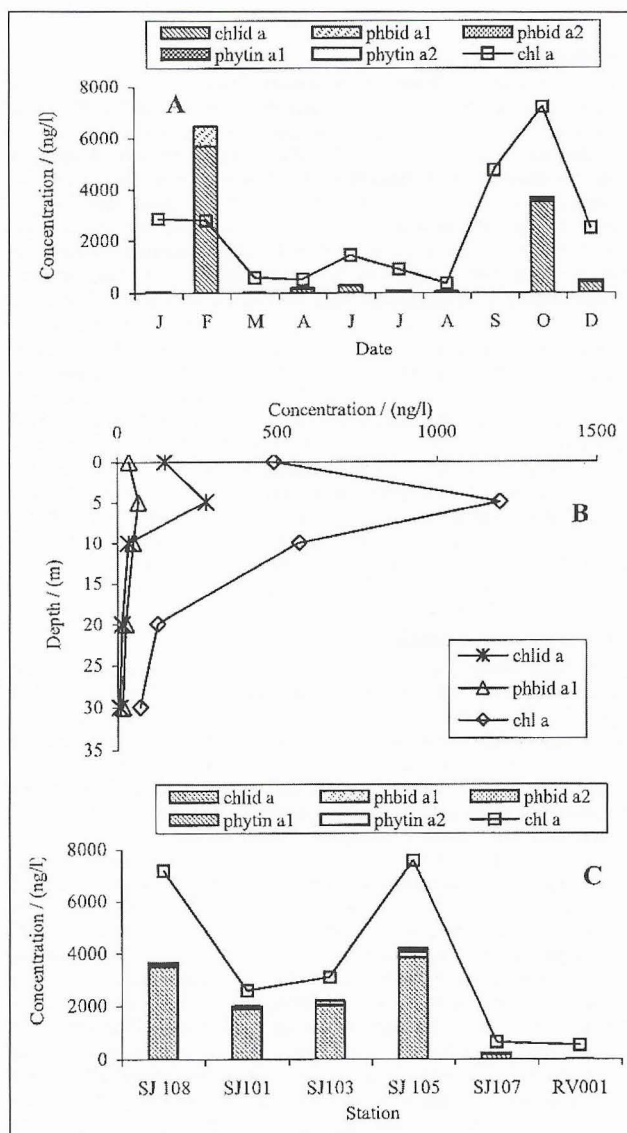


Fig. 1. Distribution of chlorophyll *a* (chl *a*) and selected pheopigments in the northern Adriatic: (A) seasonal distribution in the surface layer of the western part of the basin (station SJ108), (B) vertical distribution in the water column at the station SJ108 and (C) spatial distribution along the transect Po River mouth – Rovinj (October 2000); chl *a* = chlorophyllide *a*, phbid = pheophorbide *a*, phytin = pheophytin *a*.