MICROPHYTOPLANKTON IN TWO EASTERN ADRIATIC ESTUARIES

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Abstract

Microphytoplankton (MICRO) composition and abundance, including environmental factor measurements, were investigated in two southeastern Adriatic estuaries. The MICRO communities in estuaries are of marine origin. Diatoms and dinoflagellates were the most important MICRO constituents. The main feature of MICRO assemblages is the simultaneous dominance of more than one species. The reason for this can be found in the very frequent and rapid changes of environmental conditions in these dynamic ecosystems.

Keywords: microphytoplankton, estuaries, southeastern Adriatic

Field-oriented research, including microphytoplankton (MICRO, cells >20 μm) composition and abundance, and environmental factor measurements, were carried out at fixed stations in the two estuaries in 1999 and 2000. Water samples were collected at the Vlaška station (43° 03' N, 17° 29' E, 10 m max. depth) in the Neretva River estuary (NRE), and at the Ombla-2 station (42° 41' N, 18° 07' E, 15 m max. depth) in the Ombla River estuary (ORE).

The estuaries of the Neretva River and the Ombla River are situated in the Middle Adriatic and the South Adriatic, respectively. Both of them are highly stratified and low tidal (25 cm average daily amplitude) estuaries. The Neretva River and the Ombla River are 22.3 and 4 km long, respectively. The annual average flow of the Neretva River and the Ombla River is 414 $m^3 s^{-1}$ and 26 $m^3 s^{-1}$, respectively.

Water samples were taken using 5 L Niskin bottles from the surface to bottom at each meter depth in the NRE. In the ORE, samples were taken at depths of 0.5, 2, 4, 6, 10, and 15 meters. Samples were collected at monthly intervals. Physical-chemical parameters and MICRO cells were determined using standard oceanographic methods.

The aim of the present study was to investigate the physical-chemical conditions in the water column and to determine the dominant MICRO taxa in these estuaries.

Water column stratification was found throughout the year in both estuaries. A sharp halocline was situated frequently at 2-4 m depths. The whole column water was well aerated in the ORE, since hypoxia or anoxia was noticed below eight meters in the NRE. Euphotic layer in both estuaries decreased in the summer-autumn period. The concentration of all measured nutrients in the NRE were from 1.9 (NO_3) to 10.1 (PO_4) times higher than in the ORE. MICRO abundance oscillated in the NRE and ORE in four and three orders of magnitude, respectively (Fig. 1).

Diatoms and dinoflagellates were the most important MICRO constituents in both estuaries. Diatoms dominated the MICRO abundance throughout the year in the NRE (49-99%), but dinoflagellates caused outbursts of growth in September 1999. On the other hand, dinoflagellates were dominant (31-88%) group in the ORE, except in November 1999, March and November 2000, when diatoms were prevailed.

Two or three peaks of MICRO were observed throughout the year (Fig. 1). The first peak in the NRE (in April 1999) was reflected in the intensive development of diatoms (78% of MICRO, *Thalassiosira* sp., *Cerataulina pelagica*, *Chaetoceros compressus*, *Ch. curvisetus*, *Hemiaulus hauckii* and *Leptocylindrus danicus*). During the second peak (August-September 1999), *Nitzschia longissima* and *Scrippsiella trochoidea* were the most abundant species (>10^6 cells L^{-1}). *Cyclotella* sp. and *Ceratium fusus* showed a 94% contribution to the MICRO abundance at the third peak in April 2000.

In the ORE, the spring peak (in April 2000) was mostly made up (85% of MICRO abundance) of *Calyptrosphaera oblonga* and *Scrippsiella trochoidea*. During the second peak (June-August 2000), the greatest number of species with an abundance greater than 10^3 cells L^{-1} were identified. They are as follows: *Eutreptia lanowii*, *Scrippsiella trochoidea* (>10^4 cells L^{-1}), *Chaetoceros* spp., *Nitzschia longissima*, *Gonyaulax* sp., *Prorocentrum triestinum*, *Gyrodinium fusiforme* and *Protoperidinium tubum*.

The MICRO communities in estuaries are of marine origin. The surface layer showed some fresh and brackish water taxa (*Asterionella formosa*, *Fragillaria crotonensis* and others), but they were present at background levels. The main feature of MICRO assemblages is the simultaneous dominance of more than one species. The reason for this can be found in the very frequent and rapid changes of environmental conditions in these dynamic ecosystems. In the ORE, neritic species are more frequent due to the direct inflow of deep southern Adriatic waters. Our studies stress the important role of nutrients in the MICRO structure. However, not only the quantity, but also the quality of nutrients may influence MICRO composition. Different MICRO species can exploit nutrient sources with varying capabilities and different nitrogen sources may selectively stimulate the development algal species (1).

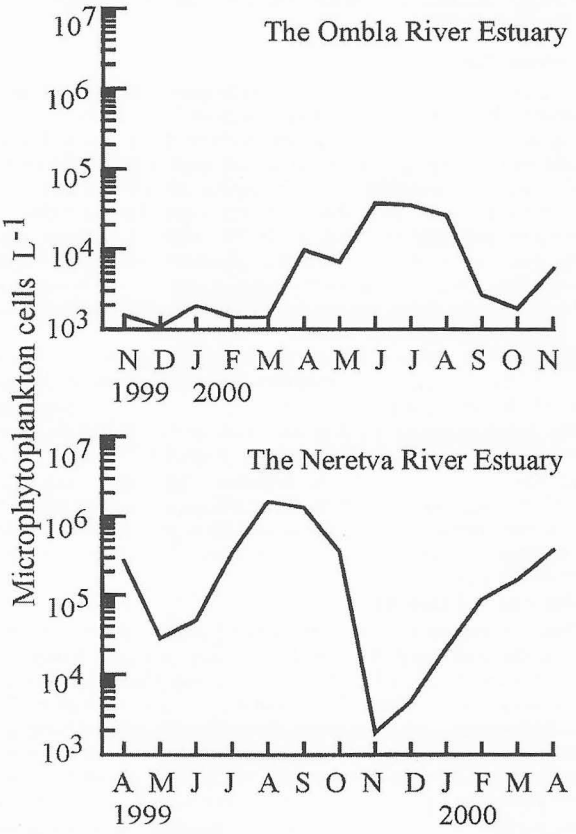

Fig. 1. Microphytoplankton abundance in the estuaries (values are expressed as water column mean).

References

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